

Topramme

Brystling

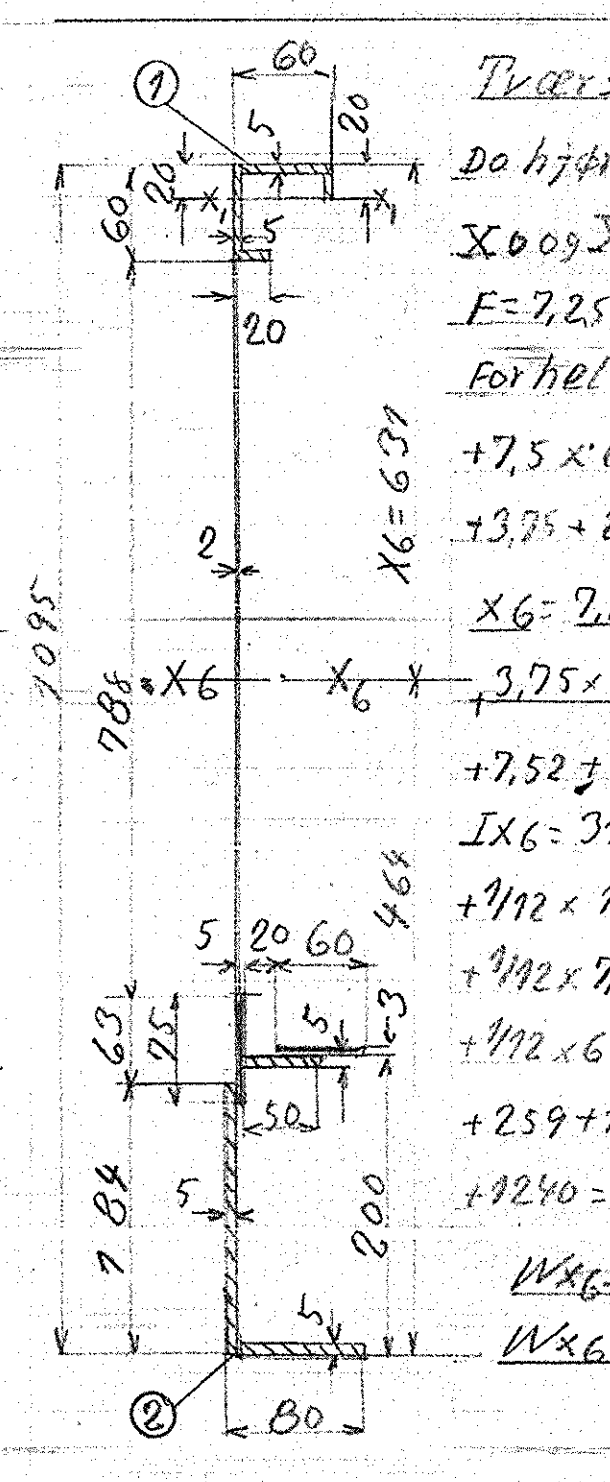
$$F_2 = 6 \times 0,5 + 5 \times 0,5 + 1,5 \times 0,5 + 2 \times 0,5 = 3,0 + 2,5 + 0,75 + 1,0 =$$
$$7,25 \text{ cm}^2 \quad X_2 = 3 \times 0,25 + 2,5 \times 3,0 + 0,75 \times 12,5 + 1,0 \times 5,75 =$$
$$= 0,1 + 0,3 + 0,13 + 0,79 = 2,05 \text{ cm}$$
$$IX_2 = \frac{1}{2} \times 6 \times 0,5^2 + \frac{3}{2} \times 1,75^2 + \frac{1}{2} \times 5^2 \times 0,5 + 2,5 \times 10^2$$
$$+ \frac{1}{2} \times 2,5^2 \times 0,5 + 0,75 \times 0,75^2 + \frac{1}{2} \times 2,5 \times 0,5^2 + 1,0 \times 3,75 =$$
$$= 0,1 + 0,2 + 5,2 + 2,5 + 0 + 0,4 + 0,7941 = 9,25 \text{ cm}^4$$

