

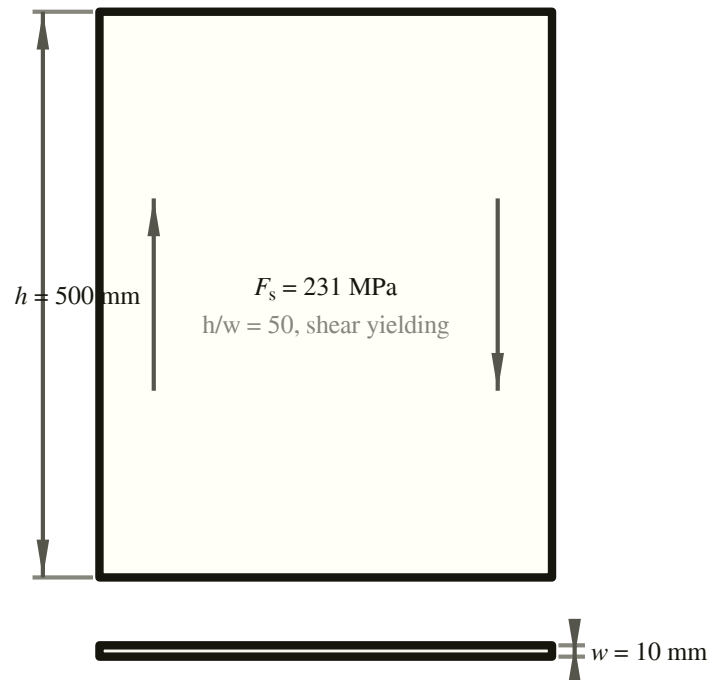
□ Steel web shear capacity

Shear stress capacity of an unstiffened steel web to CSA S16 Cl. 13.4.1.1.

Inputs

Symbol	Value	Unit	Description
h	500	mm	Clear depth of web between flanges, $d - 2t$ for a rolled shape
w	10	mm	Web thickness
F_y	350	MPa	Yield strength of the web

Figures



The web at true proportions, and the limit state its slenderness puts it in.

Checks

Name	Check	Result
Web reaches shear yield	$h_w \leq h_{w,1} \Rightarrow 50 \leq 54.2$	PASS
Web below elastic limit	$h_w \leq h_{w,2} \Rightarrow 50 \leq 76.7$	PASS

Results

Quantity	Description	Value	Unit
h_w	Web slenderness	50	
$h_{w,1}$	Slenderness limit for shear yielding	54.2	
$h_{w,2}$	Slenderness limit for inelastic buckling	76.7	
F_s	Shear stress capacity	231	MPa
A_w	Web shear area	5000	mm ²
V_r	Factored shear resistance	1.04	MN

Derivation

$$\begin{aligned}
 h_w &= \frac{h}{w} \\
 &= \frac{500 \text{ mm}}{10 \text{ mm}} \\
 &= 50
 \end{aligned}$$

$$\begin{aligned}
 \text{root}_{F,y} &= \sqrt{F_y \cdot 1 \text{ MPa}} \\
 &= \sqrt{350 \text{ MPa} \cdot 1 \text{ MPa}} \\
 &= 18.71 \text{ MPa}
 \end{aligned}$$

$$\begin{aligned}
 h_{w,1} &= 1014 \cdot \frac{1 \text{ MPa}}{\text{root}_{F,y}} && \text{Cl. 13.4.1.1 a) i)} \\
 &= 1014 \cdot \frac{1 \text{ MPa}}{18.71 \text{ MPa}} \\
 &= 54.2
 \end{aligned}$$

$$\begin{aligned}
 h_{w,2} &= 1435 \cdot \frac{1 \text{ MPa}}{\text{root}_{F,y}} && \text{Cl. 13.4.1.1 a) ii), iii)} \\
 &= 1435 \cdot \frac{1 \text{ MPa}}{18.71 \text{ MPa}} \\
 &= 76.7
 \end{aligned}$$

Branch: $h_w \leq h_{w,1}$ held

$$\begin{aligned}
 F_s &= 0.66 \cdot F_y && \text{Cl. 13.4.1.1 a) i), shear yielding} \\
 &= 0.66 \cdot 350 \text{ MPa} \\
 &= 231 \text{ MPa}
 \end{aligned}$$

$$\begin{aligned}
 A_w &= h \cdot w && \text{Cl. 13.4.1.1, girder form} \\
 &= 500 \text{ mm} \cdot 10 \text{ mm} \\
 &= 5000 \text{ mm}^2
 \end{aligned}$$

$$\begin{aligned} V_r &= 0.9 \cdot A_w \cdot F_s && \text{Cl. 13.4.1.1, phi} = 0.90 \text{ per Cl. 13.1 a)} \\ &= 0.9 \cdot 5000 \text{ mm}^2 \cdot 231 \text{ MPa} \\ &= 1.04 \text{ MN} \end{aligned}$$