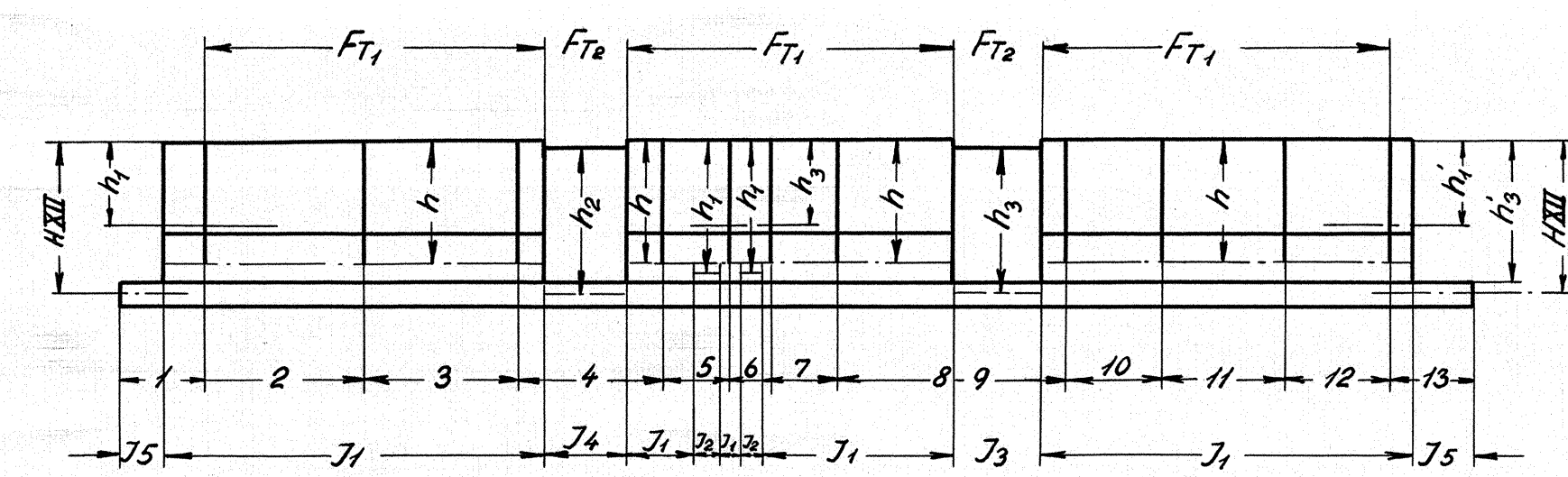


Fag:	Momentflader: kg.cm. x cm = kgcm. ²	$\frac{F_0 \times h_n}{J_0}$ kg/cm.	$\frac{h_n^2 \times l_n}{J_0}$ 1/cm.	$\frac{l_n}{F_0}$ 1/cm.	$\frac{l_n}{F_T}$ 1/cm.	$\frac{Mn^3-1}{3 \times Jsn-1}$ 1/cm.	$\frac{Hn^3}{3 \times Jsn}$ 1/cm.	a+b+c+d+e 1/cm.	$\frac{H^3-1}{3 \times Jsn-1}$ 1/cm.	$\frac{Hn^3}{3 \times Jsn}$ 1/cm.
2	$-200,98 \times 10^5$	$-\frac{200,98 \times 10^5 \times 186,9}{81747} = -45950$	$\frac{186,9^2 \times 22,77}{81747} = 97,30$	$\frac{227,7}{52,7} = 4,31$	$\frac{227,7}{17,5} = 13,01$	$\frac{186,9^3}{3 \times 53220} = 40,80$	$\frac{186,9^3}{3 \times 173988} = 12,51$	167,93	$\frac{186,9^3}{3 \times 53220} = 40,80$	$\frac{186,9^3}{3 \times 173988} = 12,51$
3	$2662,7 \times 10^5$	$\frac{2662,7 \times 10^5 \times 186,9}{81747} = 608780$	$\frac{186,9^2 \times 22,50}{81747} = 96,14$	$\frac{225,0}{52,7} = 4,26$	$\frac{225,0}{17,5} = 12,89$	$\frac{186,9^3}{3 \times 173988} = 12,51$	$\frac{186,9^3}{3 \times 27167} = 80,11$	205,91	$\frac{186,9^3}{3 \times 173988} = 12,51$	$\frac{186,9^3}{3 \times 27167} = 80,11$
4 (a+c)	$2126,82 \times 10^5$	$\frac{2126,82 \times 10^5 \times 186,9}{81747} = 486500$	$\frac{186,9^2 \times 95,7}{81747} = 40,89$	$\frac{95,7}{52,7} = 1,82$	$\frac{95,7}{17,5} = 5,48$	$\frac{186,9^3}{3 \times 27167} = 80,11$	$\frac{186,9^3}{3 \times 47711} = 45,50$	173,80	$\frac{186,9^3}{3 \times 27167} = 80,11$	$\frac{186,9^3}{3 \times 47711} = 45,50$
4 (b)	$2882,81 \times 10^5$	$\frac{2882,81 \times 10^5 \times 220,8}{10500} = 6062000$	$\frac{220,8^2 \times 123,0}{10500} = 571,11$	$\frac{123,0}{80,8} = 1,52$	$\frac{123,0}{26,5} = 4,64$	∞	∞	577,27	∞	∞
5 (d+f)	$1763,11 \times 10^5$	$\frac{1763,11 \times 10^5 \times 186,9}{81747} = 403000$	$\frac{186,9^2 \times 62}{81747} = 26,50$	$\frac{62}{52,7} = 1,18$	$\frac{62}{17,5} = 3,54$	$\frac{186,9^3}{3 \times 47711} = 45,50$	$\frac{190,0^3}{3 \times 1258} = 1819,0$	1895,72	$\frac{186,9^3}{3 \times 47711} = 45,50$	$\frac{190,0^3}{3 \times 1258} = 1819,0$
5 (e)	$1011,03 \times 10^5$	$\frac{1011,03 \times 10^5 \times 190,0}{78730} = 243980$	$\frac{190,0^2 \times 35,0}{78730} = 16,05$	$\frac{35,0}{45,3} = 0,77$	$\frac{35,0}{17,5} = 2,00$	∞	∞	18,82	∞	∞
