

Compression Member Design - Default

File Edit Options Help

Input Select Graph Check

Factored Compressive Force
 C_f kN

Factored Unbraced Length
 KL_x mm
 KL_y mm
 KL_z mm

Specified Material Properties
 F_y MPa

Number of sections in table: 53 Selected Shape: W460x213 NOT OK

Compression Member Design - Default

File Edit Options Help

Input Select Graph Check

First Criteria
 Parameter: [mm]

Second Criteria
 Parameter:

Third Criteria
 Parameter:

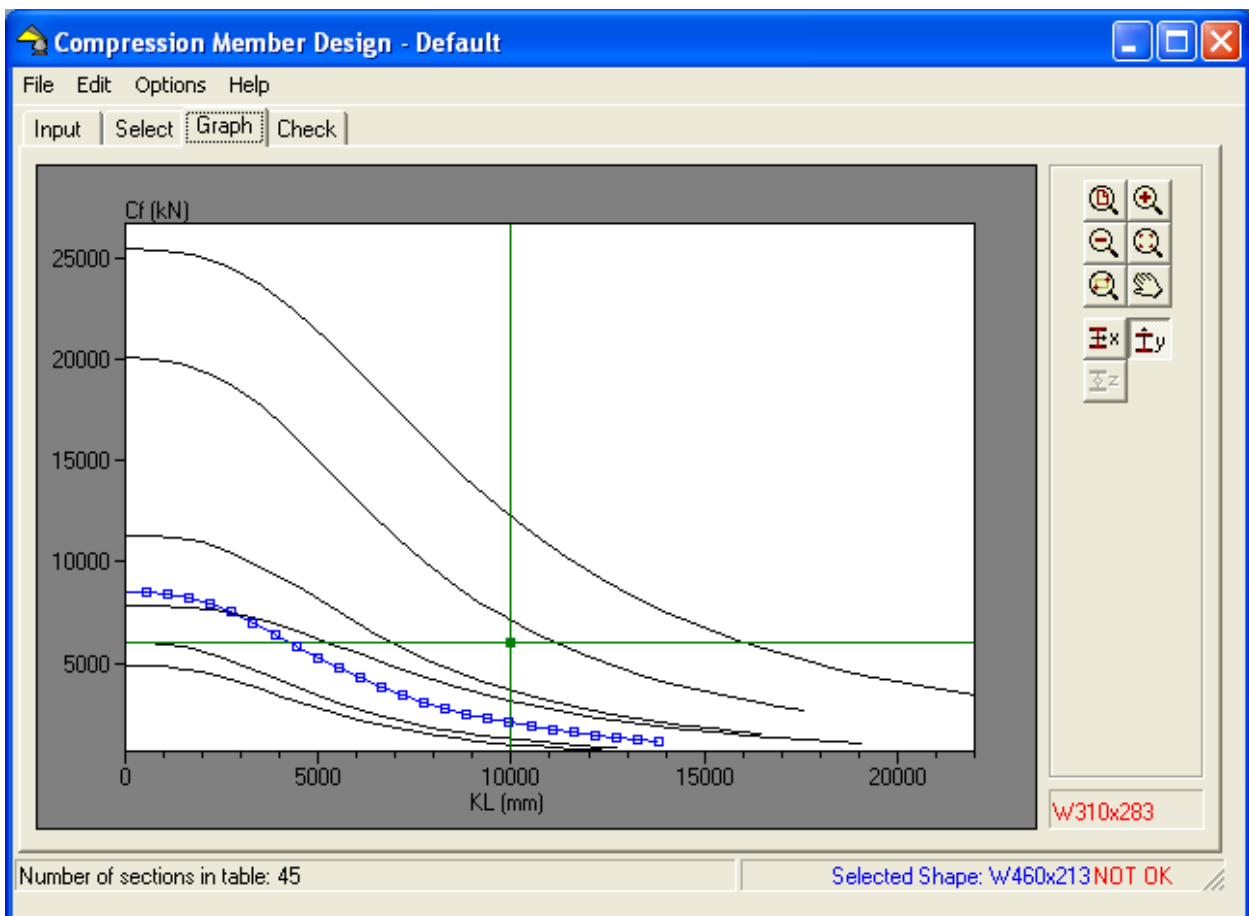
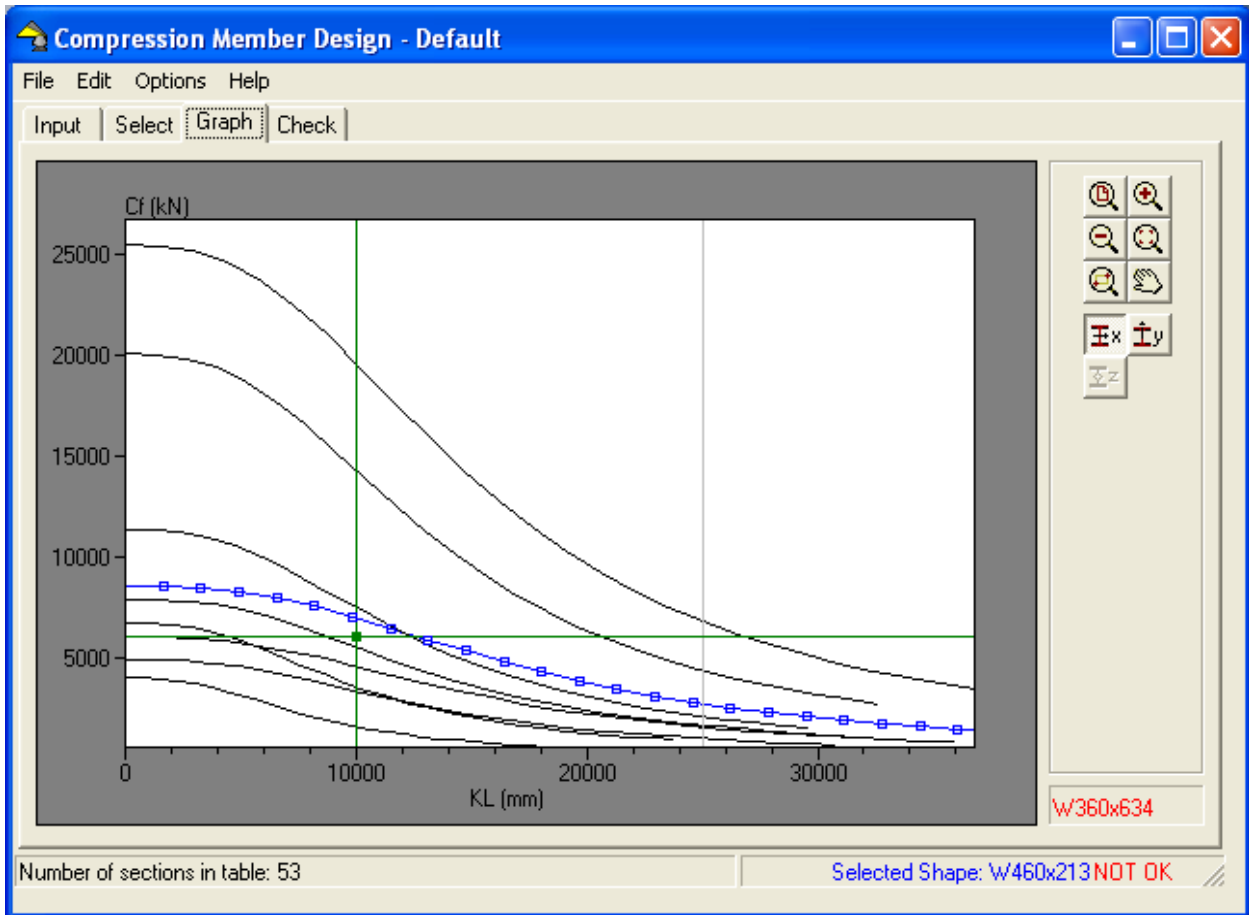
Select by Name

