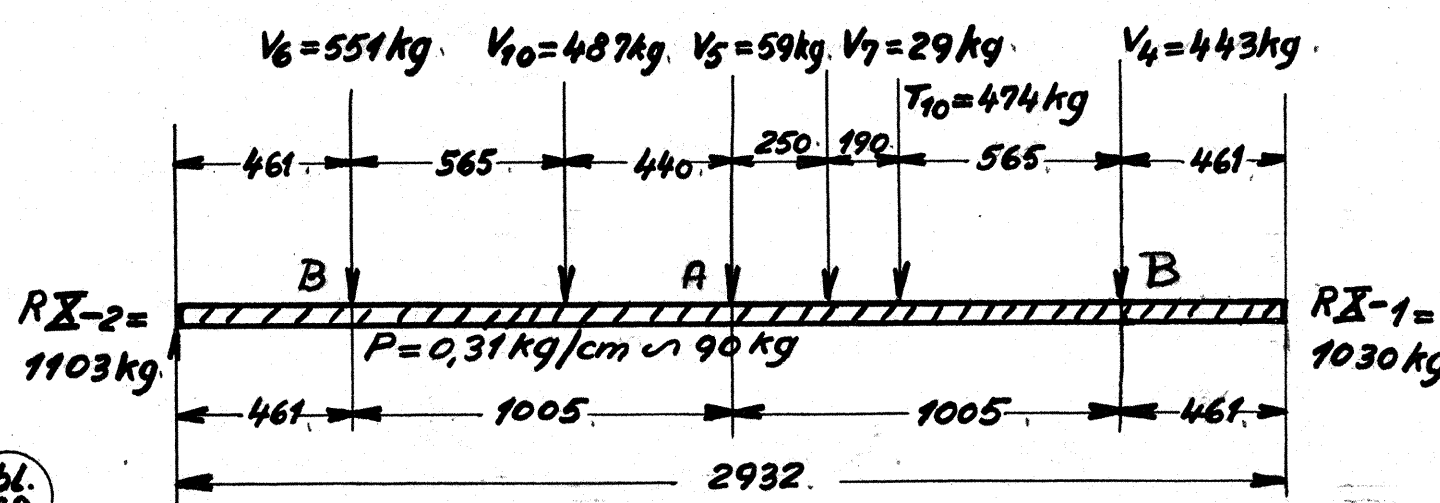


17) beregning af tværdrager X (18W-15.102 pos.2)

Egenvægt af drager ca. 90kg fordelt over 2932mm.  
 Gulv i X-X 214kg (bl.28) :  $T_{10} = W_{10} = \frac{214(440 + 1/2 \times 565)}{2 \times 2932}$   
 $25 \text{ kg}$   $V_6 = V_4 = \frac{214(565 + 461) \times 1/2}{2 \times 2932} = 19 \text{ kg}$   
 Gulv i X-XI :  $78 \times 1205 = 112 \text{ kg}$   $T_{10} = W_{10} = \frac{112(440 + 1/2 \times 1026)}{2 \times 2932}$   
 $18 \text{ kg}$ .

