I Stålsøyle

I.1 Stålsøyle C.37 - Utregning av kapasitet

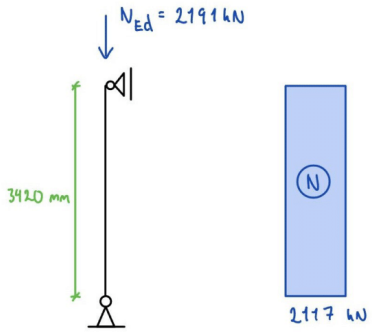
Laster: Se Vedlegg C for laster

Egenlast: $G := 1046.019\ kN + 27.057\ kN = \left(1.073 \cdot 10^3\right)\ kN$

Nyttelast: $Q := 438.019\ kN$

Snølast: $S := 163.897\ kN$

Dimensjonerende aksialkraft i brudd: $N_{Ed} := G \cdot 1.2 + Q \cdot 1.5 + S \cdot 1.5 = 2191\ kN$ (EC0, Tabell NA.A1.2(A))



Tverrsnitt:

Type: Kvadratisk hulprofil

$h := 250\ mm$ $I_T := 1.7164 \cdot 10^8\ mm^4$

$b := 250\ mm$ $i := 96.6\ mm$

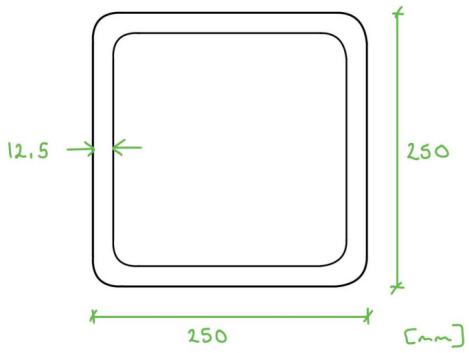
$s := 12.5\ mm$ $I := 1.0915 \cdot 10^8\ mm^4$

$L := 3420\ mm$ $W := 8.73 \cdot 10^5\ mm^3$

$A := 11700\ mm^2$ $W_p := 1.037 \cdot 10^6\ mm^3$

Dimensjoner hentet fra focus programvare

1



Stålegneskaper, dimensjoner og tøyning:

$$E_s := 210 \cdot 10^3 \ \frac{N}{mm^2}$$

$$f_y := 355 \ \frac{N}{mm^2}$$

(EC3 - Del 1-1, NA.6.1(1))

$$\gamma_{m0} := 1.05$$

$$f_d := \frac{f_y}{\gamma_{m0}} = 338 \ MPa$$

Normalspenningen

$$\sigma := \frac{N_{Ed}}{A} = 187.228 \ MPa \qquad \sigma < f_d \qquad \text{OK}$$

Aksialkraftkapasitet:

$$N_{Rd} := f_d \cdot A = \left(3.956 \cdot 10^3\right) \ kN$$

$$N_{Rd} > N_{Ed} \qquad \text{OK}$$

2

I.2 Dimensjonering av ny stålsøyle

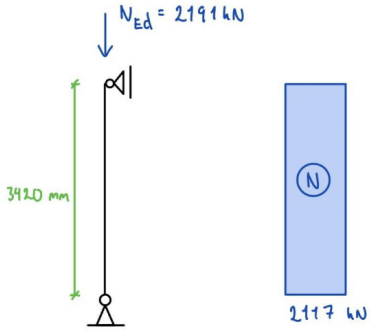
Laster: Se Vedlegg C for laster

Egenlast: $G := 1046.019\ kN + 27.057\ kN = \left(1.073 \cdot 10^{3}\right)\ kN$

Nyttelast: $Q := 438.019\ kN$

Snølast: $S := 163.897\ kN$

Dimensjonerende aksialkraft i brudd: $N_{Ed} := G \cdot 1.2 + Q \cdot 1.5 + S \cdot 1.5 = 2191\ kN$ (EC0, Tabell NA.A1.2(A))