6 (g+i)	$896,80 \times 10^5$	$\frac{896,80 \times 10^5 \times 186,9}{81747} = 205000$	$\frac{186,9^2 \times 29,5}{81747} = 12,60$	$\frac{29,5}{52,7} = 0,56$	$\frac{29,5}{17,5} = 1,69$	$\frac{190,0^3}{3 \times 1258} = 1819,00$	$\frac{186,9^3}{3 \times 1976} = 1102,0$	2935,85	$\frac{190,0^3}{3 \times 1258} = 1819,0$	$\frac{186,9^3}{3 \times 1976} = 1102,0$
6 (h)	$1028,35 \times 10^5$	$\frac{1028,35 \times 10^5 \times 190,0}{78730} = 248170$	$\frac{190,0^2 \times 3,5}{78730} = 16,05$	$\frac{3,5}{45,3} = 0,77$	$\frac{3,5}{17,8} = 2,00$	∞	∞	18,82	∞	∞
7	$2825,00 \times 10^5$	$\frac{2825,00 \times 10^5 \times 186,9}{81747} = 646000$	$\frac{186,9^2 \times 98,1}{81747} = 42,40$	$\frac{98,1}{52,7} = 1,86$	$\frac{98,1}{17,5} = 5,60$	$\frac{186,9^3}{3 \times 1976} = 1102,0$	$\frac{186,9^3}{3 \times 10590} = 205,50$	1357,36	$\frac{186,9^3}{3 \times 1976} = 1102,0$	$\frac{186,9^3}{3 \times 10590} = 205,50$
8-9 (k+m)	$4610,24 \times 10^5$	$\frac{4610,24 \times 10^5 \times 186,9}{81747} = 1055000$	$\frac{186,9^2 \times 187,1}{81747} = 80,20$	$\frac{187,1}{52,7} = 3,55$	$\frac{187,1}{17,5} = 10,70$	$\frac{186,9^3}{3 \times 10590} = 205,50$	$\frac{186,9^3}{3 \times 5130} = 425,00$	724,95	$\frac{186,9^3}{3 \times 10590} = 205,50$	$\frac{186,9^3}{3 \times 5130} = 425,00$
8-9 (l)	$2589,70 \times 10^5$	$\frac{2589,70 \times 10^5 \times 220,7}{132,62} = 4309600$	$\frac{220,7^2 \times 130}{132,62} = 477,45$	$\frac{130}{123,4} = 1,05$	$\frac{130}{26,5} = 4,91$	∞	∞	483,41	∞	∞
10	$1801,00 \times 10^5$	$\frac{1801,00 \times 10^5 \times 186,9}{81747} = 411500$	$\frac{186,9^2 \times 134,3}{81747} = 67,20$	$\frac{134,3}{52,7} = 2,93$	$\frac{134,3}{17,5} = 8,82$	$\frac{186,9^3}{3 \times 5130} = 425,00$	$\frac{186,9^3}{3 \times 24938} = 87,4$	591,35	$\frac{186,9^3}{3 \times 5130} = 425,00$	$\frac{186,9^3}{3 \times 24938} = 87,4$
11	$199,07 \times 10^5$	$\frac{199,07 \times 10^5 \times 186,9}{81747} = 45500$	$\frac{186,9^2 \times 170,0}{81747} = 72,60$	$\frac{170,0}{52,7} = 3,22$	$\frac{170,0}{17,5} = 9,70$	$\frac{186,9^3}{3 \times 24938} = 87,40$	$\frac{186,9^3}{3 \times 15979} = 136,4$	309,32	$\frac{186,9^3}{3 \times 24938} = 87,4$	$\frac{186,9^3}{3 \times 15979} = 136,4$
12	$-298,90 \times 10^5$	$\frac{298,90 \times 10^5 \times 186,9}{81747} = -68300$	$\frac{186,9^2 \times 163,4}{81747} = 6980$	$\frac{163,4}{52,7} = 3,10$	$\frac{163,4}{17,5} = 9,35$	$\frac{186,9^3}{3 \times 15979} = 136,4$	$\frac{186,9^3}{3 \times 6467} = 336,0$	554,65	$\frac{186,9^3}{3 \times 15979} = 136,4$	$\frac{186,9^3}{3 \times 6467} = 336,0$