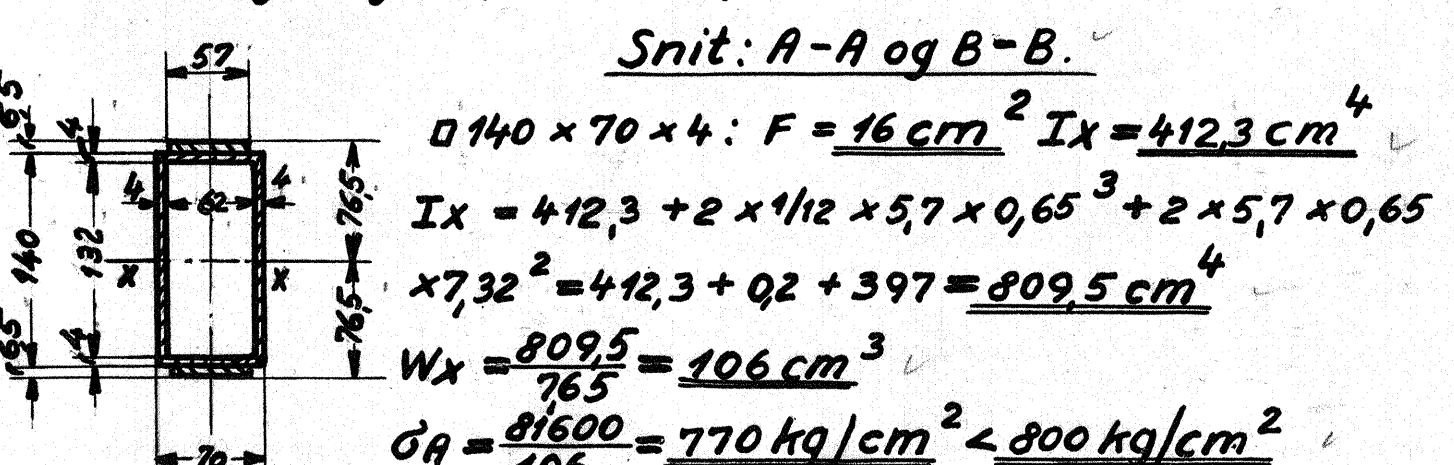


Bæring for gulv  $W_{10} = T_{10} = 14 \text{ kg}$   $V_6 = V_4 = 1/2 \times (90 + 12) = 51 \text{ kg}$  kabelkanal :  $V_5 = V_7 = \frac{600 \times 1/2 (2290 + 1205)}{18000 \times 2} = 29 \text{ kg}$   
 Passagerer (50% overlast) + sofaer udgør (bl.22) :  
 $4870 \times 1/2 (2290 + 1205) = 940 \text{ kg}$   
 $W_{10} = T_{10} = \frac{940(440 + 1/2 \times 565)}{2932} = 231 \text{ kg}$   
 $W_4 = V_6 = \frac{940 \times 1/2 (565 + 461)}{2932} = 164 \text{ kg}$   
 Bremseslitter og arm mm  $V_6 = 11 + 1/2 \times 22(375 + 895) = 2290$   
 $(22 + 7) \times 375 \times 724 + (100 + 15) \times 225 \times 724 = 11 + 7 + 2 + 4 = 24 \text{ kg}$   
 $V_4 = 9 + 1/2 \times 22(375 + 895) + (22 + 7) \times 375 \times 1286 + (100 + 15) \times 225 \times 1286 = 2290 \times 2010$   
 $9 + 7 + 3 + 7 = 26 \text{ kg}$

Skillemur ved indstigning. Paa drager X falder  $150 \times (895 + 2225) = 204 \text{ kg}$   $T_{10} = W_{10} = \frac{204(440 + 1/2 \times 565)}{2932}$   
 $50 \text{ kg}$   $V_4 = V_6 = \frac{204 \times 1/2 (565 + 461)}{2932} = 36 \text{ kg}$   
 Hovedluftbeholdere  $T_{10} = W_{10} = \frac{40 \times (895 + 1895)}{2290} = 49 \text{ kg}$   
 Batterikasse giver (bl.30)  $S_4 = 47 \text{ kg}$   $S_6 = 396 \text{ kg}$   
 $W_{10} = \frac{47 \times 635}{2290} = 13 \text{ kg}$   $V_6 = \frac{396 \times 635}{2290} = 110 \text{ kg}$  olieudskiller  
 $V_5 = 30 \text{ kg}$  Kompressorer + kølere :  $U_6 = V_{10} = U_5 = V_9 = 55 \text{ kg}$   
 $U_8 = V_8 = U_7 = V_{11} = 92 \text{ kg}$   
 $V_6 = V_4 = \frac{92 \times 2225 + 92 \times 740}{2290} = 89 + 58 = 147 \text{ kg}$   
 $W_{10} = T_{10} = \frac{55 \times 2225 + 55 \times 740}{2290} = 53 + 34 = 87 \text{ kg}$

