

### J.5.4.1.2 Screws in Screw Slots

The nominal strength  $R_n$  for the limit state of pull-out of a screw in a screw slot with the dimensions shown in Figure J.5.1 and Table J.5.3 is:

$$R_n = 0.29DL_e F_{tu} \quad (J.5-7)$$

where

$D$  = nominal diameter of the screw

$F_{tu}$  = tensile ultimate strength of the extrusion

The screw embedment length in the screw slot  $L_e$  shall not be less than  $2D$ .

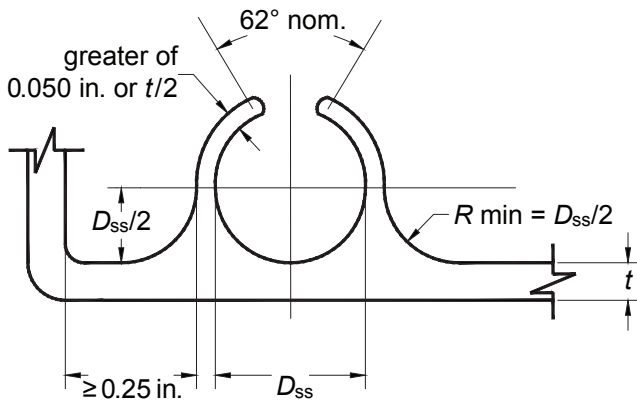


Figure J.5.1

Table J.5.3  
SCREW SLOT DIMENSIONS

Screw Size	Screw Diameter $D$ in.	$D_{ss}$ in. +/- 0.007 in.
8	0.164	0.147
10	0.190	0.169
12	0.216	0.190
1/4	0.250	0.228

### J.5.4.2 Pull-Over

a) The nominal strength  $R_n$  for the limit state of pull-over for non-countersunk screws is:

$$R_n = C_{pov} t_1 F_{tu1} (D_{ws} - D_h) \quad (J.5-8)$$

where

$C_{pov}$  = 1.0 for valley fastening and 0.7 for crown fastening

$t_1$  = nominal thickness of the part in contact with the screw head or washer

$F_{tu1}$  = tensile ultimate strength of the part in contact with the screw head or washer

$D_{ws}$  = larger of the nominal washer diameter and the screw head diameter, but no greater than 5/8 in. (16 mm). (See Section J.5.4 for the washer thickness requirement.)

$D_h$  = nominal diameter of the hole in the material under the screw head

The nominal pull-over strength for non-countersunk screws need not be less than the nominal pull-over strength computed from Equation J.5-10 for countersunk screws.

Alternately, for parts with: 1) a nominal thickness of at least 0.040 in., 2) holes with the nominal diameters given in Table J.5.4, and 3)  $t_1/D_{ws} \leq 0.5$ , the nominal strength  $R_n$  for the limit state of pull-over for non-countersunk screws with all-metal washers is:

$$R_n = (1.0 + 1.7t_1/D_{ws})D_{ws} t_1 F_{ty1} \quad (J.5-9)$$

where

$F_{ty1}$  = tensile yield strength of the part in contact with the screw head

$D_{ws}$  = nominal diameter of the washer. The washer may be integral with the screw head.

Table J.5.4  
HOLE DIAMETER FOR EQUATION J.5-9

Screw Size	Screw Diameter $D$ in.	Hole Diameter $D_h$ in.	Drill Size
8	0.164	0.177	16
10	0.190	0.201	7
12	0.216	0.228	1
1/4	0.250	0.266	H

b) The nominal strength  $R_n$  for the limit state of pull-over for countersunk screws with an 82° nominal angle head is:

$$R_n = (0.27 + 1.45t_1/D) D t_1 F_{ty1} \quad (J.5-10)$$

for  $0.06 \text{ in.} \leq t_1 < 0.19 \text{ in.}$  ( $1.5 \text{ mm} \leq t_1 < 5 \text{ mm}$ ) and  $t_1/D \leq 1.1$ . If  $t_1/D > 1.1$ , use  $t_1/D = 1.1$