$$E = 7,25 + 78,8 \times 0,2 + 18,4 \times 0,5 +$$

47 kN/m²
 2020654 = 15006 kN/m²
 h₀ = 1620 mm

65 52 65
 26 28=5
 65
 45
 50
 25 40
 18 37 24
 18

Trærsnit 516×65 i tag 3 og C i tag 4
 Sidedrager bliver som i tag 4 og 2
 $F = 148,57 \text{ m}^2$ $I_x = 693823 \text{ cm}^4$ $W_{K1} = 1062 \text{ cm}^3$
 $W_{K2} = 1572 \text{ cm}^3$
 Toprammen forstærkes som vist
 $F_5 = 6,5 \times 0,65 + 6,2 \times 0,65 + 3,85 \times 0,65 = 25 \times 0,65$
 $+ 4,4 \times 0,5 = 4,23 + 4,04 + 2,5 + 1,62 + 2,2 = 14,59 \text{ m}^2$
 $x_g = 4,23 \times 0,32 + 4,04 \times 0,375 + 2,5 \times 0,571 + 1,62 \times 0,77 + 2,2 \times 0,85$
 $0,09 + 1,04 + 1,40 + 0,80 + 1,84 = 2,8 \text{ m}$
 Afstand til X-akser drager: $1574 + 47 = 1621 \text{ mm}$
 $y_3 = 4,23 \times 0,25 + 4,04 \times 0,32 + 2,5 \times 0,67 + 1,62 \times 1,25 + 2,2 \times 5,6 = 0,94 + 0,09$
 $+ 1,06 + 0,14 + 0,87 = 3,07 \text{ m}$
 $I_x = 1/12 \times 6,5 \times 0,65^3 + 4,23 \times 2,47^2 + 1/12 \times 6,2 \times 0,65^3 + 4,04 \times 0,93^2$
 $+ 1/12 \times 3,85 \times 0,65^3 + 2,5 \times 0,23^2 + 1/12 \times 2,5 \times 0,65^3 + 1,62 \times 3,37^2 + 1/12 \times 4,4^3 \times 0,5$
 $+ 2,2 \times 0,03^2 = 0,1 + 2,60 + 12,9 + 3,73 + 0,91 + 0,13 + 3,670 = 80,6 \text{ cm}^4$
 $S_{x2} = 14,59^2 \times 2,64$
 $I_{y3} = 1/12 \times 6,5^3 \times 0,65 + 4,23 \times 0,15^2 + 1/12 \times 6,2 \times 0,65^3 + 4,04 \times 2,77^2$
 $+ 1/12 \times 3,85 \times 0,65^3 + 2,5 \times 3,07^2 + 1/12 \times 2,5 \times 0,65^3 + 1,62 \times 1,83^2 + 1/12 \times 4,4 \times 0,5^3$
 $+ 2,2 \times 2,5^2 = 14,8 + 0,1 + 0,1 + 37,0 + 0,1 + 23,5 + 0,8 + 5,5 + 0 + 1,4 =$
 $90,0 \text{ cm}^4$
 $S_{y3} = 14,59 \times 2,36$
 $W_{K3-1} = \frac{90,0}{3,7} = 2,9 \text{ cm}^3$
 Svækkelse: $1,4 \times 0,65 = 0,91 \text{ cm}^2$
 $\frac{0,91 \times 100}{6,2} = 14,5\% < 12\%$



