

CI Strkn. 0" (Fortsat fra 301L-1.142)

$$F = 1/2 \times 30,5 (940,0 + 801,4) = 26556 \text{ cm}^2$$

Bestemmelse af kræfterne i topammer

Konstanter i Ligningerne: $\frac{h^2 \times L}{I_{dr}}$, $\frac{L}{F_{dr}}$, $\frac{L}{F_c}$, $\frac{H^3}{3 \times I_{dr}}$ er opført på 301L-1.144.

1) Fag 1

$$F = 75017 \text{ cm}^2 \quad L = 2757 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2 \quad I_{dr} = 69387,5 \text{ cm}^4$$

$$h = 1621 \text{ mm} \quad I_T = 151382,2 \text{ cm}^4 \quad I_{dr} = 69286,4 \text{ cm}^4 \quad F_c = 12,39 \text{ cm}^2$$

$$F_{ch} = \frac{75017 \times 1621}{69387,5} = 175,23 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 2757}{69387,5} = 104,40 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{2757}{48,57} = 56,5 \text{ t/mm} \quad \frac{L}{F_c} = \frac{2757}{12,39} = 222,0 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 2,38 \text{ t/mm}$$

$$\frac{H}{3 \times I_{dr}} = \frac{1621}{3 \times 151382,2} = 2,05 \text{ t/mm} \quad I_{dr} \times X_0 = 0, \text{ Faas}$$

$$1) 175,23 = X_1 (104,40 + 5,65 + 22,20 + 9,38 + 2,05) \div 0 \times 9,38 \div 2,05 X_2$$

$$X_1 = 175,23 + 2,05 X_2 = 121,96 + 0,0143 X_2$$

2) Fag 2

$$F = 36897,5 \text{ cm}^2 \quad L = 2572 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2 \quad I_{dr} = 69387,5 \text{ cm}^4$$

$$F_c = 12,39 \text{ cm}^2 \quad h = 1621 \text{ mm} \quad I_T = 69286,4 \text{ cm}^4 \quad I_{dr} = 97438,7 \text{ cm}^4$$

$$F_{ch} = \frac{36897,5 \times 1621}{69387,5} = 861,88 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 2572}{69387,5} = 162,1 \times 2572 = 9759 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{2572}{48,57} = 52,0 \text{ t/mm} \quad \frac{L}{F_c} = \frac{2572}{12,39} = 207,6 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 2,05 \text{ t/mm}$$

$$\frac{H}{3 \times I_{dr}} = \frac{1621}{3 \times 151382,2} = 2,05 \text{ t/mm} \quad I_{dr} \times X_0 = 0, \text{ Faas}$$

$$2) 861,88 = X_1 (97,59 + 5,30 + 20,76 + 2,05 + 14,57) \div X_2 \times 2,05 \div X_3 \times 14,57$$

Ved indførelse af X fra 1) Faas:

$$2) 861,88 = 140,27 X_2 + 2,05 (121,96 + 0,0143 X_2) \div 14,57 X_3$$

$$X_2 = \frac{861,88 + 250 + 1457 X_3}{140,27 + 0,05} = \frac{861,88 + 250 + 1457 X_3}{140,27} = 6,1628 + 0,01039 X_3$$

3) Fag 3

$$A) \text{ Strkn. "a": } F = 112150 \text{ cm}^2 \quad L = 695 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2 \quad I_{dr} = 69387,5 \text{ cm}^4$$

$$F_c = 12,39 \text{ cm}^2 \quad h = 1621 \text{ mm} \quad I_T = 97438,7 \text{ cm}^4$$

$$F_{ch} = \frac{112150 \times 1621}{69387,5} = 2620 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 695}{69387,5} = 26,32 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{695}{48,57} = 14,3 \text{ t/mm} \quad \frac{L}{F_c} = \frac{695}{12,39} = 56,1 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 14,57 \text{ t/mm}$$

$$B) \text{ Strkn. "b": } L = 1045 \text{ mm} \quad h = 1621 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2$$

$$I_{dr} = 69387,5 \text{ cm}^4 \quad F_c = 14,59 \text{ cm}^2 \quad I_T = 47036,9 \text{ cm}^4 \quad F = 150157 \text{ cm}^2$$

$$F_{ch} = \frac{150157 \times 1621}{69387,5} = 350,78 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 1045}{69387,5} = 39,57 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{1045}{48,57} = 21,5 \text{ t/mm} \quad \frac{L}{F_c} = \frac{1045}{12,39} = 71,6 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 30,18 \text{ t/mm}$$