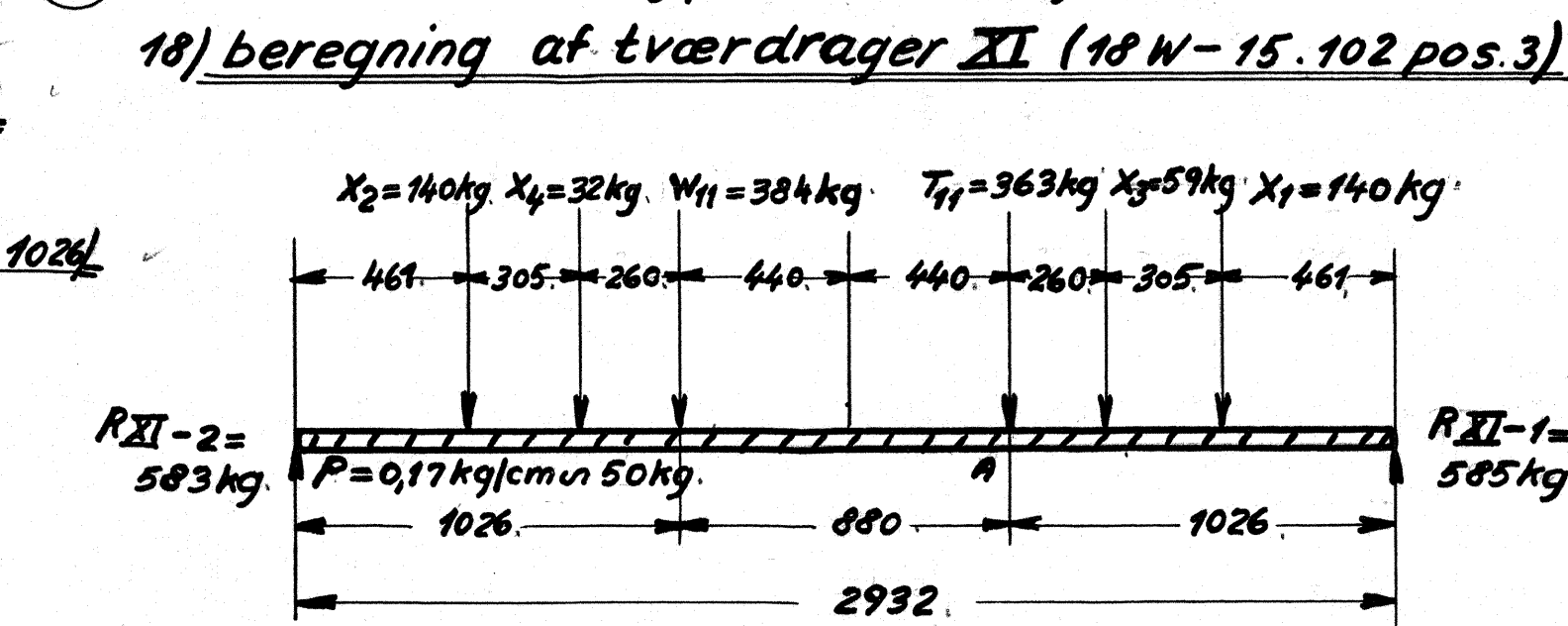
A) statiske lodrette tryk  
 $P = \frac{90}{2932} = 0.31 \text{ kg/cm}$   $V_6 = 19 + 51 + 164 + 24 + 36 + 110 + 147 = 551 \text{ kg}$   $W_{10} = 25 + 18 + 14 + 231 + 50 + 49 + 13 + 87 = 487 \text{ kg}$   
 $V_5 = 29 + 30 = 59 \text{ kg}$   $V_7 = 29 \text{ kg}$   $T_{10} = 25 + 18 + 14 + 231 + 50 + 49 + 87 = 474 \text{ kg}$   $V_4 = 19 + 51 + 164 + 26 + 36 + 147 = 443 \text{ kg}$   
 $R_{X-1} = \frac{551 \times 461 + 487 \times 1026 + 59 \times 1466 + 29 \times 1716 + 474 \times 1906}{2932}$   
 $443 \times 2471 + 1/2 \times 90 = 37 + 171 + 29 + 17 + 308 + 373 + 45 = 1030 \text{ kg}$   
 $R_{X-2} = \frac{551 \times 2471 + 487 \times 1906 + 59 \times 1466 + 29 \times 1216 + 474 \times 1026}{2932}$   
 $443 \times 461 + 1/2 \times 90 = 464 + 316 + 30 + 12 + 166 + 70 + 45 = 1103 \text{ kg}$   
 $Q = 0$  ved  $V_5$   $M_{XA} = 1103 \times 146,6 - 45 \times 73,3 - 551 \times 100,5 - 487 \times 44 = 161700 - 3300 - 55400 - 21400 = 81600 \text{ kg cm}$

Drageren forsynes med lameller  $57 \times 65$  ud til drager for indstigningen (snit B-B).



B) statiske lodrette tryk + 30% stød + direkte bremsning, da kræfterne  $V_4$  og  $V_6$  fra bremsning (bl.37) gaar opad, bliver paavirkningen størst uden bremsning

18) beregning af tværdrager XI (18W-15.102 pos.3)



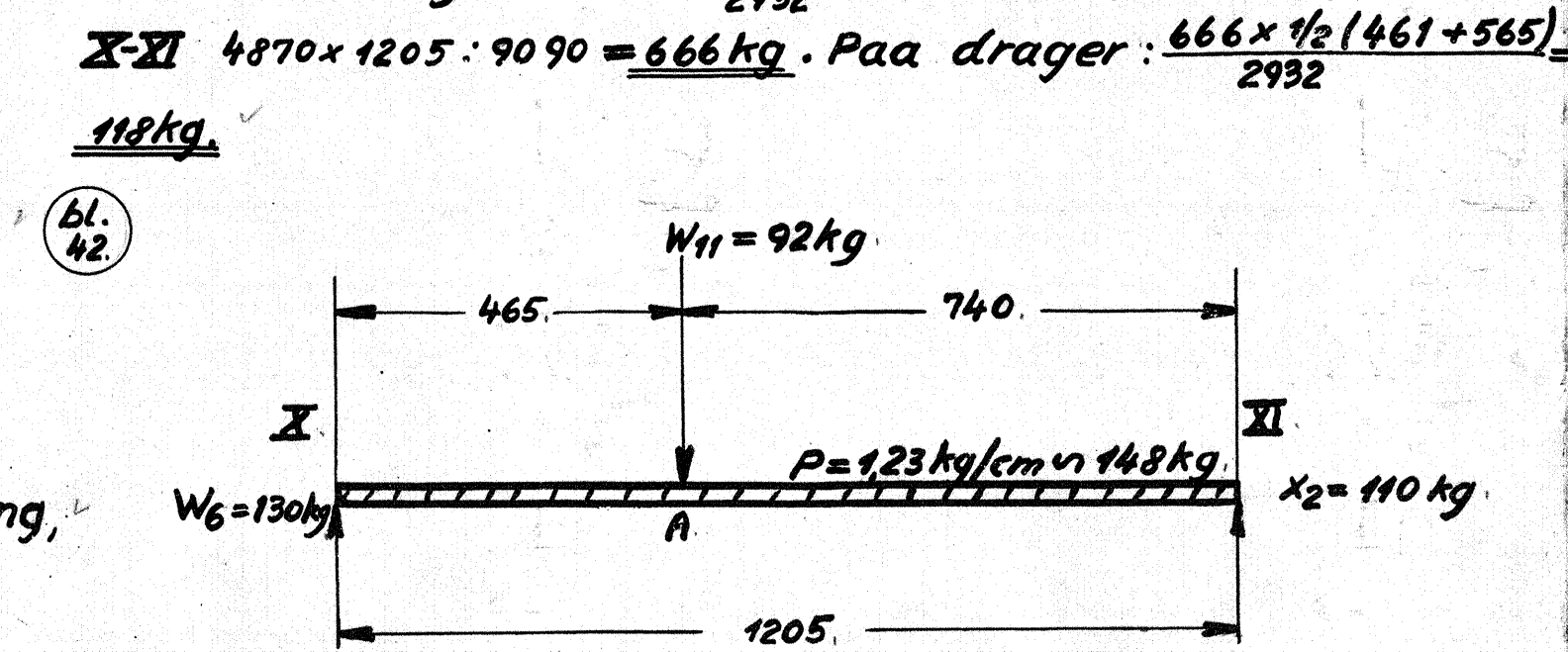
Egenvægt af drager ca. 50kg, der fordeles over 2932  
 $P = \frac{50}{2932} \approx 0.17 \text{ kg/cm}$  Gulv i X-XI (bl.37) :  $112 \text{ kg}$   
 Gulv i XI-XII  $\frac{78 \times 1970}{835} = 184 \text{ kg}$   $T_{11} = W_{11} = \frac{112(440 + 1/2 \times 565) + 184 \times (440 + 1/2 \times 1026)}{2 \times 2932} = 14 + 30 = 44 \text{ kg}$   
 $X_1 = X_2 = \frac{112 \times 1/2 (461 + 565)}{2932} = 10 \text{ kg}$   
 Passagerer med 50% overlast X-XI :  $\frac{4870 \times 1205}{9090} = 650 \text{ kg}$   
 XI-XII :  $\frac{4870 \times 1970}{9090} = 1060 \text{ kg}$   $W_{11} = T_{11} = \frac{650 \times (440 + 1/2 \times 565) + 1060(440 + 1/2 \times 1026)}{2 \times 2932} = 30 + 173 = 253 \text{ kg}$   
 $X_1 = X_2 = \frac{650 \times (461 + 565) \times 1/2}{2 \times 2932} = 57 \text{ kg}$