Toprame

$6 \times 0,8 + 7,2 \times 1,3 + 7,5 \times 1,3 = 770 + 3,75 + 6,0 + 4,8 + 28,5$
 $71 \times 12,3 + 3,75 \times 15,5 + 6 \times 21,6 + 4,8 \times 20,9 + 2,5 \times 16,9$
 $85 + 3,57 + 0,14 = 779,8 \approx 120 \text{ mm}$
 $10 \cdot 12 \cdot 2005 + 73 + 55 = 120 = 1795,3 \text{ cm m}$
 $2 + 112 \times 2,5 \times 0,5^3 + 3,75 \times 10,45^3 + 112 \times 10 \times 0,6^3$
 $1,0,2 + 112 \times 7,2 \times 1,3 + 9,25 \times 4,9^3 + 112 \times 7,5 \times 1,3^3$
 $1 + 4,09 + 0,2 + 55,2 + 3,2 + 38,2 + 3,6 + 22,5 + 1,4$
 $1 - 3315,6 = 294 \text{ cm}^3 \quad \text{Wks-2-3315,6-296 cm}^3$
 $17,3 \quad 120$

Da hjørne søjlerne ikke kan medregnes bliver
 $X_{009} X_{5:0}$ Brystning som i fig 1092:

$$F = 7,25 \text{ cm}^2 \times 20 \text{ mm} \text{ of } I_x = 37,5 \text{ cm}^4$$

For the side dragers: $F = 7,25 + 78,2 \times 0,2 + 18,4 \times 0,5$

$$+ 7,5 \times 0,5 + 7,5 \times 0,5 + 15 \times 0,5 + 6 \times 0,3 = 7,25 + 15,76 + 9,2 + 3,75$$

$$+ 3,75 + 2,5 + 1,8 = 49,01 \text{ cm}^2$$

$$x_G = 7,25 \times 2,0 + 15,76 \times 4,5 + 9,2 \times 10,3 + 3,75 \times 8,55$$

$$+ 3,75 \times 10,25 + 2,5 \times 8,925 + 1,8 \times 8,925 = 44,01$$

$$+ 7,52 + 9,33 + 5,07 + 3,76 = 63,11 \text{ cm}$$

$$I_{xG} = 37,5 + 7,25 \times 6,11^2 + 112 \times 78,8^2 \times 0,2 + 15,76 \times 7,77^2$$

$$+ 112 \times 18,4^2 \times 0,5 + 9,2 \times 37,2^2 + 112 \times 7,5^2 \times 0,5 + 3,75 \times 2,5^2 \times 5$$

$$+ 112 \times 7,5 \times 0,5^3 + 3,75 \times 4,6^2 \times 0,5 + 112 \times 0,5 \times 0,5^3 \times 2,5 \times 26,95^2$$