$$\frac{H}{3 \times I_{dr}} = \frac{1621}{3 \times 151382,2} = 2,05 \text{ t/mm} \quad I_{dr} \times X_0 = 0, \text{ Faas}$$

$$Ligning for Fag 3:$$

$$1) 2620 + 350,78 = X_1 (39,57 + 2,15 + 71,6 + 30,18 + 26,32 + 14,57 + 5,61 + 14,57) \div X_2 \times 2,05$$

$$\div X_3 \times 30,18 \quad \text{Ved indførelse af } X_2 \text{ fra 2) Faas:}$$

$$3) 612,78 = X_1 (39,57 + 14,57 + 6,1628 + 0,01039 X_3) \div 30,18 X_4$$

$$X_3 = \frac{612,78 + 89,79 + 30,18 X_4}{12,39 + 0,03} = \frac{612,78 + 89,79 + 30,18 X_4}{12,39} = 5,5991 + 0,2405 X_4$$

4) Fag 4

$$A) \text{ Strkn. "c": } L = 435 \text{ mm} \quad h = 1621 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2 \quad I_{dr} = 69387,5 \text{ cm}^4$$

$$F_c = 14,59 \text{ cm}^2 \quad I_T = 47036,9 \text{ cm}^4 \quad F = 150157 \text{ cm}^2$$

$$F_{ch} = \frac{150157 \times 1621}{69387,5} = 350,78 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 435}{69387,5} = 16,47 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{435}{48,57} = 9,0 \text{ t/mm} \quad \frac{L}{F_c} = \frac{435}{12,39} = 2,98 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 30,18 \text{ t/mm}$$

$$B) \text{ Strkn. "d": } L = 620 \text{ mm} \quad h = 1953 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2$$

$$I_{dr} = 3315,6 \text{ cm}^4 \quad F_c = 13,99 \text{ cm}^2 \quad F = 66729 \text{ cm}^2$$

$$F_{ch} = \frac{66729 \times 1953}{3315,6} = 3930,5 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1953^2 \times 620}{3315,6} = 713,23 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{620}{48,57} = 12,7 \text{ t/mm} \quad \frac{L}{F_c} = \frac{620}{13,99} = 44,3 \text{ t/mm}$$

$$C) \text{ Strkn. "e": } L = 305 \text{ mm} \quad h = 1621 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2$$

$$I_{dr} = 69387,5 \text{ cm}^4 \quad F_c = 12,39 \text{ cm}^2 \quad I_T = 20916,9 \text{ cm}^4 \quad F = 26556 \text{ cm}^2$$

$$F_{ch} = \frac{26556 \times 1621}{69387,5} = 620,5 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 305}{69387,5} = 11,54 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{305}{48,57} = 6,3 \text{ t/mm} \quad \frac{L}{F_c} = \frac{305}{12,39} = 24,6 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 62,87 \text{ t/mm}$$

$$\frac{H}{3 \times I_{dr}} = \frac{1621}{3 \times 151382,2} = 2,05 \text{ t/mm} \quad I_{dr} \times X_0 = 0, \text{ Faas}$$

$$4) 128,85 + 3930,5 + 620,5 = X_1 (16,47 + 0,90 + 2,98 + 30,18 + 713,23 + 1,39 + 14,57 + 11,54 + 0,63 + 2,46 + 67,87) \div X_2 \times 2,05 \div X_3 \times 62,87$$

$$\div X_4 \times 62,87 \quad \text{Ved indførelse af } X_2 \text{ fra 3) Faas:}$$

$$1121,40 X_4 + 852,08 = 30,18 X_3 + 14,57 X_4 + 5,5991 + 0,2405 X_4$$

$$X_4 = \frac{1121,40 + 169,98}{852,08 + 7,26} = \frac{1291,38}{859,34} = 1,5028 \text{ t/mm}$$

$$X_1 = 5599,1 + 0,2405 \times 1,5028 = 5599,1 + 0,3614 = 5600,5 \text{ t/mm}$$

$$X_2 = 6162,8 + 0,1039 \times 6000,5 = 6162,8 + 624,2 = 6787 \text{ t/mm}$$

$$X_3 = 1219,6 + 0,0143 \times 6854 = 1219,6 + 98,2 = 1317,8 \text{ t/mm}$$

AFstand fra topamme til søjlernes svageste snit udgør

$$h = 920 + 47 \div 66 = 970 \text{ mm}$$

II) Momenter og moment flader, naar drageren er under støttet ved R₃ og R₄ (se 301L-1.140)

