

Solution for Assignment on Section Classification

Determine whether or not the following sections meet Class 3 requirements for compression members. Steel is 300W.

- 1) WT100x13.5
- 2) W200x27
- 3) W200x22
- 4) L76X76X6.4
- 5) C200x17
- 6) HSS 152x152x6.4

Solution:

For classification limits, refer to Table 1.

For the definitions of b_{el} and t for various types of section refer to Clause 11.3.1 and 11.3.2 in CAN-CSA-S16.

1) WT100x13.5	$d = 104 \text{ mm}$ $b = 133 \text{ mm}$ $t = 8.4 \text{ mm}$ $w = 5.8 \text{ mm}$	$F_y = 300 \text{ MPa}$
<u>Flange:</u>	$\frac{b_{el}}{t} = \frac{(133/2)}{(8.4)} = 7.9$	$\left(\frac{b_{el}}{t}\right)_{lim} = \frac{200}{\sqrt{300}} = 11.55$
	7.9 < 11.5	Thus flange meets Class 3 requirements
<u>Stem:</u>	$\frac{b_{el}}{t} = \frac{104}{5.8} = 17.9$	$\left(\frac{b_{el}}{t}\right)_{lim} = \frac{340}{\sqrt{300}} = 19.6$
	17.9 < 19.6	Stem meets Class 3 requirements
<p>Since both the flange and the stem meet Class 3 requirements, the section meets Class 3 requirements.</p>		
<u>Notes:</u>		
1. For the flange of a wide flange and T sections, b_{el} is half of the flange width, and t is the thickness of the flange		
2. For the stem of a T section, b_{el} is the nominal height of the section and t is its thickness		

2) W200x27

$$\begin{aligned}
 F_y &= 300 \text{ MPa} \\
 d &= 207 \text{ mm} \\
 b &= 133 \text{ mm} \\
 t &= 8.4 \text{ mm} \\
 w &= 5.8 \text{ mm}
 \end{aligned}$$

$$\text{Flange: } \frac{b_{el}}{t} = \frac{(133/2)}{8.4} = 7.9 \qquad \left(\frac{b_{el}}{t} \right)_{\text{lim}} = \frac{200}{\sqrt{300}} = 11.55$$

$$7.9 < 11.5$$

Flange meets Class 3 requirements

$$\text{Web: } \frac{h}{t} = \frac{207 - 2 \times 8.4}{5.8} = 32.8 \qquad \left(\frac{h}{w} \right)_{\text{lim}} = \frac{670}{\sqrt{300}} = 38.7$$

$$32.8 < 38.7$$

Web meets Class 3 requirements

Since both the flange and the web meet Class 3 requirements, the section meets Class 3 requirements.

2) W200x22

$$\begin{aligned}
 F_y &= 300 \text{ MPa} \\
 d &= 206 \text{ mm} \\
 b &= 102 \text{ mm} \\
 t &= 8.0 \text{ mm} \\
 w &= 6.2 \text{ mm}
 \end{aligned}$$

$$\text{Flange: } \frac{b_{el}}{t} = \frac{102}{2(8.0)} = 6.38 \qquad \left(\frac{b_{el}}{t} \right)_{\text{lim}} = \frac{200}{\sqrt{300}} = 11.55$$

$$6.38 < 11.55$$

Flange meets Class 3 requirements

$$\text{Web: } \frac{h}{w} = \frac{206 - 2 \times 8.0}{6.2} = 30.6 \qquad \left(\frac{h}{w} \right)_{\text{lim}} = \frac{670}{\sqrt{300}} = 38.7$$

$$30.6 < 38.7$$

Web meets Class 3 requirements

Since both the flange and the web meet Class 3 requirements, the section meets Class 3 requirements.

4) L76x76x6.4	$b = 76.2 \text{ mm}$	$F_y = 300 \text{ MPa}$
	$t = 6.4 \text{ mm}$	
$\frac{b}{t} = \frac{76.2}{6.4} = 11.8$	$\left(\frac{b}{t}\right)_{\text{lim}} = \frac{250}{\sqrt{300}} = 13.4$	Class 3 requirement is not met

5) C200x17	$d = 203 \text{ mm}$	$F_y = 300 \text{ MPa}$
	$b = 57 \text{ mm}$	
	$t = 9.9 \text{ mm}$	
	$w = 5.6 \text{ mm}$	
<u>Flange:</u>	$\frac{b}{t} = \frac{57}{9.9} = 5.8$	$\left(\frac{b}{t}\right)_{\text{lim}} = \frac{200}{\sqrt{300}} = 11.5$
	$5.8 < 11.5$	Flange meets Class 3 requirements
<u>Web:</u>	$\frac{b}{t} = \frac{203 - 2(9.9)}{5.6} = 32.7$	$\left(\frac{b}{t}\right)_{\text{lim}} = \frac{670}{\sqrt{300}} = 38.7$
	$32.7 < 38.7$	Web meets Class 3 requirements
<u>Note:</u>		
For the web of a channel section, b is the clear distance between flanges, and t is the thickness of the web		
Since the flanges and the web meet Class 3 requirements, the section meets class 3 requirements.		

6) HSS152x152x6.4	$F_y = 300 \text{ MPa}$
<u>Note:</u>	
For a hollow structural section, the width $b = \text{width} - 4 \times \text{thickness}$	
$\frac{b}{t} = \frac{152 - 4(6.4)}{6.4} = \frac{126.4}{6.4} = 19.75$	$\left(\frac{b}{t}\right)_{\text{lim}} = \frac{670}{\sqrt{300}} = 38.7$
$19.75 < 38.7$	Section meets Class 3 requirements.