Shape Table

Sections

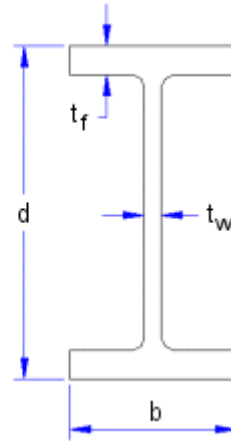
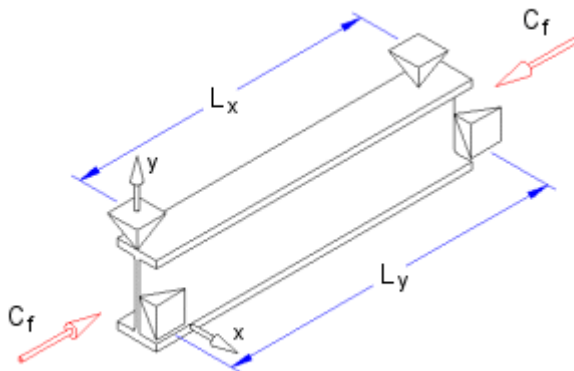
Designation	d	b	t	w
▶ W460x213	495	285	33.5	
W460x193	489	283	30.5	
W460x177	482	286	26.9	
W460x158	476	284	23.9	
W460x144	472	283	22.1	
W410x149	431	265	25	
W410x132	425	263	22.2	
W360x744	498	432	88.9	
W360x677	483	428	81.5	
W360x634	474	424	77.1	
W360x592	465	421	72.3	
W360x551	455	418	67.6	

Number of sections in table: 53 Selected Shape: W460x213 NOT OK



CIVL231	PROJECT	Euler Column	
	AREA		
	AUTHOR	AUTHOR	TIME 2:19:38 PM
	CK'D BY	CHECKER	DATE 1/30/2007

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



INPUT PARAMETERS

Force

Factored Axial Load

$$C_f = 6000 \quad \text{kN}$$

Geometry

Factored Unsupported Length

$$KL_x = 10000 \quad \text{mm}$$

$$KL_y = 10000 \quad \text{mm}$$

Section (W460x213)

Area

$$A = 27100 \quad \text{mm}^2$$

Depth

$$d = 495 \quad \text{mm}$$

Width

$$b = 285 \quad \text{mm}$$

Flange Thickness

$$t_f = 33.5 \quad \text{mm}$$

Web Thickness

$$t_w = 18.5 \quad \text{mm}$$

Radius of Gyration

$$r_x = 205.0 \quad \text{mm}$$

Radius of Gyration

$$r_y = 69.1 \quad \text{mm}$$

Material

Specified Yield

$$F_y = 350 \quad \text{MPa}$$

DESIGN CHECKS

Section Class

Flange

$$b/t = b / (2 \cdot t_f) = 285 / (2 \cdot 33.5) = 4.3 \quad 11.3.1$$

$$\leq 145 / (F_y)^{1/2} = 145 / (350)^{1/2} \quad 11.2$$

$$\leq 7.8 \rightarrow \text{Flange is class 1}$$

Web

$$h/w = (d - 2t_f) / t_w = (495 - 2 \cdot 33.5) / 18.5 = 23.1 \quad 11.3.2$$

$$\leq 1100.0 \cdot [1 - 0.39 \cdot C_f \cdot 1000 / (A \cdot F_y)] / (F_y)^{1/2} \quad 11.2$$

$$\leq 1100.0 \cdot [1 - 0.39 \cdot 6000 \cdot 1000 / (27100 \cdot 350)] / (350)^{1/2}$$

$\leq 44.3 \rightarrow$ Web is class 1

\rightarrow Section is class 1

Axial Compression

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

where

$$\phi = 0.9$$

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

$$\begin{aligned} (KL/r)_{\max} &= \text{Max}(KL_x/r_x, KL_y/r_y) \\ &= \text{Max}(10000/205.0, 10000/69.1) \\ &= \text{Max}(48.8, 144.7) \\ &= 144.7 \end{aligned}$$

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

$$144.7 \leq 200 \quad \text{OK}$$

$$\begin{aligned} \lambda &= (KL/r)_{\max} [F_y / (\pi^2 E)]^{1/2} \\ &= 144.7 \cdot [350 / (\pi^2 \cdot 200000)]^{1/2} \\ &= 1.927 \end{aligned}$$

$$\begin{aligned} C_r &= 0.9 \cdot 27100 \cdot 350 \cdot (1 + 1.927^{2 \cdot 1.34})^{-1/1.34} / 1000 \\ &= 2042 \text{ kN} \end{aligned}$$

$$C_f \leq C_r$$

$$6000 \text{ kN} > 2042 \text{ kN}$$

NOT OK