Reaktioner R₃ og R₄ er fundet på 301L-1.140, og momenterne i de enkelte snit er angivet på 301L-1.141. Momenter i 0 (395 mm fra R₄) er 0 (momenter 301L-1.142-04-06)

Beregning af moment flader arealer

$$1) \text{ Fag 1: } F = 1/2 \times 55,9 (112,9 + 138,5) + 1/2 \times 28,2 (138,5 + 146,3) +$$

$$+ 1/2 \times 53 (146,3 + 159,2) + 1/2 \times 60 (159,2 + 172,6) + 1/2 \times 62,8 (172,6 + 185,7) +$$

$$+ 1/2 \times 15,8 (185,7 + 182,6) = 70392 + 40223 + 80987 + 99578 + 112365$$

$$+ 29057 = 432602 \text{ cm}^2$$

$$2) \text{ Fag 2: } F = 1/2 \times 65 (182,6 + 177,8) + 1/2 \times 67 (177,8 + 159,6) +$$

$$+ 1/2 \times 63 (159,6 + 157,7) + 1/2 \times 53 (157,7 + 140,8) + 1/2 \times 72 (140,8 + 117,6) =$$

$$115193 + 102265 + 10000 + 79124 + 91435 = 398077 \text{ cm}^2$$

$$3) \text{ Fag 3: } B) \text{ Strkn. "a"}$$

$$F = 1/2 \times 12 (1160,3 + 1116,2) + 1/2 \times 57,5 (1116,2 + 735,6) = 7059 + 53239 = 60298 \text{ cm}^2$$

$$B) \text{ Strkn. "b": } F = 1/2 \times 53 (735,6 + 375,3) + 1/2 \times 51,5 (375,3 + 167) =$$

$$29439 + 10094 = 39533 \text{ cm}^2$$

$$4) \text{ Fag 4) A) Strkn. "c": } F = 1/2 \times 2,5 \times 16,7 \div 1/2 \times 39,5 \times 281 = 1/2 \times 15,1281 + 278,5 =$$

$$+ 21 \div 5550 + 420 = 55949 \text{ cm}^2$$

$$B) \text{ Strkn. "d": } F = 1/2 \times 62 (278,5 + 181,8) = 14269 \text{ cm}^2$$

$$C) \text{ Strkn. "e": } F = 1/2 \times 30,5 (181,8 + 139,3) = 14997 \text{ cm}^2$$

Bestemmelse af kræfterne i topammer

Konstanter i Ligninger: $\frac{h^2 \times L}{I_{dr}}$, $\frac{L}{F_{dr}}$, $\frac{L}{F_c}$ og $\frac{H^3}{3 \times I_{dr}}$ er opført på 301L-1.144.

1) Fag 1

$$F = 432602 \text{ cm}^2 \quad L = 2757 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2 \quad I_{dr} = 69387,5 \text{ cm}^4$$

$$F_c = 12,39 \text{ cm}^2 \quad I_T = 151382,2 \text{ cm}^4 \quad F_{ch} = \frac{432602 \times 1621}{69387,5} = 1020,63 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{2757}{48,57} = 56,5 \text{ t/mm} \quad \frac{L}{F_c} = \frac{2757}{12,39} = 222,0 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 2,38 \text{ t/mm}$$

$$\frac{H}{3 \times I_{dr}} = \frac{1621}{3 \times 151382,2} = 2,05 \text{ t/mm} \quad I_{dr} \times X_0 = 0, \text{ Faas}$$

$$Ligning for Fag 1:$$

$$1) 1020,63 = X_1 (104,40 + 5,65 + 22,20 + 9,38 + 2,05) \div 0 \times 9,38 \div 2,05 X_2$$

$$X_1 = \frac{1020,63 + 2,05 X_2}{143,68} = 7,0332 + 0,0143 X_2$$

2) Fag 2

$$F = 398077 \text{ cm}^2 \quad L = 2572 \text{ mm} \quad h = 1621 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2 \quad I_{dr} = 69387,5 \text{ cm}^4$$

$$F_c = 12,39 \text{ cm}^2 \quad I_T = 69286,4 \text{ cm}^4 \quad I_{dr} = 97438,7 \text{ cm}^4$$

$$F_{ch} = \frac{398077 \times 1621}{69387,5} = 929,82 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 2572}{69387,5} = 9759 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{2572}{48,57} = 52,0 \text{ t/mm} \quad \frac{L}{F_c} = \frac{2572}{12,39} = 207,6 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 2,05 \text{ t/mm}$$