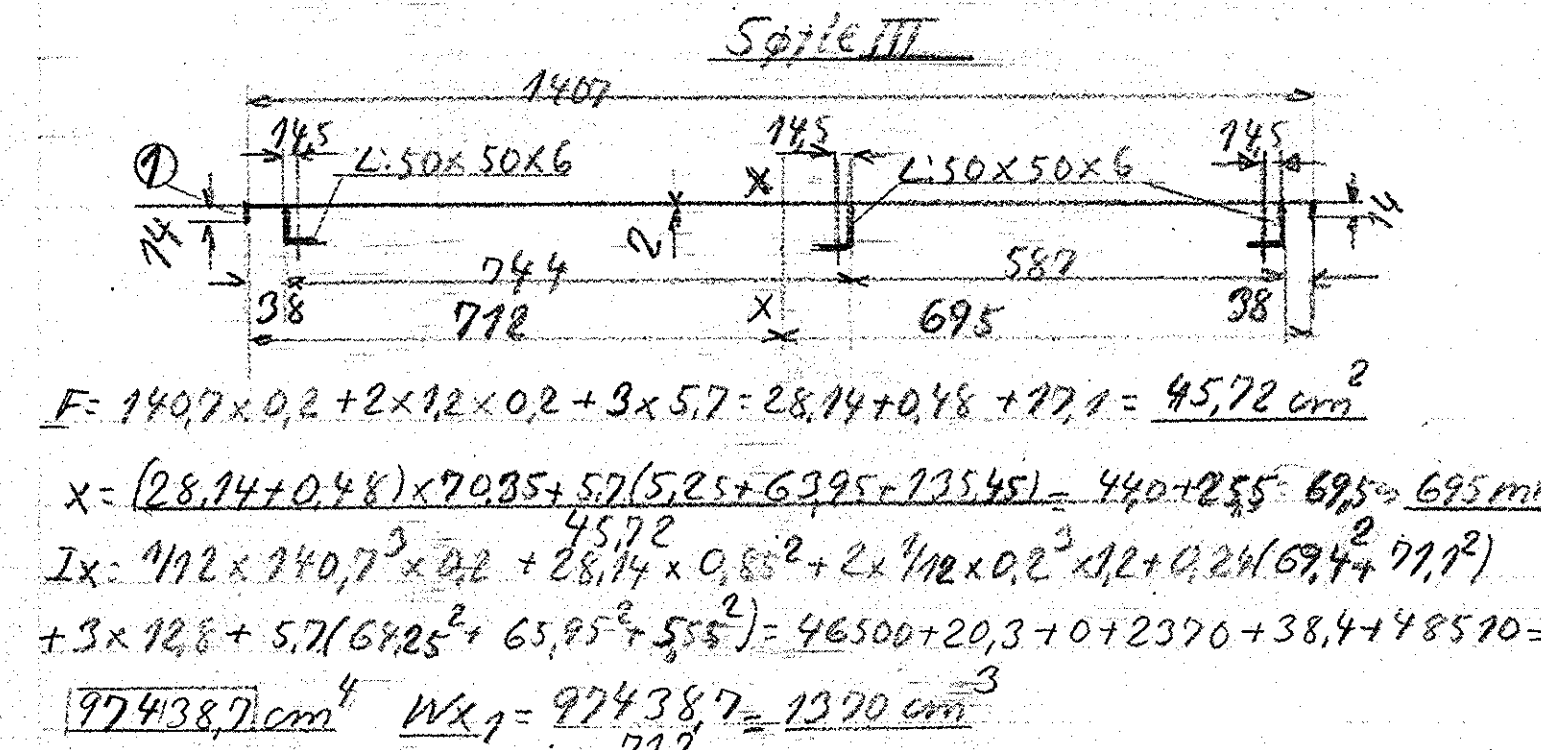
$$+ 112 \times 6 \times 0,3^3 + 1,8 \times 26,95^2 = 37,5 + 27,200 + 81,40 + 49,50$$

$$+ 2,59 + 127,00 + 78,6 + 24,80 + 0,9 + 80,00 + 0 + 78,20 + 0$$

$$+ 92,40 = 66838,2 \text{ cm}^4$$

$$W_{xG-1} = 66838,2 = 1055 \text{ cm}^3$$

$$W_{xG-2} = 66838,2 = 1430 \text{ cm}^3$$


$$F = 18,7 \times 0,5 + 8,0 \times 0,5 + 8,0 \times 0,8 = 9,35 + 4,0 + 6,4 = 19,75 \text{ cm}^2$$

$$X_{\eta} = \frac{9,35 \times 10,15 + 4 \times 19,75 + 6,4 \times 0,4}{19,75} = 4,8$$

$$+ 4,0 + 0,13 = 8,93 \text{ cm} \approx 89 \text{ mm}$$

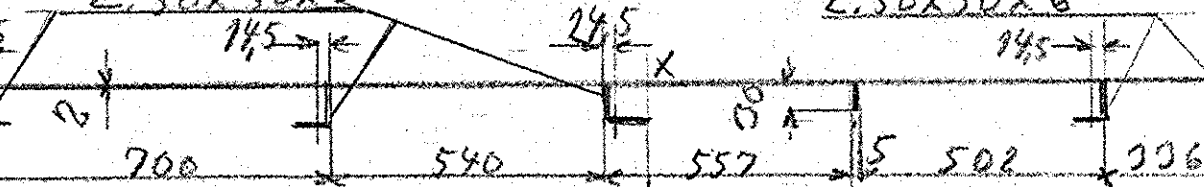
$$I_{X\eta} = \frac{1}{12} \times 18,7^3 \times 0,5 + 9,35 \times 1,35^2 + \frac{1}{12} \times 8,0 \times 0,5^3$$