Fag 2:1) $-45950 = X_2 \times 167,93 - 0 \times 40,80 - X_3 \times 12,51$
 $X_2 = \frac{-45950 + 12,51 X_3}{167,93} = -274,0 + 0,0746 X_3$

Fag 3:2) $608780 = X_3 \times 205,91 - X_2 \times 12,51 - X_4 \times 80,11$
 $608780 = X_3 \times 205,91 - 12,51 \times (0,0746 X_3 - 273,9) - 80,11 X_4$
 $608780 = X_3 \times (205,91 - 0,993) + 3430,0 - 80,11 X_4$
 $X_3 = \frac{608780 - 3430 + 80,11 X_4}{204,98} = 2953,0 + 0,3908 X_4$

Fag 4:3) $486500 + 6062000 X_4 \times (173,80 + 577,27) - 80,11 X_3 - 45,50 X_5$
 $6548500 = 751,07 X_4 - 80,11 \times (2953,0 + 0,3908 X_4) - 45,50 X_5$
 $X_4 = \frac{6548500 + 236580 + 45,50 X_5}{751,07 - 31,31} = \frac{6785080 + 45,50 X_5}{719,76} = 9440,0 + 0,0633 X_5$

Fag 5:4) $403000 + 243980 = (1895,72 + 18,82) X_5 - X_4 \times 45,50 - 1819,0 X_6$
 $646980 = 1914,54 X_5 - 45,50 \times (9440,0 + 0,0633 X_5) - 1819,0 X_6$
 $X_5 = \frac{646980 + 429000 + 1819,0 X_6}{1914,54 - 0,29} = \frac{1075980 + 1819,0 X_6}{1914,25} = 562,0 + 0,9520 X_6$

Fag 6:5) $205000 + 248170 = (2935,85 + 18,82) X_6 - X_5 \times 1819,0 - 1102,0 X_7$
 $453170 = 2954,67 X_6 - 1819,0 \times (562,0 + 0,9520 X_6) - 1102,0 X_7$
 $X_6 = \frac{453170 + 1022000 + 1102,0 X_7}{2954,67 - 1730,00} = \frac{1475170 + 1102,0 X_7}{1224,67} = 1208,0 + 0,9030 X_7$

Fag 7:6) $646000 = 1357,73 X_7 - 1102,0 \times (1208,0 + 0,9030 X_7) = 205,50 X_8 - 9$
 $646000 = 1357,73 X_7 - 1102,0 \times (1208,0 + 0,9030 X_7) = 205,50 X_8 - 9$
 $X_7 = \frac{646000 + 1330000 + 205,50 X_8 - 9}{1357,73 - 995,00} = \frac{1976000 + 205,50 X_8 - 9}{362,73} = 5450,0 + 0,5660 X_8 - 9$

