Table 2-7W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	7.7
axial tension stress on gross area	D.2a	3.0
Shear or torsion		
Shear or torsion rupture	G, H.2	4.6
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	15.4
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	10.2
screws in holes	J.5.5.1	10.0

5005 - H34 **B209 0.009 to 1.000 in. thick**

F_{tyw} =	5 k/in^2
F_{cyw} =	5 k/in^2
F_{tuw} =	15 k/in^2
E =	10,100 k/in^2
k_t =	1

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	3.0	23.4	$0.00001\lambda^2 - 0.012\lambda + 3.3$	236	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	236	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	3.0	12.2	$3.7 - 0.056\lambda$	44	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	3.0	12.2	$3.7 - 0.056\lambda$	33.2	$61/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	3.0	38.0	$3.7 - 0.018\lambda$	104	$192/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	3.0	23.4	$3.2 - 0.009\lambda$	236	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	3.0	70.3	$3.8 - 0.086\lambda^{1/2}$	1066	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	3.0	60.9	$3.7 - 0.011\lambda$	166	$307/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	4.5	32.5	$4.9 - 0.011\lambda$	222	$544/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	4.5	6.0	$4.9 - 0.060\lambda$	55	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	4.5	72.8	$4.9 - 0.005\lambda$	497	$1{,}219/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$5.6 - 0.203\lambda^{1/2}$	259.1	$3.8 - 0.086\lambda^{1/2}$	1066	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	60.9	see B.5.5.5	221	$307/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	1.8	64.3	$2.2 - 0.007\lambda$	228	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	1.8	26.8	$2.2 - 0.016\lambda$	95	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	1.8	127.9	$2.9 - 0.009\lambda$	228	$50{,}264/\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	1.8	64.3	$2.2 - 0.007\lambda$	228	$38{,}665/\lambda^2$

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

Table 2-8W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	9.2
axial tension stress on gross area	D.2a	3.6
Shear or torsion		
Shear or torsion rupture	G, H.2	5.5
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	18.5
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	12.3
screws in holes	J.5.5.1	12.0

5050 - H34 **B209 0.009 to 0.249in. thick**

5050 - H34 **B210 0.010 to 0.500 in. thick**

F_{tyw} =	6	k/in^2
F_{cyw} =	6	k/in^2
F_{tuw} =	18	k/in^2
E =	10,100	k/in^2
k_t =	1	

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	3.6	23.2	$0.00001\,\lambda^2 - 0.015\lambda + 4.0$	215	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	215	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	3.6	11.6	$4.5 - 0.075\lambda$	40	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	3.6	11.6	$4.5 - 0.075\lambda$	30.1	$68/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	3.6	36.3	$4.5 - 0.024\lambda$	94	$211/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	3.6	23.2	$3.9 - 0.012\lambda$	215	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	3.6	65.7	$4.5 - 0.111\lambda^{1/2}$	920	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	3.6	58.0	$4.5 - 0.015\lambda$	150	$339/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	5.5	34.0	$6.0 - 0.015\lambda$	201	$599/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	5.5	6.3	$6.0 - 0.080\lambda$	50	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	5.5	76.3	$6.0 - 0.007\lambda$	451	$1{,}343/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$6.8 - 0.261\lambda^{1/2}$	228.3	$4.5 - 0.111\lambda^{1/2}$	920	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	58.0	see B.5.5.5	201	$339/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	2.2	61.3	$2.7 - 0.009\lambda$	207	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	2.2	25.5	$2.7 - 0.021\lambda$	86	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	2.2	118.3	$3.5 - 0.011\lambda$	207	$50{,}264\ /\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	2.2	61.3	$2.7 - 0.009\lambda$	207	$38{,}665/\lambda^2$

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

Table 2-9W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	12.8
axial tension stress on gross area	D.2a	5.8
Shear or torsion		
Shear or torsion rupture	G, H.2	7.7
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	25.6
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	17.1
screws in holes	J.5.5.1	16.7

5052 - H32 **B209 0.017 to 2.000 in. thick**
5052 - H32 **B210 0.010 to 0.450 in. thick**

F_{tyw} = 9.5 k/in^2
F_{cyw} = 9.5 k/in^2
F_{tuw} = 25 k/in^2
E = 10,100 k/in^2
k_t = 1