$$+ 4 \times 8,85^2 + \frac{1}{12} \times 8,0 \times 0,8^3 + 6,4 \times 8,5^2 = 274 + 116 + 0,1$$

$$+ 388 + 0,3 + 463 = 1140 \text{ cm}^4$$

$$W_{X\eta-1} = \frac{1140}{89} = 128 \text{ cm}^3 \quad W_{X\eta-2} = \frac{1140}{117} = 97,3 \text{ cm}^3$$

Diagram of a trapezoidal channel cross-section. The top width is 1670 mm. The bottom width is 690 mm. The side slopes are 1:1. The channel depth is 980 mm. The bottom is sloped at 1:50. The top width is divided into three sections: 145 mm on the left, 541 mm in the middle, and 145 mm on the right. The bottom width is divided into three sections: 269 mm on the left, 541 mm in the middle, and 269 mm on the right. The bottom width is also labeled as 541 mm. The bottom width is also labeled as 541 mm. The bottom width is also labeled as 541 mm.



$$F = 2776 \times 0,2 + 2 \times 12 \times 0,2 + 5 \times 5,7 + 3,0 \times 0,5 = 54,32 + 0,98 + 28,5 + 1,5 = 898 \text{ cm}^2$$

$$x = \frac{154,32 + 0,48}{848} \times 1986 + \frac{75,715,25}{848} + 38,85 + 142,35 + 199,25 + 26,635 + 15 \times 8,725 =$$

$$876 + 43,85 + 1,5 = 133 \approx 1320 \text{ mm}$$

$$I_x = \frac{1}{12} \times 2776^3 \times 0,2 + 5432 \times 28^2 + 2 \times \frac{1}{12} \times 12 \times 0,2^3 + 0,24 \times 12^3 + 138,5^2 \times 12 \times 8$$

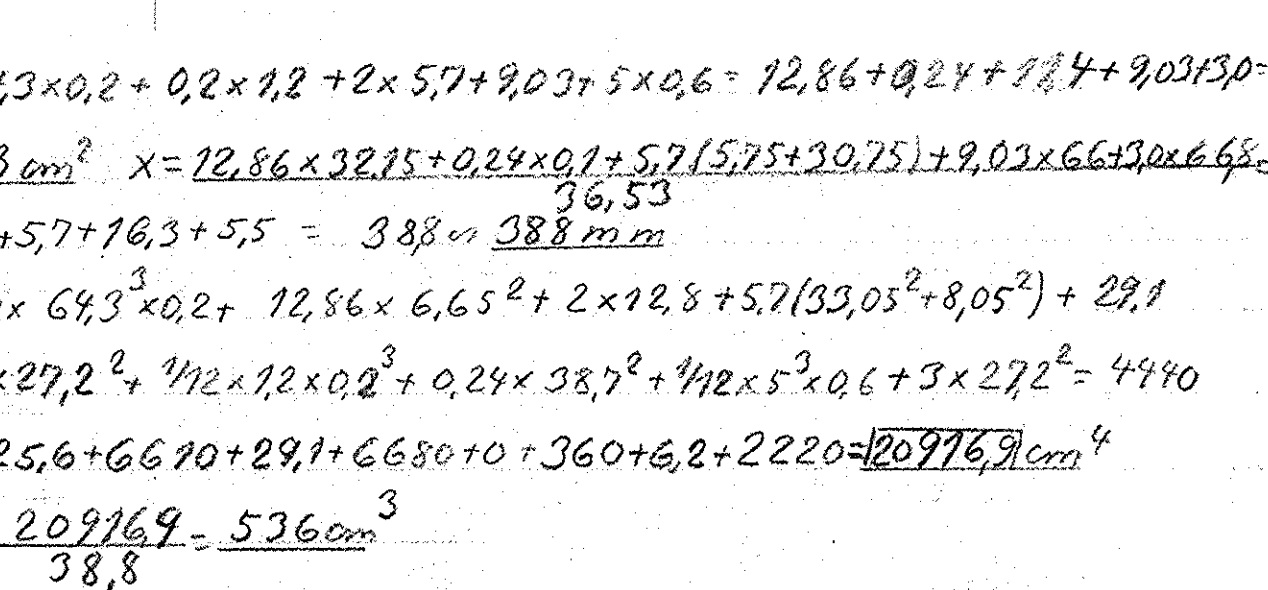
$$+ 5,7172 \times 75^2 + 94,5^2 \times 9,75^2 + 65,25^2 \times 133,35^2 = 3074000 + 42570 + 8500 + 64$$