Tverrsnitt:

Type: Kvadratisk hulprofil

$h := 200\ mm$ $I_T := 70.6 \cdot 10^{6}\ mm^{4}$

$b := 200\ mm$ $i := 77\ mm$

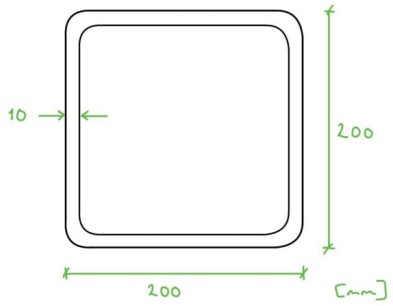
$s := 10\ mm$ $I := 44.2 \cdot 10^{6}\ mm^{4}$

$L := 3420\ mm$ $W := 442 \cdot 10^{3}\ mm^{3}$

$A := 7.45 \cdot 10^{3}\ mm^{2}$ $W_p := 526 \cdot 10^{3}\ mm^{3}$

Dimensjoner hentet fra tabell 1.4 i "stålkonstruksjoner, profiler og formler"

1



Stålegneskaper, dimensjoner og tøyning:

$$E_s := 210 \cdot 10^3 \ \frac{N}{mm^2}$$

$$f_y := 355 \ \frac{N}{mm^2}$$

(EC3 - Del 1-1, NA.6.1(1))

$$\gamma_{m0} := 1.05$$

$$f_d := \frac{f_y}{\gamma_{m0}} = 338 \ MPa$$

Normalspenningen

$$\sigma := \frac{N_{Ed}}{A} = 294.036 \ MPa \qquad \sigma < f_d \qquad \text{OK}$$

Aksialkraftkapasitet:

$$N_{Rd} := f_d \cdot A = \left(2.519 \cdot 10^3\right) \ kN$$

$$N_{Rd} > N_{Ed} \qquad \text{OK}$$

2

Sjekker knekking:

$$N_{cr} := \frac{\pi^2 \cdot E_s \cdot I}{L^2} = \left(7.832 \cdot 10^3\right)\ kN$$

$N_{cr} < N_{Ed}$ OK

Sjekker bøyeknekking:

$$\frac{N_{Ed}}{N_{b.Rd}} \leq 1.0$$ (EC3 - Del 1-1, 6.3.1.1(1))

$$N_{b.Rd} = \chi \cdot A \cdot f_d$$ (EC3 - Del 1-1, 6.3.1.1(3))

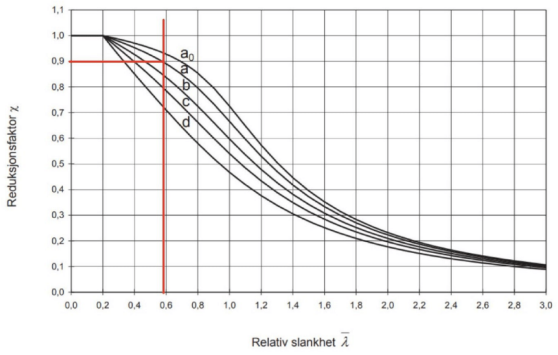
Finner reduksjonsfaktor χ:

Relativ slankhet:

$$\lambda := \sqrt[2]{\frac{A \cdot f_y}{N_{cr}}} = 0.581$$ (EC3 - Del 1-1, 6.3.1.2(1))

Sjekker tabell 6.2 i EC3 - Del 1-1 = finner at knekkurve er a

Finner så reduksjonsfaktor i figur 6.4 i EC3 - Del 1-1



Figur 6.4 – Knekkurver

3

$$\chi := 0.9$$

$$N_{b.Rd} := \chi \cdot A \cdot f_d = \left(2.267 \cdot 10^3\right)\ kN$$

$$\frac{N_{Ed}}{N_{b.Rd}} = 0.966$$

$0.934 < 1.0$ OK

4