### J.5.4.3 Screw Tension

The nominal strength  $R_n$  of an aluminum screw for the limit state of screw tensile rupture is:

$$R_n = A_r F_{tu} / 1.25 \quad (J.5-11)$$

where

$A_r$  = root area of the screw

$F_{tu}$  = tensile ultimate strength of the screw

= 68 ksi for 7075-T73 screws,

= 62 ksi for 2024-T4 screws

### J.5.5 Screwed Connection Shear

The shear strength of a screwed connection is the least of the bearing, tilting, and screw shear rupture strengths. The design shear strength  $\phi R_n$  and the allowable shear strength  $R_n/\Omega$  shall be determined as follows:

$$\phi = 0.50 \text{ (LRFD)}$$

**Table 4-1**  
**BEAM ALLOWABLE UNIFORM LOADS**  
**Aluminum Association Standard Channels, ALLOY 6061-T6**

Depth in.	Wt lb/ft	span (ft)																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
2	0.577	4.43	2.22	1.48																			
		0.03	0.14	0.31																			
		3.90	1.63	0.94																			
2	1.07	8.56	4.28	2.85																			
		0.03	0.14	0.31																			
		7.97	3.59	2.21																			
3	1.14	13.77	6.89	4.59	3.44	2.75																	
		0.02	0.09	0.20	0.35	0.54																	
		13.06	5.72	3.40	2.29	1.54																	
3	1.60	19.59	9.80	6.53	4.90	3.92																	
		0.02	0.09	0.20	0.35	0.55																	
		18.93	8.51	5.19	3.60	2.68																	
4	1.74	28.63	14.32	9.54	7.16	5.73	4.77	4.09															
		0.02	0.07	0.15	0.26	0.41	0.59	0.80															
		28.09	12.63	7.61	5.18	3.79	2.72	1.92															
4	2.33	38.66	19.33	12.89	9.67	7.73	6.44	5.52															
		0.02	0.07	0.15	0.26	0.41	0.60	0.81															
		38.34	17.50	10.72	7.45	5.56	4.34	3.49															
5	2.21	22.90	15.27	11.45	9.16	7.63	6.54	5.73															
		0.05	0.12	0.21	0.32	0.47	0.63	0.83															
		20.68	12.54	8.58	6.27	4.69	3.26	2.39															
5	3.09	32.62	21.74	16.31	13.05	10.87	9.32	8.15															
		0.05	0.12	0.21	0.33	0.47	0.64	0.84															
		30.49	18.87	13.18	9.87	7.72	6.23	5.14															
6	2.83			23.33	17.50	14.00	11.67	10.00	8.75	7.78	7.00												
				0.10	0.17	0.27	0.39	0.53	0.69	0.88	1.08												
				19.64	13.50	9.91	7.59	5.49	3.99	3.03	2.39												
6	4.03			33.76	25.32	20.26	16.88	14.47	12.66	11.25	10.13												
				0.10	0.17	0.27	0.39	0.53	0.69	0.87	1.07												
				30.67	21.58	16.23	12.74	10.31	8.54	7.17	5.62												
7	3.21			29.95	22.46	17.97	14.98	12.84	11.23	9.98	8.99	8.17	7.49										
				0.08	0.14	0.23	0.33	0.44	0.58	0.73	0.91	1.10	1.30										
				26.45	18.25	13.42	10.28	7.69	5.50	4.12	3.20	2.56	2.09										
7	4.72			34.76	27.81	23.17	19.86	17.38	15.45	13.90	12.64	11.59											
				0.15	0.23	0.33	0.45	0.59	0.74	0.92	1.11	1.32											
				30.10	22.68	17.82	14.43	11.94	10.05	8.02	6.43	5.27											
8	4.15			34.30	27.44	22.86	19.60	17.15	15.24	13.72	12.47	11.43	10.55	9.80									
				0.13	0.20	0.29	0.40	0.52	0.66	0.82	0.99	1.18	1.38	1.60									
				27.91	20.69	15.98	12.69	9.51	7.11	5.51	4.39	3.59	2.99	2.53									
