

Table 2-18W
ALLOWABLE STRESSES F/Ω (k/in²) FOR BUILDING-TYPE STRUCTURES (WELDED)

<u>Axial Tension</u>	Section	F/Ω
axial tension stress on net effective area	D.2b	12.3
axial tension stress on gross area	D.2a	6.7
<u>Shear or torsion</u>		
Shear or torsion rupture	G, H.2	7.4
<u>Bearing</u>		
bolts or rivets on holes	J.3.6a, J.4.6	24.6
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	16.4
screws in holes	J.5.5.1	16.0

6061 - T6 ASTM B209 0.010 to 4.000 in. thick
 6061 - T651 ASTM B209 0.010 to 4.000 in. thick
 6061 - T6 ASTM B210 0.025 to 0.500 in. thick
 6061 - T6 ASTM B211 0.125 to 8.000 in. thick
 6061 - T651 ASTM B211 0.125 to 8.000 in. thick
 6061 - T6 ASTM B632 0.010 to 0.625 in. thick
 6061 - T6 ASTM B221, B241, B429
 6061 - T6510 ASTM B221
 6061 - T6511 ASTM B221
 6061 - T6 ASTM B247 0.000 to 4.000 thick
 6061 - T6 ASTM B308 0.062 thick and greater
 6351 - T5 ASTM B221 0.000 to 1.000 in. thick

$$F_{tyw} = 11 \text{ k/in}^2 \quad E = 10,100 \text{ k/in}^2$$

$$F_{cyw} = 11 \text{ k/in}^2 \quad k_t = 1$$

$$F_{tuw} = 24 \text{ k/in}^2$$

For thicknesses > 0.375" welded with 4043, 5554,
or 5654 alloy filler

	λ	F/Ω for $\lambda \leq \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \geq \lambda_2$	
<u>Axial Compression - member buckling</u>	E.2	kL/r	6.7	22.3	$0.00003 \lambda^2 - 0.040 \lambda + 7.5$	157	$51,352/\lambda^2$
<u>Flexure - lateral-torsional buckling</u>	F.4	see F.4.2	-	-	see F.4	157	$60,414/\lambda^2$
<u>Elements - Uniform Compression</u>							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	6.7	9.8	$8.6 - 0.198 \lambda$	29	$2,417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	6.7	9.8	$8.6 - 0.198 \lambda$	21.8	$94/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	6.7	30.8	$8.6 - 0.063 \lambda$	68	$293/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	6.7	22.3	$7.4 - 0.031 \lambda$	157	$60,414/\lambda^2$
round hollow elements	B.5.4.5	R_p/t	6.7	52.2	$8.5 - 0.257 \lambda^{1/2}$	389	$3,776/(\lambda k_r)^\dagger$
flat elements - direct strength method	B.5.4.6	λ_{eq}	6.7	49.2	$8.6 - 0.040 \lambda$	109	$468/\lambda$
<u>Elements - Flexural Compression</u>							
flat elements supported on both edges	B.5.5.1	b/t	10.0	36.3	$11.4 - 0.039 \lambda$	145	$830/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	10.0	6.7	$11.4 - 0.212 \lambda$	36	$4,932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	10.0	81.4	$11.4 - 0.018 \lambda$	326	$1,861/\lambda$
pipes and round tubes	B.5.5.4	R_p/t	$12.8 - 0.606 \lambda^{1/2}$	149.9	$8.5 - 0.257 \lambda^{1/2}$	389	$3,776/(\lambda k_r)^\dagger$
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	49.2	see B.5.5.5	145	$468/\lambda$
<u>Elements - Shear</u>							
flat elements supported on both edges	G.2	b/t	4.0	51.9	$5.2 - 0.023 \lambda$	149	$38,665/\lambda^2$
flat elements supported on one edge	G.3	b/t	4.0	21.6	$5.2 - 0.056 \lambda$	62	$6,713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p^*	4.0	91.3	$6.8 - 0.030 \lambda$	149	$50,264/\lambda^2$
<u>Torsion - pipes and round or oval tubes</u>	H.2.1	λ_p^*	4.0	51.9	$5.2 - 0.023 \lambda$	149	$38,665/\lambda^2$

* $\lambda_p = 2.9(R_p/t)^{5/8}(L/R_b)^{1/4}$
 $\dagger k_r = (1 + \lambda^{1/2}/35)^2$

Table 2-19W
ALLOWABLE STRESSES F/Ω (k/in²) FOR BUILDING-TYPE STRUCTURES (WELDED)