$$+ 766500 + 10095 = 692864 \text{ cm}^4 = 166.692864 = 5000 \text{ cm}^3$$

[illegible]

The diagram shows a stepped shaft with the following dimensions and calculations:

- Dimensions:**
 - Step 1 (left): Diameter 11, Length 98, Radius 24.5.
 - Step 2: Diameter 24.5, Length 297, Radius 122.5.
 - Step 3: Diameter 300, Length 600, Radius 150.
 - Step 4 (right): Diameter 50, Length 15, Radius 25.
- Section Properties:**
 - Section 1: $L' 50 \times 50 \times 6$
 - Section 2: $L' 60 \times 60 \times 8$
- Centroidal Distances:**
 - From the left end to the centroid of the first step: $x = 90$
 - From the left end to the centroid of the second step: $x = 180$
 - From the left end to the centroid of the third step: $x = 435$
 - From the left end to the centroid of the fourth step: $x = 702$
- Calculations:**
 - First moment of area: $F = 90 \times 0,2 + 12 \times 0,2 + 2 \times 5,7 + 9,03 \times 5 \times 0,6 = 18 + 0,24 + 11,4 + 9,03 + 3,0 = 41,67 \text{ cm}^2$
 - Moment of inertia: $I_x = 18 \times 50 + 0,24 \times 94,9 + 5,7(60,35 + 89,75) + 9,03 \times 3,3 + 3 \times 2,5 = 21,60 + 0,55 + 20,45 + 0,71 + 0,18 = 44,69$
 - Parallel axis theorem: $I_x = 492 \times 90^2 + 18 \times 6,5^2 + 112 \times 12^2 + 0,2^2 + 0,24 \times 53,4^2 + 2 \times 128 + 5,7(146,25^2 + 16,55^2) + 29,1 + 9,03 \times 702^2 + 492 \times 5^2 + 0,6 \times 3 \times 49,0^2 = 12140 + 769 + 0 + 662 + 25,6 + 13736 + 29,1 + 14600 + 62 + 5043 = 47036,9 \text{ cm}^4$
 - Final result: $W_{xP} = 47036,9 - 918 \text{ cm}^3$



1) Fläche: $F = \frac{1}{2} \times 55,9 \times (230,9 + 358) = \frac{1}{2} \times 28,2 \times (358 + 752,6) = \frac{1}{2} \times 20,8 \times 752,6$

$$2) \text{Fog 2: } F = \frac{1}{2} \times 65(1723,7 + 1304,7) + \frac{1}{2} \times 62(1304,7 + 7472,5) + \\ \frac{1}{2} \times 6,3(7472,5 + 7484,3) + \frac{1}{2} \times 53(7484,3 + 7562,8) + \frac{1}{2} \times 712(7562,8 + 7648,5) =$$
$$F = \frac{1}{2} \times 1217648,5 + 1660,5 + \frac{1}{2} \times 575(1660,5 + 1549,8) = 19854 + 92296 + 12150 \text{ tcm}^2$$

150151 km^2
4) Fag 4: A) Strka, C

	5				
	4				

[illegible]