Shear Centre of a Channel Section

Location of the shear centre of a thin-walled channel from the flange width, depth and plate thicknesses, with the section's second moment of area.

Method: Shear-flow equilibrium of a thin-walled channel

Input parameters

Unit system: SI

Parameter	Value	Unit
Flange width (to the web centreline)	75.000	mm
Depth between flange centrelines	200.00	mm
Flange thickness	10.000	mm
Web thickness	6.0000	mm

Calculated results

Parameter	Value	Unit
Second moment of area (thin-wall)	1,900.0	cm^4
Shear centre distance outside the web centreline	29.605	mm
Shear centre distance relative to the flange width	0.39474	
Centroid distance inside the web centreline	20.833	mm
Distance from the centroid to the shear centre	50.439	mm

Notes for this case

- Thin-wall theory on centreline dimensions (flange bending about its own axis neglected). A load through the shear centre bends the channel without twisting it; a load through the web twists it by the moment P(e + distance to the load).

Formula and method

$$I_x = \frac{t_w h^3}{12} + \frac{b t_f h^2}{2}, \quad e = \frac{t_f b^2 h^2}{4 I_x} \left(= \frac{3b^2}{h + 6b} \text{ for } t_f = t_w \right)$$

Variables

b	Flange width (to the web centreline)	m
h	Depth between flange centrelines	m
t_f	Flange thickness	m
t_w	Web thickness	m
I_x	Second moment of area (thin-wall)	m^4
e	Shear centre distance outside the web centreline	m
e/b	Shear centre distance relative to the flange width	-
$\bar{x}$	Centroid distance inside the web centreline	m
$e + \bar{x}$	Distance from the centroid to the shear centre	m

Method and standards

Thin-walled shear-flow analysis.

Assumptions and limits

- Thin walls, centreline dimensions, elastic.

References

Shear-flow equilibrium of a thin-walled channel

Report details

Report reference	FCC-P4T4-YSS1 (the same inputs always give the same reference)
Generated	23 November 2026, 18:18 UTC
Calculator	Shear Centre of a Channel Section
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/mechanical/strength-of-materials/channel-shear-centre

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.