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	5.8	22.6	$0.00003\lambda^2 - 0.032\lambda + 6.5$	169	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	169	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	5.8	10.3	$7.4 - 0.156\lambda$	31	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	5.8	10.3	$7.4 - 0.156\lambda$	23.5	$87/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	5.8	32.1	$7.4 - 0.050\lambda$	74	$271/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	5.8	22.6	$6.3 - 0.025\lambda$	169	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	5.8	55.3	$7.3 - 0.210\lambda^{1/2}$	573	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	5.8	51.3	$7.4 - 0.031\lambda$	118	$433/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	8.6	36.1	$9.8 - 0.031\lambda$	157	$767/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	8.6	6.7	$9.8 - 0.167\lambda$	39	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	8.6	80.9	$9.8 - 0.014\lambda$	353	$1{,}719/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$11.0 - 0.494\lambda^{1/2}$	166.0	$7.3 - 0.210\lambda^{1/2}$	573	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	51.3	see B.5.5.5	157	$433/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	3.5	54.1	$4.4 - 0.018\lambda$	162	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	3.5	22.5	$4.4 - 0.044\lambda$	67	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	3.5	97.2	$5.8 - 0.024\lambda$	162	$50{,}264/\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	3.5	54.1	$4.4 - 0.018\lambda$	162	$38{,}665/\lambda^2$

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

Table 2-10W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	12.8
axial tension stress on gross area	D.2a	5.8
Shear or torsion		
Shear or torsion rupture	G, H.2	7.7
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	25.6
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	17.1
screws in holes	J.5.5.1	16.7

5052 - H34 **B209 0.009 to 1.000 in. thick**

5052 - H34 **B210 0.010 to 0.450 in. thick**

F_{tyw} =	9.5	k/in^2
F_{cyw} =	9.5	k/in^2
F_{tuw} =	25	k/in^2
E =	10,100	k/in^2
k_t =	1	

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	5.8	22.6	$0.00003\,\lambda^2 - 0.032\lambda + 6.5$	169	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	169	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	5.8	10.3	$7.4 - 0.156\lambda$	31	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	5.8	10.3	$7.4 - 0.156\lambda$	23.5	$87/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	5.8	32.1	$7.4 - 0.050\lambda$	74	$271/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	5.8	22.6	$6.3 - 0.025\lambda$	169	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	5.8	55.3	$7.3 - 0.210\lambda^{1/2}$	573	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	5.8	51.3	$7.4 - 0.031\lambda$	118	$433/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	8.6	36.1	$9.8 - 0.031\lambda$	157	$767/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	8.6	6.7	$9.8 - 0.167\lambda$	39	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	8.6	80.9	$9.8 - 0.014\lambda$	353	$1{,}719/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$11.0 - 0.494\lambda^{1/2}$	166.0	$7.3 - 0.210\lambda^{1/2}$	537	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	51.3	see B.5.5.5	157	$433/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	3.5	54.1	$4.4 - 0.018\lambda$	162	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	3.5	22.5	$4.4 - 0.044\lambda$	67	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	3.5	97.2	$5.8 - 0.024\lambda$	162	$50{,}264\ /\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	3.5	54.1	$4.4 - 0.018\lambda$	162	$38{,}665/\lambda^2$

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

Table 2-11W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	12.8
axial tension stress on gross area	D.2a	5.8
Shear or torsion		
Shear or torsion rupture	G, H.2	7.7
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	25.6
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	17.1
screws in holes	J.5.5.1	16.7

5052 - H36 **B209 0.006 to 0.162 in. thick**

F_{tyw} =	9.5	k/in^2
F_{cyw} =	9.5	k/in^2
F_{tuw} =	25	k/in^2
E =	10,100	k/in^2
k_t =	1	

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	5.8	22.6	$0.00003\lambda^2 - 0.032\lambda + 6.5$	169	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	169	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	5.8	10.3	$7.4 - 0.156\lambda$	31	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	5.8	10.3	$7.4 - 0.156\lambda$	23.5	$87/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	5.8	32.1	$7.4 - 0.050\lambda$	74	$271/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	5.8	22.6	$6.3 - 0.025\lambda$	169	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	5.8	55.3	$7.3 - 0.210\lambda^{1/2}$	573	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	5.8	51.3	$7.4 - 0.031\lambda$	118	$433/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	8.6	36.1	$9.8 - 0.031\lambda$	157	$767/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	8.6	6.7	$9.8 - 0.167\lambda$	39	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	8.6	80.9	$9.8 - 0.014\lambda$	353	$1{,}719/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$11.0 - 0.494\lambda^{1/2}$	166.0	$7.3 - 0.210\lambda^{1/2}$	537	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	51.3	see B.5.5.5	157	$433/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	3.5	54.1	$4.4 - 0.018\lambda$	162	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	3.5	22.5	$4.4 - 0.044\lambda$	67	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	3.5	97.2	$5.8 - 0.024\lambda$	162	$50{,}264/\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	3.5	54.1	$4.4 - 0.018\lambda$	162	$38{,}665/\lambda^2$