$$\frac{H}{3 \times I_{dr}} = \frac{1621}{3 \times 151382,2} = 2,05 \text{ t/mm} \quad I_{dr} \times X_0 = 0, \text{ Faas}$$

$$Ligning for Fag 2:$$

$$2) 929,82 = X_1 (97,59 + 5,30 + 20,76 + 2,05 + 14,57) \div X_2 \times 2,05 \div X_3 \times 14,57$$

$$\text{Ved indførelse af } X_2 \text{ fra 1) Faas:}$$

$$929,82 = X_1 (97,59 + 2,05 (7,0332 + 0,0143 X_2)) \div 14,57 X_3$$

$$X_2 = \frac{929,82 + 14,57 + 14,57 X_3}{140,27 + 0,03} = \frac{944,39 + 14,57 X_3}{140,27} = 6,7402 + 0,1039 X_3$$

3) Fag 3

$$A) \text{ Strkn. "a": } F = 60298 \text{ cm}^2 \quad L = 695 \text{ mm} \quad h = 1621 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2$$

$$I_{dr} = 69387,5 \text{ cm}^4 \quad F_c = 12,39 \text{ cm}^2 \quad I_T = 97438,7 \text{ cm}^4$$

$$F_{ch} = \frac{60298 \times 1621}{69387,5} = 140,87 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 695}{69387,5} = 26,32 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{695}{48,57} = 14,3 \text{ t/mm} \quad \frac{L}{F_c} = \frac{695}{12,39} = 56,1 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 14,57 \text{ t/mm}$$

$$\frac{H}{3 \times I_{dr}} = \frac{1621}{3 \times 151382,2} = 2,05 \text{ t/mm} \quad I_{dr} \times X_0 = 0, \text{ Faas}$$

$$B) \text{ Strkn. "b": } L = 1045 \text{ mm} \quad h = 1621 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2 \quad I_{dr} = 69387,5 \text{ cm}^4$$

$$F_c = 14,59 \text{ cm}^2 \quad I_T = 47036,9 \text{ cm}^4 \quad F = 150157 \text{ cm}^2$$

$$F_{ch} = \frac{150157 \times 1621}{69387,5} = 350,78 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 1045}{69387,5} = 39,57 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{1045}{48,57} = 21,5 \text{ t/mm} \quad \frac{L}{F_c} = \frac{1045}{12,39} = 71,6 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 30,18 \text{ t/mm}$$

$$\frac{H}{3 \times I_{dr}} = \frac{1621}{3 \times 151382,2} = 2,05 \text{ t/mm} \quad I_{dr} \times X_0 = 0, \text{ Faas}$$

$$Ligning for Fag 3:$$

$$3) 140,87 + 92,36 = X_1 (39,57 + 2,15 + 71,6 + 30,18 + 26,32 + 14,57 + 5,61 + 14,57) \div$$

$$\div X_2 \times 2,05 \div X_3 \times 14,57 \quad \text{Ved indførelse af } X_2 \text{ fra 2) Faas:}$$

$$233,23 = X_1 (39,57 + 2,15 + 71,6 + 30,18 + 26,32 + 14,57 + 5,61 + 14,57) \div$$

$$X_3 \div 2,05 \div 14,57 = \frac{233,23 + 98,20 + 30,18 X_3}{126,99 + 1,51} = \frac{331,43 + 30,18 X_3}{125,48} = \frac{2,6413 + 0,2405 X_3}{125,48}$$

$$4) \text{ Fag 4}$$

$$A) \text{ Strkn. "c": } L = 435 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2 \quad I_{dr} = 69387,5 \text{ cm}^4$$

$$F_c = 14,59 \text{ cm}^2 \quad I_T = 47036,9 \text{ cm}^4 \quad h = 1621 \text{ mm} \quad F = 150157 \text{ cm}^2$$

$$F_{ch} = \frac{150157 \times 1621}{69387,5} = 350,78 \text{ t/mm} \quad \frac{h^2 \times L}{I_{dr}} = \frac{1621^2 \times 435}{69387,5} = 16,47 \text{ t/mm}$$

$$\frac{L}{F_{dr}} = \frac{435}{48,57} = 9,0 \text{ t/mm} \quad \frac{L}{F_c} = \frac{435}{12,39} = 2,98 \text{ t/mm} \quad \frac{H^3}{3 \times I_{dr}} = \frac{1621^3}{3 \times 151382,2} = 30,18 \text{ t/mm}$$

$$B) \text{ Strkn. "d": } L = 620 \text{ mm} \quad h = 1953 \text{ mm} \quad F_{dr} = 48,57 \text{ cm}^2$$