

TOLERANCES

STRUCTURALS

Permissible Variations in Cross Section for W, HP, S, M, C and MC Shapes

Shape	Section Nominal Sizes in.	Depth, in.		Flange Width, in.		Flanges Out-of-Square, max. in.*†
		Over Theoretical	Under Theoretical	Over Theoretical	Under Theoretical	
W and HP	Up to 12, incl	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{1}{4}$
	over 12	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{5}{16}$
S and M	3 to 7, incl	$\frac{3}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{32}$
	Over 7 to 14, incl	$\frac{1}{8}$	$\frac{3}{32}$	$\frac{5}{32}$	$\frac{5}{32}$	$\frac{1}{32}$
	Over 14 to 24, incl	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{1}{32}$
C and MC	1½ and under	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{32}$
	Over 1½ to 3, excl	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{32}$
	3 to 7, incl	$\frac{3}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{32}$
	Over 7 to 14, incl	$\frac{1}{8}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{5}{32}$	$\frac{1}{32}$
	Over 14	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{32}$

* Applies when flanges of channels are toed in or out. For channels $\frac{5}{8}$ in. and under in depth, the permissible out-of-square is $\frac{3}{64}$ in./in. of depth.

† Tolerance is per inch of flange width for S, M, C, and MC shapes.

Permissible Variations in Cross Section for Angles (L Shapes) and Zees

Section	Nominal Size, in.	Depth, in.		Flange Width or Length of Leg, in.		Variations from Thickness for Thickness Given, Over and Under, in.		
		Over Theoretical	Under Theoretical	Over Theoretical	Under Theoretical	Out of Square per Inch, in.	$\frac{3}{16}$ and under	Over $\frac{3}{16}$ to $\frac{1}{2}$ incl
		Theoretical	Theoretical	Theoretical	Theoretical	in.	Under $\frac{3}{16}$	Over $\frac{3}{16}$
Angles*	1 and under	—	—	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{3}{128}$ †	0.008	0.010
(L Shapes)	Over 1 to 2, incl	—	—	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{128}$ †	0.010	0.010
	Over 2 to 3, excl	—	—	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{3}{128}$ †	0.012	0.015
	3 to 4, incl	—	—	$\frac{1}{8}$	$\frac{3}{32}$	$\frac{3}{128}$ †	—	—
	Over 4 to 6, incl	—	—	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{128}$ †	—	—
	Over 6	—	—	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{3}{128}$ †	—	—
Zees	3 to 4, incl	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{32}$	$\frac{3}{128}$ †	—	—
	Over 4 to 6, incl	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{128}$ †	—	—

* For unequal leg angles, longer leg determines classification.

† $\frac{3}{128}$ in./in. = $1\frac{1}{2}$ deg.

Permissible Variations in Sectional Dimensions for Rolled Tees

Nominal Size*, in.	Depth†, in.		Width†, in.		Thickness of Flange, in.		Thickness of Stem, in.	
	Over	Under	Over	Under	Over	Under	Over	Under
1½ and under	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	0.010	0.010	0.005	0.020
Over 1½ to 2, incl	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	0.012	0.012	0.010	0.020
Over 2 to 3, excl	$\frac{3}{32}$	$\frac{3}{32}$	$\frac{3}{32}$	$\frac{3}{32}$	0.015	0.015	0.015	0.020

* The longer member of an unequal tee determines the size for permissible variations.

† Measurements for both depth and width are overall.

Permissible Variations in Straightness for S, M, C, MC, L, T, Z, Shapes

Variable	Nominal Size, in.	Permissible Variation, in.
Camber	Under 3	$\frac{1}{4}$ in. in any 5 ft, or $\frac{1}{4} \times$ (number of feet of total length/5)
	3 and over	$\frac{1}{8} \times$ (number of feet of total length/5)
Sweep	all	Due to the extreme variations in flexibility of these shapes, straightness tolerances for sweep are subject to negotiations between the manufacturer and the purchaser for the individual sections involved.

Permissible Variations in Straightness for W Shapes

Permissible Variation	
Camber and sweep	$\frac{1}{8}$ in. \times (number of feet of total length/10)

* Sections with a flange width less than 6 in., tolerance for sweep = $\frac{1}{8}$ in. \times (number of feet of total length/5).