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

Table 2-12W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	20.5
axial tension stress on gross area	D.2a	10.9
Shear or torsion		
Shear or torsion rupture	G, H.2	12.3
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	41.0
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	27.3
screws in holes	J.5.5.1	26.7

5083 - H116 **B928 0.125 to 1.500 in. thick**
5083 - H32 **B209 0.125 to 1.500 in. thick**
5083 - H321 **B209 0.125 to 1.500 in. thick**

F_{tyw} = 18 k/in^2
F_{cyw} = 18 k/in^2
F_{tuw} = 40 k/in^2
E = 10,100 k/in^2
k_t = 1

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	10.9	21.5	$0.00010\lambda^2 - 0.089\lambda + 12.8$	121	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	121	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	10.9	8.5	$14.7 - 0.440\lambda$	22	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	10.9	8.5	$14.7 - 0.440\lambda$	16.7	$122/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	10.9	26.7	$14.7 - 0.141\lambda$	52	$382/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	10.9	21.5	$12.4 - 0.068\lambda$	121	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	10.9	43.2	$14.3 - 0.511\lambda^{1/2}$	327	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	10.9	42.7	$14.7 - 0.088\lambda$	83	$611/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	16.4	35.9	$19.5 - 0.088\lambda$	111	$1{,}085/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	16.4	6.7	$19.5 - 0.472\lambda$	28	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	16.4	80.4	$19.5 - 0.039\lambda$	249	$2{,}431/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$21.4 - 1.203\lambda^{1/2}$	106.3	$14.3 - 0.511\lambda^{1/2}$	327	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	42.7	see B.5.5.5	111	$611/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	6.5	45.0	$8.9 - 0.052\lambda$	114	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	6.5	18.8	$8.9 - 0.124\lambda$	48	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	6.5	74.0	$11.5 - 0.067\lambda$	114	$50{,}264/\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	6.5	45.0	$8.9 - 0.052\lambda$	114	$38{,}665/\lambda^2$

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

Table 2-13W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	17.9
axial tension stress on gross area	D.2a	8.5
Shear or torsion		
Shear or torsion rupture	G, H.2	10.8
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	35.9
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	23.9
screws in holes	J.5.5.1	23.3

5086 - H34 B209 0.009 to 1.000 in. thick
5086 - H34 B210 0.010 to 0.450 in. thick

F_{tyw} = 14 k/in^2
F_{cyw} = 14 k/in^2
F_{tuw} = 35 k/in^2
E = 10,100 k/in^2
k_t = 1

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	8.5	21.9	$0.00006\lambda^2 - 0.059\lambda + 9.8$	138	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	138	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	8.5	9.2	$11.2 - 0.292\lambda$	25	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	8.5	9.2	$11.2 - 0.292\lambda$	19.1	$107/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	8.5	28.7	$11.2 - 0.094\lambda$	60	$333/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	8.5	21.9	$9.5 - 0.046\lambda$	138	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	8.5	47.6	$11.0 - 0.360\lambda^{1/2}$	416	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	8.5	46.0	$11.2 - 0.058\lambda$	96	$534/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	12.7	36.3	$14.8 - 0.058\lambda$	128	$946/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	12.7	6.7	$14.8 - 0.313\lambda$	32	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	12.7	81.4	$14.8 - 0.026\lambda$	286	$2{,}120/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$16.5 - 0.847\lambda^{1/2}$	126.7	$11.0 - 0.360\lambda^{1/2}$	416	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	46.0	see B.5.5.5	127	$534/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	5.1	48.5	$6.8 - 0.034\lambda$	131	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	5.1	20.2	$6.8 - 0.082\lambda$	55	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	5.1	82.4	$8.8 - 0.045\lambda$	131	$50{,}264/\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	5.1	48.5	$6.8 - 0.034\lambda$	131	$38{,}665/\lambda^2$

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

Table 2-14W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	17.9
axial tension stress on gross area	D.2a	8.5
Shear or torsion		
Shear or torsion rupture	G, H.2	10.8
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	35.9
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	23.9
screws in holes	J.5.5.1	23.3

5086 - H116	**B928 0.063 to 2.000 in. thick**		
5086 - H32	**B209 0.020 to 2.000 in. thick**		
5086 - H32	**B210 0.010 to 0.450 in. thick**		
F_{tyw} =	14	k/in^2	
F_{cyw} =	14	k/in^2	
F_{tuw} =	35	k/in^2	
E =	10,100	k/in^2	
k_t =	1		