Gulvbærere  $T_{11} = W_{11} = 12 \text{ kg}$   $X_1 = X_2 = 5 \text{ kg}$   
 Afgitring og bæring for ventilation (18W-15.300)  
 $W_{11} = 2 + 3 + 3 = 8 \text{ kg}$   $T_{11} = 2 \text{ kg}$   
 Leje for sikkerhedsstøtte (18W-15.420a)  
 $T_{11} = W_{11} = 2 + 1 = 3 \text{ kg}$  Kompressorer, mellem-kølere med stativer :  $T_{11} = W_{11} = \frac{55 \times 465}{1203} \approx 22 \text{ kg}$   $X_1 = X_2 = \frac{92 \times 465}{1205} = 36 \text{ kg}$   
 kabelkanal paa drager XI :  $\frac{600 \times 1/2 (1205 + 1970)}{18000} \approx 54 \text{ kg}$ , der fordeles med  $T_{11} = X_3 = 27 \text{ kg}$

Ventilator med motor og kanaler for forreste bane-motor. Motor med blæser 62kg kasse mm. (18W-21.570) vægt : Jern : 30kg. Træ 10kg  $X_5 = X_6 = \frac{(30 + 10) \times 750}{2 \times 1026} = 15 \text{ kg}$   
 Motor med blæser  $X_5 = X_6 = \frac{62 \times 550}{2 \times 1026} = 17 \text{ kg}$   
 $W_{11} = (15 + 17) \times (1030 + 1520) = 42 \text{ kg}$