Fag 8-9:7) $1055000 + 4309600 = (724,95 + 483,41) X_8 - 205,50 X_7 - 425,00 X_{10}$
 $5364600 = 1208,36 X_8 - 205,50 \times (5450,0 + 0,5660 X_8 - 9) - 425,00 X_{10}$
 $X_8 = \frac{5364600 + 1123000 + 425,00 X_{10}}{1208,36 - 116,20} = \frac{6487600 + 425,00 X_{10}}{1092,16} = 5920,0 + 0,3890 X_{10}$

Fag 10:8) $411500 = 591,35 X_{10} - 425,00 X_{8-9} - 87,40 X_{11}$
 $411500 = 591,35 X_{10} - 425,00 \times (5920,0 + 0,3890 X_{10}) - 87,40 X_{11}$
 $X_{10} = \frac{411500 + 2518000 - 87,40 X_{11}}{591,35 - 165,70} = \frac{2929500 - 87,40 X_{11}}{425,65} = 6900,0 + 0,2060 X_{11}$

Fag 11:9) $45500 = 309,32 X_{11} - 87,40 X_{10} - 136,40 X_{12}$
 $45500 = 309,32 X_{11} - 87,40 \times (6900,0 + 0,2060 X_{11}) - 136,40 X_{12}$
 $X_{11} = \frac{45500 + 603000 + 136,40 X_{12}}{309,32 - 18,00} = \frac{648500 + 136,40 X_{12}}{291,32} = 2228,0 + 0,4680 X_{12}$

Fag 12:10) $-68300 = 554,65 X_{12} - 136,40 X_{11} - 0 \times 336,0$
 $-68300 = 554,65 X_{12} - 136,40 \times (2228,0 + 0,4680 X_{12})$
 $X_{12} = \frac{-68300 + 303800}{554,65 - 62,50} = \frac{235500}{492,15} = 478,0 \text{ kg. tryk.}$

$X_{11} = 2228,0 + 0,4680 \times 478,0 = 2228,0 + 224,0 = 2452,0 \text{ kg. (tryk)}$
 $X_{10} = 6900,0 + 0,2060 \times 2452,0 = 6900,0 + 505,0 = 7405,0 \text{ kg. (tryk)}$
 $X_{8-9} = 5920,0 + 0,3890 \times 7405,0 = 5920,0 + 2880,0 = 8800,0 \text{ kg. (tryk)}$
 $X_7 = 5450,0 + 0,5660 \times 8800,0 = 5450,0 + 4990,0 = 10440,0 \text{ kg. (tryk)}$
 $X_6 = 1208,0 + 0,9030 \times 10440,0 = 1208,0 + 9450,0 = 10658,0 \text{ kg. (tryk)}$
 $X_5 = 562,0 + 0,9520 \times 10658,0 = 562,0 + 10120,0 = 10692,0 \text{ kg. (tryk)}$
 $X_4 = 9440,0 + 0,0633 \times 10692,0 = 9440,0 + 675,0 = 10115,0 \text{ kg. (tryk)}$

konstanter m.m. er udregnet i tabellen ovenfor, momentflader er udregnet på tegn.nr. 18W-1142.

Elasticitetligningerne efter „Bieck“, der udtrykker, at de statisk ubestemte antager en værdi, så deformationsarbejdet er minimum, giver:

$$\frac{F_0 \times h_n}{J_0} = X_n \left(\frac{h_n^2 \times l_n}{J_0} - \frac{l_n}{F_0} - \frac{l_n}{F_T} + \frac{Hn^3-1}{3 \times Jsn-1} + \frac{Hn^3}{3 \times Jsn} \right) - \frac{X_{n-1} \times Hn-1}{3 \times Jsn-1} - \frac{X_{n+1} \times Hn}{3 \times Jsn}$$

Det må dog bemærkes, at for søjlelængden H må man indføre den mindste værdi for afstanden fra toparræms tyngdepunkt til X-aksen i de tilstødende sidearræms. X_n indføres som positiv for trykkraft. X₁ og X₁₃ = 0. Man får følgende ligninger:

5					
4					
3					
2					
1					
Sik.	Betegnelse	Pts.	Materiale kvalitet	Model nr. eller materiale størrelse	rå færdig vægt/stk.
Tegn. E.U. 18-11-50 Rev.	Afd. ZL	Dato	Målestok:		
Kalk. L.E. 14-3-58 Norm.	Afd. K.	Dato	Indeks:		
Dato	Retelse		FRICHS		
Anvendelse			Stykliste nr.		
Diesel-el. motorvogn 500/550HK-Mo.					
Tegningens betegnelse			Tegningens nummer.		
Beregning af vognside.			18W-1143		
Indeks:					