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	8.5	21.9	$0.00006\,\lambda^2 - 0.059\lambda + 9.8$	138	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	138	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	8.5	9.2	$11.2 - 0.292\lambda$	25	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	8.5	9.2	$11.2 - 0.292\lambda$	19.1	$107/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	8.5	28.7	$11.2 - 0.094\lambda$	60	$333/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	8.5	21.9	$9.5 - 0.046\lambda$	138	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	8.5	47.6	$11.0 - 0.360\lambda^{1/2}$	416	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	8.5	46.0	$11.2 - 0.058\lambda$	96	$534/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	12.7	36.3	$14.8 - 0.058\lambda$	128	$946/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	12.7	6.7	$14.8 - 0.313\lambda$	32	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	12.7	81.4	$14.8 - 0.026\lambda$	286	$2{,}120/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$16.5 - 0.487\lambda^{1/2}$	126.7	$11.0 - 0.360\lambda^{1/2}$	416	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	46.0	see B.5.5.5	127	$534/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	5.1	48.5	$6.8 - 0.034\lambda$	131	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	5.1	20.2	$6.8 - 0.082\lambda$	55	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	5.1	82.4	$8.8 - 0.045\lambda$	131	$50{,}264\ /\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	5.1	48.5	$6.8 - 0.034\lambda$	131	$38{,}665/\lambda^2$

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

Table 2-15W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	15.9
axial tension stress on gross area	D.2a	7.3
Shear or torsion		
Shear or torsion rupture	G, H.2	9.5
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	31.8
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	21.1
screws in holes	J.5.5.1	20.7

5454 - H32 **B209 0.020 to 2.000 in. thick**

F_{tyw} =	12 k/in^2
F_{cyw} =	12 k/in^2
F_{tuw} =	31 k/in^2
E =	10,100 k/in^2
k_t =	1

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	7.3	22.2	$0.00004\,\lambda^2 - 0.046\lambda + 8.3$	150	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	150	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	7.3	9.6	$9.5 - 0.228\lambda$	28	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	7.3	9.6	$9.5 - 0.228\lambda$	20.8	$98/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	7.3	30.0	$9.5 - 0.073\lambda$	65	$307/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	7.3	22.2	$8.1 - 0.036\lambda$	150	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	7.3	50.5	$9.3 - 0.291\lambda^{1/2}$	481	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	7.3	48.0	$9.5 - 0.046\lambda$	104	$491/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	10.9	36.4	$12.6 - 0.045\lambda$	139	$870/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	10.9	6.8	$12.6 - 0.244\lambda$	34	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	10.9	81.5	$12.6 - 0.020\lambda$	311	$1{,}950/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$14.0 - 0.684\lambda^{1/2}$	141.1	$9.3 - 0.291\lambda^{1/2}$	481	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	48.0	see B.5.5.5	138	$491/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	4.4	50.7	$5.7 - 0.027\lambda$	142	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	4.4	21.2	$5.7 - 0.064\lambda$	59	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	4.4	88.0	$7.4 - 0.035\lambda$	142	$50{,}264/\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	4.4	50.7	$5.7 - 0.027\lambda$	142	$38{,}665/\lambda^2$

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

Table 2-16W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	15.9
axial tension stress on gross area	D.2a	7.3
Shear or torsion		
Shear or torsion rupture	G, H.2	9.5
Bearing		
bolts or rivets on holes	J.3.6a, J.4.6	31.8
bolts on slots, pins on holes, flat surfaces	J.3.6b, J.6.5, J.8	21.1
screws in holes	J.5.5.1	20.7

5454 - H34 **B209 0.020 to 1.000 in. thick**

F_{tyw} =	12	k/in^2	
F_{cyw} =	12	k/in^2	
F_{tuw} =	31	k/in^2	
E =	10,100	k/in^2	
k_t =	1		