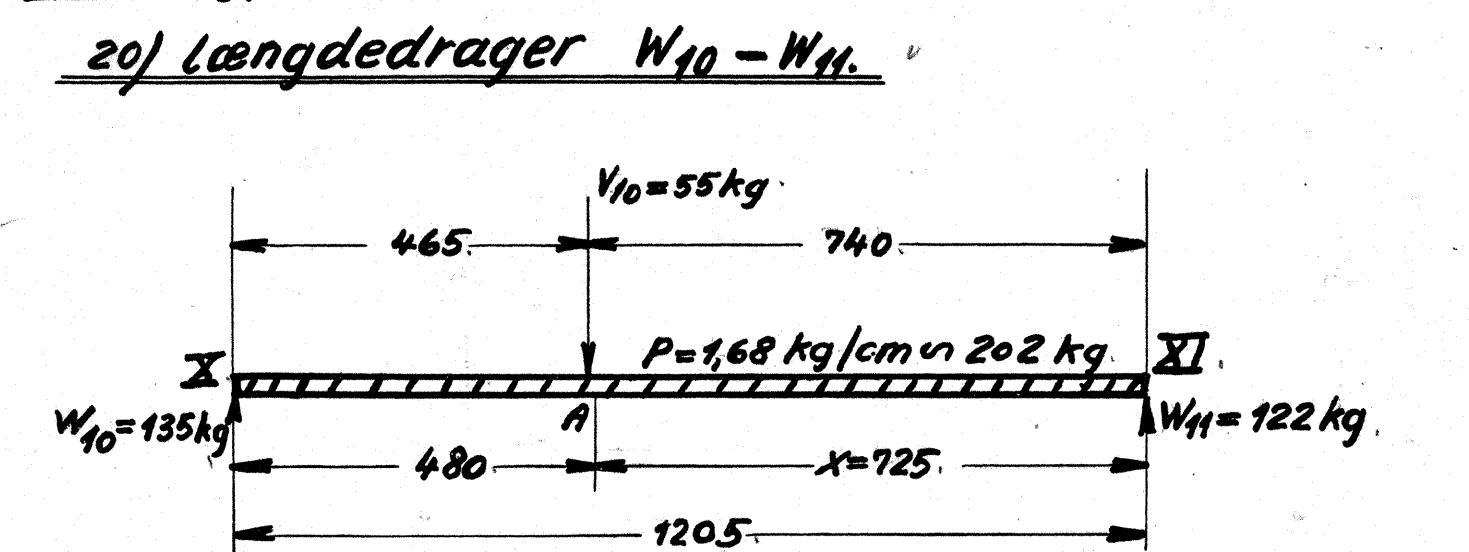
Sandkasser vejer hver ca. 65 kg, og fordeles i  $X_2 = X_4 = X_3 = X_1 = 32 \text{ kg}$  Jalt  $X_2 = 10 + 57 + 5 + 36 + 32 = 140 \text{ kg}$   
 $X_4 = 32 \text{ kg}$   $W_{11} = 44 + 253 + 12 + 8 + 3 + 22 + 42 = 366 \text{ kg}$   
 $T_{11} = 44 + 253 + 12 + 2 + 3 + 22 + 27 = 363 \text{ kg}$   
 $X_3 = 27 + 32 = 59 \text{ kg}$   $X_1 = 10 + 57 + 5 + 36 + 32 = 140 \text{ kg}$   
 $R_{XI-1} = \frac{1/2 \times 50 + 140 \times 461 + 32 \times 766 + 384 \times 1026 + 363 \times 1906}{2932}$   
 $+ 59 \times 2066 + \frac{140 \times 2471}{2932} = 25 + 22 + 8 + 134 + 236 + 42 + 118 = 595 \text{ kg}$   
 $R_{XI-2} = \frac{1/2 \times 50 + 140 \times 2471 + 32 \times 2166 + 384 \times 1906 + 363 \times 1026}{2932}$   
 $59 \times 866 + \frac{140 \times 461}{2932} = 25 + 118 + 24 + 250 + 127 + 17 + 22 = 583 \text{ kg}$   
 $Q = 0$ , ved  $T_{11}$   $M_{XA} = 585 \times 102,6 - 140 \times 56,5 - 59 \times 26 = 60000 - 7900 - 1500 - 900 = 49700 \text{ kg cm}$   
 Profil J.N.P. 10/12.  $W_x = 62,7 \text{ cm}^3$   $\sigma = \frac{49700}{62,7} = 790 \text{ kg/cm}^2$   
 $= 800 \text{ kg/cm}^2$

19) beregning af længdedrage W6-X2.



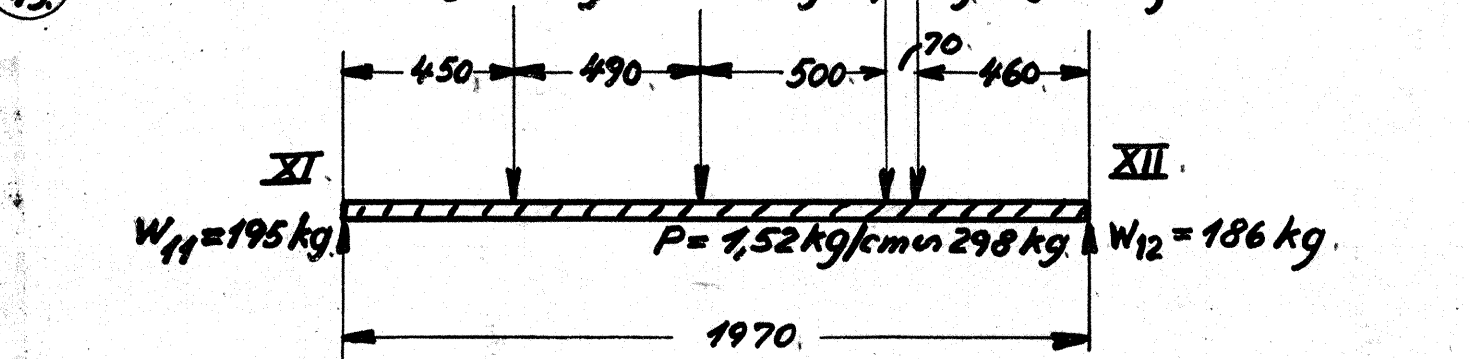
Gulv i X-XI giver  $\frac{112 \times 1/2 (461 + 565)}{2932} = 20 \text{ kg}$  Passagerer i X-XI  $4870 \times 1205 : 9090 = 666 \text{ kg}$  Paa drager :  $\frac{666 \times 1/2 (461 + 565)}{2932} = 118 \text{ kg}$

