

Properties of Weld Treated as a Line		
Outline of Welded Joint b = width d = depth	Bending (about horizontal axis X-X)	Twisting
	$Z_w = \frac{d^2}{6}$	$J_w = \frac{d^3}{12}$
	$Z_w = \frac{d^2}{3}$	$J_w = \frac{d(3b^2 + d^2)}{6}$
	$Z_w = bd$	$J_w = \frac{b^3 + 3bd^2}{6}$
	$Z_w = \frac{4bd + d^2}{6} = \frac{d^2(4b + d)}{6(2b + d)}$ top bottom	$J_w = \frac{(b + d)^4 - 6b^2d^2}{12(b + d)}$
	$Z_w = bd + \frac{d^2}{6}$	$J_w = \frac{(2b + d)^3}{12} - \frac{b^2(b + d)^2}{(2b + d)}$
	$Z_w = \frac{2bd + d^2}{3} = \frac{d^2(2b + d)}{3(b + d)}$ top bottom	$J_w = \frac{(b + 2d)^3}{12} - \frac{d^2(b + d)^2}{(b + 2d)}$
	$Z_w = bd + \frac{d^2}{3}$	$J_w = \frac{(b + d)^3}{6}$
	$Z_w = \frac{2bd + d^2}{3} = \frac{d^2(2b + d)}{3(b + d)}$ top bottom	$J_w = \frac{(b + 2d)^3}{12} - \frac{d^2(b + d)^2}{(b + 2d)}$
	$Z_w = \frac{4bd + d^2}{3} = \frac{4bd^2 + d^3}{6b + 3d}$ top bottom	$J_w = \frac{d^3(4b + d)}{6(b + d)} + \frac{b^3}{6}$
	$Z_w = bd + \frac{d^2}{3}$	$J_w = \frac{b^3 + 3bd^2 + d^3}{6}$
	$Z_w = 2bd + \frac{d^2}{3}$	$J_w = \frac{2b^3 + 6bd^2 + d^3}{6}$
	$Z_w = \frac{\pi d^2}{4}$	$J_w = \frac{\pi d^3}{4}$
	$Z_w = \frac{\pi d^2}{2} + \pi D^2$	

Fig. 25-7 (a)

Courtesy The Lincoln Electric Co.

Type of Loading	Standard Design Formula Stress lb/in ²	Treating the Weld as a Line Force lb/in
Primary Welds transmit entire load		
	$s = \frac{P}{A}$	$f = \frac{P}{L_w}$
	$s = \frac{V}{A}$	$f = \frac{V}{L_w}$
	$s = \frac{M}{Z}$	$f = \frac{M}{Z_w}$
	$s = \frac{TC}{J}$	$f = \frac{TC}{J_w}$
Secondary Welds hold section together — low stress		
	$s = \frac{VAy}{It}$	$f = \frac{VAy}{In}$
	$s = \frac{TC}{J}$	$f = \frac{TCt}{J}$

Courtesy The Lincoln Electric Co.

Fig. 25-7 (b)

If intermittent welds are to be used, determine the ratio R of the calculated leg size for continuous welding and the actual leg size to be used with intermittent welding:

$$R = \frac{\text{calculated leg size, continuous weld}}{\text{actual leg size to be used, intermittent weld}}$$

The length of intermittent welds and distance between centers is given as a function of R . A representation such as 3-4 means a weld 3" long with a distance of 4" between the centers of two consecutive welds.