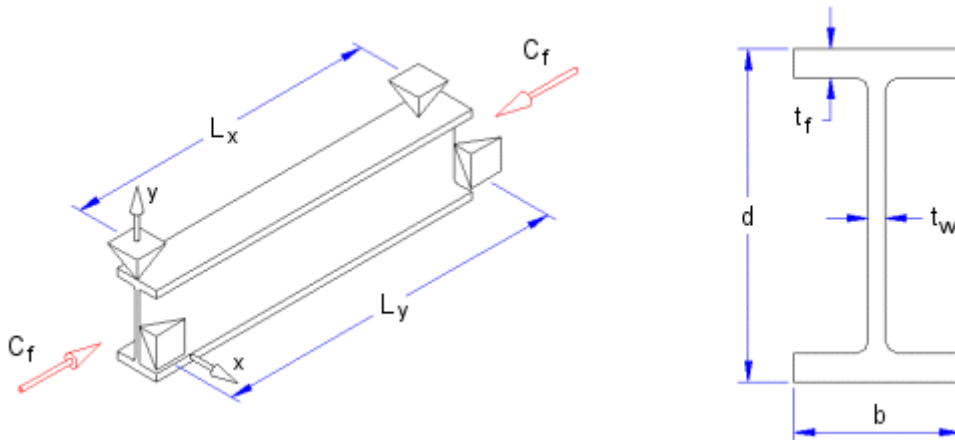


CIVL231	PROJECT	Column design according to CAS/CAN3 – 16.0	
	AREA		
	AUTHOR	sfs	TIME 9:19:25 AM
	CK'D BY	sfs	DATE 04/02/2007

Design of Columns to CAN/CSA-S16.1-94



INPUT PARAMETERS

Force

Factored Axial Load $C_f = 6000$ kN

Geometry

Factored Unsupported Length $KL_x = 5000$ mm

$KL_y = 5000$ mm

Section (W360x196)

Area $A = 25000$ mm²

Depth $d = 372$ mm

Width $b = 374$ mm

Flange Thickness $t_f = 26.2$ mm

Web Thickness $t_w = 16.4$ mm

Radius of Gyration $r_x = 159.0$ mm

Radius of Gyration $r_y = 95.6$ mm

Material

Specified Yield $F_y = 350$ MPa

DESIGN CHECKS

Section Class

Flange

$$b/t = b / (2 \cdot t_f) = 374 / (2 \cdot 26.2) = 7.1 \quad 11.3.1$$
$$\leq 145 / (F_y)^{1/2} = 145 / (350)^{1/2} \quad 11.2$$
$$\leq 7.8 \rightarrow \text{Flange is class 1}$$

Web

$$h/w = (d - 2t_f) / t_w = (372 - 2 \cdot 26.2) / 16.4 = 19.5 \quad 11.3.2$$
$$\leq 1100.0 \cdot [1 - 0.39 \cdot C_f \cdot 1000 / (A \cdot F_y)] / (F_y)^{1/2} \quad 11.2$$
$$\leq 1100.0 \cdot [1 - 0.39 \cdot 6000 \cdot 1000 / (25000 \cdot 350)] / (350)^{1/2}$$
$$\leq 43.1 \rightarrow \text{Web is class 1}$$

-> Section is class 1

Axial Compression

$$C_r = \phi A F_y (1 + \lambda^{2n})^{-1/n} \quad 13.3.1$$

where

$$\phi = 0.9$$

$$n = 1.34 \text{ for Group 1, 2 and 3 W-shapes of CSA G40.20 Table 1}$$

$$(KL/r)_{\max} = \text{Max}(KL_x/r_x, KL_y/r_y)$$
$$= \text{Max}(5000/159.0, 5000/95.6)$$
$$= \text{Max}(31.4, 52.3)$$
$$= 52.3$$

$$(KL/r)_{\max} \leq 200 \quad 10.2.1$$

$$52.3 \leq 200 \quad \text{OK}$$

$$\lambda = (KL/r)_{\max} [F_y / (\pi^2 E)]^{1/2}$$
$$= 52.3 \cdot [350 / (\pi^2 \cdot 200000)]^{1/2}$$
$$= 0.696$$

$$C_r = 0.9 \cdot 25000 \cdot 350 \cdot (1 + 0.696^{2 \cdot 1.34})^{-1/1.34} / 1000$$
$$= 6195 \text{ kN}$$

$$C_f \leq C_r$$

$$6000 \text{ kN} < 6195 \text{ kN} \quad \text{OK}$$