Egenvægt af drager 10kg. Jalt  $20 + 10 + 118 = 148 \text{ kg}$   
 $P = \frac{148}{120,5} = 1,23 \text{ kg/cm}$  Fra kompressor  $W_{11} = 92 \text{ kg}$   
 $V_6 = 1/2 \times 148 + 92 \times 740 = 74 + 56 = 130 \text{ kg}$   
 $X_2 = 1/2 \times 148 + \frac{92 \times 465}{1205} = 74 + 36 = 110 \text{ kg}$   
 $M_{AX} = 130 \times 46,5 - 1,23 \times 46,5 \times 23,25 = 6050 - 1320 = 4730 \text{ kg cm}$  [N.P. 6 1/2]  $W_x = 17,7 \text{ cm}^3$   $\sigma_A = \frac{4730}{17,7} = 268 \text{ kg/cm}^2$   
 $< 800 \text{ kg/cm}^2$

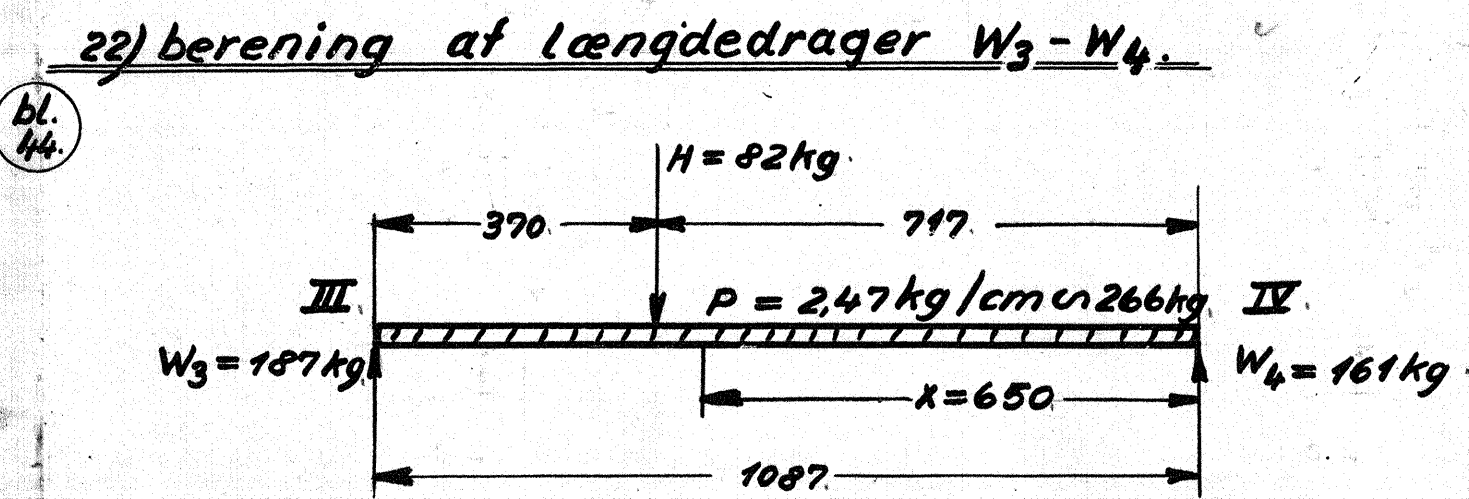


Egenvægt af drager 10kg. Egenvægt af gulv :  $\frac{112 \times (440 + 1/2 \times 565)}{2932} = 28 \text{ kg}$  Passager  $\frac{666(440 + 1/2 \times 565)}{2932} = 164 \text{ kg}$  Jalt  $10 + 28 + 164 = 202 \text{ kg}$  fordelt over 120,5  
 $P = \frac{202}{120,5} = 1,68 \text{ kg/cm}$  Fra kompressor :  $V_{10} = 55 \text{ kg}$   $W_{10} = 1/2 \times 202 + 55 \times 740 = 101 + 34 = 135 \text{ kg}$   $W_{11} = 1/2 \times 202 + 55 \times 465 = 101 + 21 = 122 \text{ kg}$   
 $Q = 0$ , for  $X$   $\text{for } 725 \text{ mm}$   $M_{AX} = 122 \times 72,5 - 202 \times 72,5 \times 36,25 = 8900 - 4380 = 4520 \text{ kg cm}$  [N.P. 6 1/2]  $W_x = 17,7 \text{ cm}^3$   
 $\sigma = \frac{4520}{17,7} = 256 \text{ kg/cm}^2 < 800 \text{ kg/cm}^2$

21) beregning af længdedragere W11-W12.