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	7.3	22.2	$0.00004\,\lambda^2 - 0.046\lambda + 8.3$	150	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	150	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	7.3	9.6	$9.5 - 0.228\lambda$	28	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	7.3	9.6	$9.5 - 0.228\lambda$	20.8	$98/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	7.3	30.0	$9.5 - 0.073\lambda$	65	$307/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	7.3	22.2	$8.1 - 0.036\lambda$	150	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	7.3	50.5	$9.3 - 0.291\lambda^{1/2}$	481	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	7.3	48.0	$9.5 - 0.046\lambda$	104	$491/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	10.9	36.4	$12.6 - 0.045\lambda$	139	$870/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	10.9	6.8	$12.6 - 0.244\lambda$	34	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	10.9	81.5	$12.6 - 0.020\lambda$	311	$1{,}950/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$14.0 - 0.684\lambda^{1/2}$	141.1	$9.3 - 0.291\lambda^{1/2}$	481	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	48.0	see B.5.5.5	138	$491/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	4.4	50.7	$5.7 - 0.027\lambda$	142	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	4.4	21.2	$5.7 - 0.064\lambda$	59	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	4.4	88.0	$7.4 - 0.035\lambda$	142	$50{,}264\ /\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	4.4	50.7	$5.7 - 0.027\lambda$	142	$38{,}665/\lambda^2$

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

Table 2-17W
ALLOWABLE STRESSES F/Ω (k/in^2) FOR BUILDING-TYPE STRUCTURES (WELDED)

Axial Tension	Section	F/Ω
axial tension stress on net effective area	D.2b	12.3
axial tension stress on gross area	D.2a	7.9
Shear or torsion		
Shear or torsion rupture	G, H.2	7.4
Bearing		
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

6005A - T61 **B221 0.000 to 1.000 in. thick**

F_{tyw} =	13	k/in^2
F_{cyw} =	13	k/in^2
F_{tuw} =	24	k/in^2
E =	10,100	k/in^2
k_t =	1	

		λ	F/Ω for $\lambda \le \lambda_1$	λ_1	F/Ω for $\lambda_1 < \lambda < \lambda_2$	λ_2	F/Ω for $\lambda \ge \lambda_2$
Axial Compression - member buckling	E.2	kL/r	7.9	22.1	$0.00005\lambda^2 - 0.053\lambda + 9.0$	144	$51{,}352/\lambda^2$
Flexure - lateral-torsional buckling	F.4	see F.4.2		-	see F.4	144	$60{,}414/\lambda^2$
Elements - Uniform Compression							
flat elements supported on one edge in columns whose buckling axis is not an axis of symmetry	B.5.4.1	b/t	7.9	9.4	$10.3 - 0.259\lambda$	27	$2{,}417/\lambda^2$
flat elements supported on one edge in all other columns and all beams	B.5.4.1	b/t	7.9	9.4	$10.3 - 0.259\lambda$	19.9	$103/\lambda$
flat elements supported on both edges	B.5.4.2	b/t	7.9	29.4	$10.3 - 0.083\lambda$	62	$320/\lambda$
flat elements supported on both edges and with an intermediate stiffener	B.5.4.4	λ_s	7.9	22.1	$8.8 - 0.041\lambda$	144	$60{,}414/\lambda^2$
round hollow elements	B.5.4.5	R_b/t	7.9	49.0	$10.2 - 0.325\lambda^{1/2}$	446	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.4.6	λ_{eq}	7.9	47.0	$10.3 - 0.052\lambda$	99	$513/\lambda$
Elements - Flexural Compression							
flat elements supported on both edges	B.5.5.1	b/t	11.8	36.4	$13.7 - 0.052\lambda$	133	$909/\lambda$
flat elements supported on tension edge, compression edge free	B.5.5.2	b/t	11.8	6.8	$13.7 - 0.278\lambda$	33	$4{,}932/\lambda^2$
flat elements supported on both edges and with a longitudinal stiffener	B.5.5.3	b/t	11.8	81.5	$13.7 - 0.023\lambda$	298	$2{,}037/\lambda$
pipes and round tubes	B.5.5.4	R_b/t	$15.2 - 0.764\lambda^{1/2}$	133.4	$10.2 - 0.325\lambda^{1/2}$	446	$3{,}776/(\lambda k_n)$†
flat elements - direct strength method	B.5.5.5	λ_{eq}	M_{np}/S_{xc}	47.0	see B.5.5.5	133	$513/\lambda$
Elements - Shear							
flat elements supported on both edges	G.2	b/t	4.7	49.5	$6.2 - 0.030\lambda$	136	$38{,}665/\lambda^2$
flat elements supported on one edge	G.3	b/t	4.7	20.6	$6.2 - 0.073\lambda$	57	$6{,}713/\lambda^2$
pipes and round or oval tubes	G.4	λ_p*	4.7	85.0	$8.1 - 0.040\lambda$	136	$50{,}264/\lambda^2$
Torsion - pipes and round or oval tubes	H.2.1	λ_p*	4.7	49.5	$6.2 - 0.030\lambda$	136	$38{,}665/\lambda^2$

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