<u>Axial Tension</u>	Section	F/Ω	6061 - T6 6061 - T651 6061 - T6 6061 - T6 6061 - T651 6061 - T6	ASTM B209 0.010 to 4.000 in. thick ASTM B209 0.010 to 4.000 in. thick ASTM B210 0.025 to 0.500 in. thick ASTM B211 0.125 to 8.000 in. thick ASTM B211 0.125 to 8.000 in. thick ASTM B632 0.010 to 0.625 in. thick
axial tension stress on net effective area	D.2b	12.3	6061 - T6 6061 - T6510 6061 - T6511	ASTM B221, B241, B429 ASTM B221 ASTM B221
axial tension stress on gross area	D.2a	9.1	6061 - T6	ASTM B247 0.000 to 4.000 thick
<u>Shear or torsion</u>			6061 - T6 6061 - T6510 6061 - T6511	ASTM B308 0.062 thick and greater ASTM B221 0.000 to 1.000 in. thick
Shear or torsion rupture	G, H.2	7.4	6061 - T6	
<u>Bearing</u>			6061 - T6 6061 - T6510 6061 - T6511	
bolts or rivets on holes	J.3.6a, J.4.6	24.6	6061 - T6	
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	16.4	6061 - T6 6351 - T5	
screws in holes	J.5.5.1	16.0		

$$F_{tyw} = 15 \text{ k/in}^2 \quad E = 10,100 \text{ k/in}^2$$

$$F_{cyw} = 15 \text{ k/in}^2 \quad k_t = 1$$

$$F_{tuw} = 24 \text{ k/in}^2$$

For thicknesses ≤ 0.375 " welded with 4043, 5554, or 5654 and for any thickness welded with 5183, 5356, or 5556

	λ	F/Ω for $\lambda \leq \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \geq \lambda_2$
<u>Axial Compression - member buckling</u>	E.2 kL/r	9.1	21.8	$0.00007 \lambda^2 - 0.066\lambda + 10.5$	133	$51,352/\lambda^2$
<u>Flexure - lateral-torsional buckling</u>	F.4 see F.4.2		-	see F.4	133	$60,414/\lambda^2$
<u>Elements - Uniform Compression</u>						
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1 b/t	9.1	9.0	$12.0 - 0.327\lambda$	25	$2,417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1 b/t	9.1	9.0	$12.0 - 0.327\lambda$	18.4	$111/\lambda$
flat elements supported on both edges	B.5.4.2 b/t	9.1	28.2	$12.0 - 0.105\lambda$	58	$346/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4 λ_s	9.1	21.8	$10.2 - 0.051\lambda$	133	$60,414/\lambda^2$
round hollow elements	B.5.4.5 R_p/t	9.1	46.4	$11.8 - 0.396\lambda^{1/2}$	389	$3,776/(\lambda k_r)^\dagger$
flat elements - direct strength method	B.5.4.6 λ_{eq}	9.1	45.1	$12.0 - 0.065\lambda$	92	$554/\lambda$
<u>Elements - Flexural Compression</u>						
flat elements supported on both edges	B.5.5.1 b/t	13.6	36.2	$16.0 - 0.065\lambda$	123	$982/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2 b/t	13.6	6.7	$16.0 - 0.350\lambda$	30	$4,932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3 b/t	13.6	81.2	$16.0 - 0.029\lambda$	275	$2,201/\lambda$
pipes and round tubes	B.5.5.4 R_p/t	$17.7 - 0.933\lambda^{1/2}$	120.8	$11.8 - 0.396\lambda^{1/2}$	389	$3,776/(\lambda k_r)^\dagger$
flat elements - direct strength method	B.5.5.5 λ_{eq}	M_{np}/S_{xc}	45.1	see B.5.5.5	123	$554/\lambda$
<u>Elements - Shear</u>						
flat elements supported on both edges	G.2 b/t	5.5	47.5	$7.3 - 0.038\lambda$	126	$38,665/\lambda^2$
flat elements supported on one edge	G.3 b/t	5.5	19.8	$7.3 - 0.092\lambda$	53	$6,713/\lambda^2$
pipes and round or oval tubes	G.4 λ_p^*	5.5	80.0	$9.5 - 0.050\lambda$	126	$50,264/\lambda^2$
<u>Torsion - pipes and round or oval tubes</u>	H.2.1 λ_p^*	5.5	47.5	$7.3 - 0.038\lambda$	126	$38,665/\lambda^2$

$$*\lambda_p = 2.9(R_p/t)^{5/8} (L/R_b)^{1/4}$$

$$\dagger k_r = (1 + \lambda^{1/2}/35)^2$$