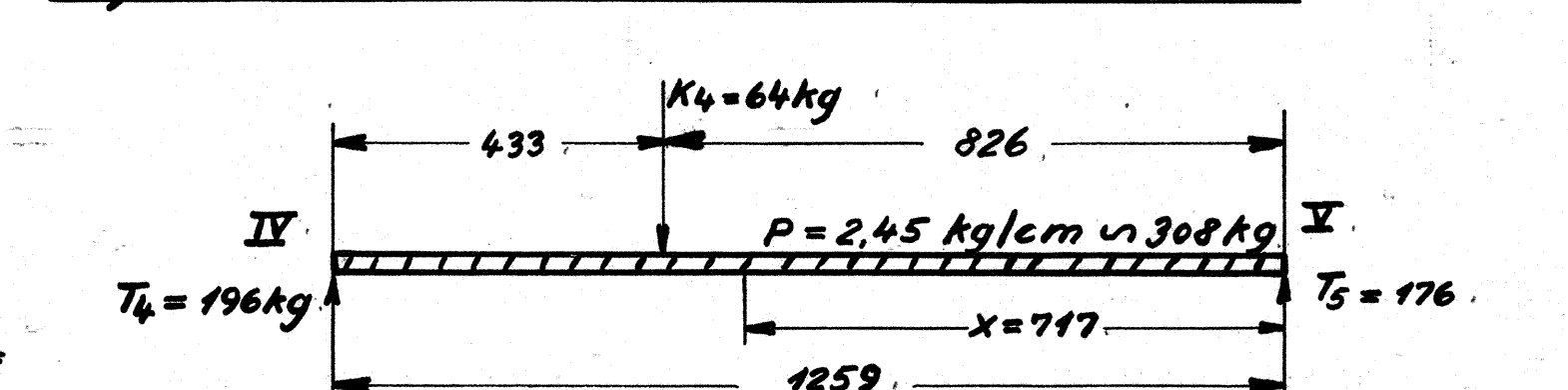


Egenvægt af drager 14kg. Egenvægt af gulv i XI-XII :  $184 \text{ kg}$  Paa  $W_{11} - W_{12}$  falder  $\frac{184 \times (440 + 1/2 \times 1026)}{2932} = 60 \text{ kg}$   
 Passagerer i XI-XII  $\frac{4870 \times 1290}{9090} = 690 \text{ kg}$   
 Paa drager  $W_{11} - W_{12}$  falder  $\frac{690(440 + 1/2 \times 1026)}{2932} = 224 \text{ kg}$   
 Jalt  $14 + 60 + 224 = 298 \text{ kg}$   $P = \frac{298}{1970} = 1,52 \text{ kg/cm}$   
 Fra ventilation for foreste banemotor faas :  
 Vægt af kasse 40kg motor med blæser vejer 62kg understøtning ventilation  $X_5 = 4 \text{ kg}$   $X_6 = 5 \text{ kg}$   
 Ventilation mm. giver  $X_5 = 4 + \frac{0,6 \times 62 \times 550}{7026} + \frac{780 \times 40}{7026 \times 4} = 4 + 14 + 8 = 26 \text{ kg}$   $X_6 = 5 + \frac{0,6 \times 62 \times 550}{7026} + \frac{780 \times 40}{1026 \times 2} = 5 + 20 + 16 = 41 \text{ kg}$   $X_7 = \frac{40 \times 780}{4 \times 1026} = 8 \text{ kg}$  Leje for sikkerhedsstap (18W-15.420a)  $X_8 = 8 \text{ kg}$   
 $W_{11} = 1/2 \times 298 + 8(460 + 530) + 41 \times 1030 + 26 \times 1520 = 149 + 4 + 22 + 20 = 195 \text{ kg}$   
 $W_{12} = 1/2 \times 298 + 8(1570 + 1440) + 41 \times 940 + 26 \times 450 = 149 + 12 + 19 + 6 = 186 \text{ kg}$   $Q = 0$  ved  $X_6$   $M_{X6} = 195 \times 94 - 26 \times 49 - 298 \times 940 \times 47 = 18400 - 1300 - 6700 = 10400 \text{ kg cm}$  [N.P. 6 1/2]  $W_x = 17,7 \text{ cm}^3$   
 $\sigma_{X6} = 10400 : 17,7 = 590 \text{ kg/cm}^2 < 800 \text{ kg/cm}^2$

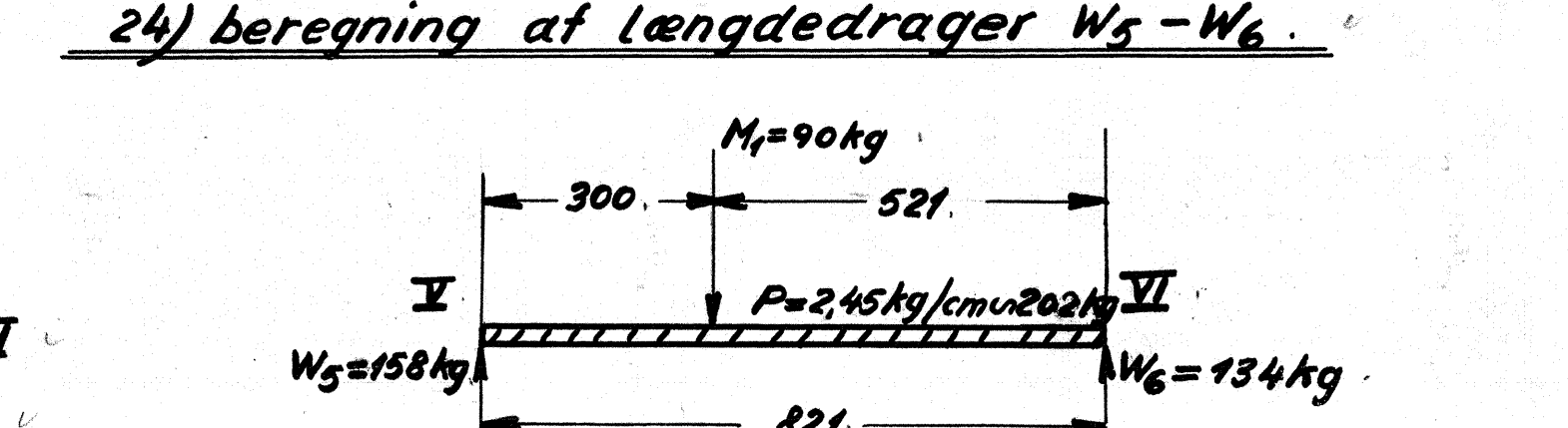


22) beregning af længdedragere W3-W4.  
 Egenvægt : 8kg vægt af gulv og rist (bl.03) :  $\frac{140 \times 1087}{980} = 155 \text{ kg}$  Bagage med 50% overlast (bl.03)  $\frac{2400 \times 1087}{4115} = 635 \text{ kg}$  Paa  $W_3 - W_4$  :  $8 + (155 + 635)(440 + 1/2 \times 1026) = 8 + 258 = 266 \text{ kg}$   $P = \frac{266}{108,7} = 2,47 \text{ kg/cm}$   
 Fra hovedapparatkasse faas : (bl.03)  $H = 82 \text{ kg}$   
 $W_3 = 1/2 \times 266 + 82 \times 717 = 133 + 54 = 187 \text{ kg}$   
 $W_4 = 1/2 \times 266 + 82 \times 370 = 133 + 28 = 161 \text{ kg}$   
 $Q = 0$  For  $X = 65 \text{ cm}$   $M_X = 161 \times 65 - 266 \times 650 \times 32,5 = 10500 - 5100 = 5400 \text{ kg cm}$  [N.P. 6 1/2]  $W_x = 17,7 \text{ cm}^3$   
 $\sigma = \frac{5400}{17,7} = 304 \text{ kg/cm}^2 < 800 \text{ kg/cm}^2$

23) beregning af længdedragere T4-T5.  
 Egenvægt : 10kg. Gulv og rist i bagagerum IV-V :  $\frac{140 \times 1259}{980} = 147 \text{ kg}$  Bagage (bl.03)  $\frac{2400 \times 1259}{4115} = 730 \text{ kg}$  Paa  $T_4 - T_5$  :  $10 + (147 + 730)(440 + 1/2 \times 1026) = 10 + 298 = 308 \text{ kg}$   
 $P = \frac{308}{125,9} \approx 2,45 \text{ kg/cm}$  Efter bl.05 faas :  $K_4 = \frac{63(276 + 754)}{1026} = 64 \text{ kg}$   $T_4 = 1/2 \times 308 + 64 \times 826 = 154 + 42 = 196 \text{ kg}$   
 $T_5 = 1/2 \times 308 + 64 \times 433 = 154 + 22 = 176 \text{ kg}$   
 $Q = 0$  for  $X = 71,7 \text{ m}$   $M_X = 176 \times 71,7 - 308 \times 717 \times 35,95 = 12600 - 6200 = 6400 \text{ kg cm}$  [N.P. 6 1/2]  $W_x = 17,7 \text{ cm}^3$   
 $\sigma_X = 6400 : 17,7 = 361 \text{ kg/cm}^2 < 800 \text{ kg/cm}^2$



24) beregning af længdedragere W5-W6.  
 Egenvægt : 8kg vægt af gulv og rist i I-II :  $\frac{140 \times 821}{980} = 117 \text{ kg}$  Bagage med 50% overlast :  $\frac{2400 \times 821}{4115} = 480 \text{ kg}$   
 Paa  $W_5 - W_6$  :  $8 + (117 + 480)(440 + 1/2 \times 1026) = 8 + 194 = 202 \text{ kg}$   
 $P = \frac{202}{82,1} = 2,45 \text{ kg/cm}$  Fra batterikasse faas (bl.07)  
 $M_1 = 90 \text{ kg}$   $W_5 = 1/2 \times 202 + 90 \times 521 = 101 + 57 = 158 \text{ kg}$   
 $W_6 = 1/2 \times 202 + 90 \times 300 = 101 + 33 = 134 \text{ kg}$   
 $M_{M_1} = 158 \times 30 - 300 \times 202 \times 15 = 4740 - 1100 = 3640 \text{ kg cm}$   
 [N.P. 6 1/2]  $W_x = 17,7 \text{ cm}^3$   $\sigma_{M_1} = \frac{3640}{17,7} = 206 \text{ kg/cm}^2$   
 $< 800 \text{ kg/cm}^2$



Sik.	5	4	3	2	1
Stk.					
Ben.					
Kat.					
Dato					

Stk.	Ben.	Kat.	Dato	Pos.	Materialer kvalitet	Model nr. eller materiale størrelse	rå færdig	Indek.
<b>FRICHS</b>								
Diesel-el. 500/550 HK. motorvogn.								
Beregning af dragere i undervogn.								
18W-1.195.								