8	5.79			47.86	38.29	31.91	27.35	23.93	21.27	19.15	17.41	15.95	14.73	13.68									
				0.13	0.20	0.29	0.40	0.52	0.66	0.81	0.98	1.17	1.37	1.59									
				41.96	31.69	24.96	20.24	16.77	14.13	11.83	9.43	7.69	6.40	5.40									
9	4.98			35.17	29.31	25.12	21.98	19.54	17.58	15.99	14.65	13.53	12.56	11.72									
				0.18	0.26	0.35	0.46	0.58	0.72	0.87	1.04	1.22	1.41	1.62									
				27.65	21.40	17.02	13.53	10.01	7.69	6.09	4.94	4.09	3.44	2.93									
9	6.97			51.17	42.64	36.55	31.98	28.43	25.58	23.26	21.32	19.68	18.27	17.06									
				0.18	0.26	0.36	0.47	0.59	0.73	0.88	1.05	1.23	1.43	1.64									
				42.85	33.81	27.45	22.77	19.20	16.41	13.46	10.94	9.06	7.63	6.52									
10	6.14			41.20	35.32	30.90	27.47	24.72	22.48	20.60	19.02	17.66	16.48	15.45	14.54								
				0.24	0.32	0.42	0.54	0.66	0.80	0.95	1.12	1.30	1.49	1.69	1.91								
				30.45	24.38	19.91	15.70	12.04	9.52	7.71	6.37	5.35	4.56	3.94	3.43								
10	8.36			57.31	49.13	42.99	38.21	34.39	31.26	28.66	26.45	24.56	22.93	21.49	20.23								
				0.24	0.32	0.42	0.53	0.66	0.80	0.95	1.12	1.29	1.49	1.69	1.91								
				45.98	37.46	31.17	26.37	22.60	19.57	15.97	13.20	11.10	9.47	8.17	7.13								
12	8.27								56.70	49.61	44.10	39.69	36.08	33.07	30.53	28.35	26.46	24.81	23.35	22.05	20.89	19.84	18.90
									0.27	0.35	0.45	0.55	0.67	0.80	0.93	1.08	1.24	1.41	1.60	1.79	1.99	2.21	2.44
									41.38	34.05	28.45	23.21	18.19	14.61	11.99	10.01	8.48	7.28	6.32	5.53	4.89	4.35	3.90
12	11.8								84.28	73.74	65.55	58.99	53.63	49.16	45.38	42.14	39.33	36.87	34.70	32.77	31.05	29.50	28.09
									0.27	0.35	0.44	0.55	0.66	0.79	0.93	1.07	1.23	1.40	1.58	1.77	1.98	2.19	2.41
									67.86	56.89	48.47	41.84	36.50	32.12	28.48	23.97	20.35	17.50	15.21	13.35	11.81	10.53	9.44
14	13.9								116.60	102.03	90.69	81.62	74.20	68.02	62.79	58.30	54.41	51.01	48.01	45.35	42.96	40.81	38.87
									0.22	0.29	0.37	0.45	0.55	0.65	0.77	0.89	1.02	1.16	1.31	1.47	1.64	1.81	2.00
									100.92	85.07	72.85	63.16	55.32	48.87	43.47	38.91	34.45	29.34	25.27	21.99	19.31	17.09	15.24

**Notes**

1. Load is applied at beam’s neutral axis on a simply supported single span braced against twisting at supports.
2. Building-type structure.
3. For each beam size, first line is total load (k) for laterally braced beam, second line is deflection (in.) for laterally braced beam, and third line is total load (k) for beam not laterally braced.

**Table 4-2**  
**BEAM ALLOWABLE UNIFORM LOADS**  
**Aluminum Association Standard I Beams, ALLOY 6061-T6**

Depth in.	Wt lb/ft	span (ft)																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
3	1.64	21.05	10.52	7.02	5.26	4.21																	
		0.02	0.08	0.19	0.33	0.52																	
		20.74	9.42	5.75	3.99	2.97																	
3	2.03	26.11	13.06	8.70	6.53	5.22																	
		0.02	0.09	0.19	0.34	0.54																	
		25.75	11.76	7.25	5.09	3.83																	
4	2.31	39.88	19.94	13.29	9.97	7.98	6.65	5.70															
		0.02	0.06	0.14	0.25	0.40	0.57	0.77															
		39.88	18.31	11.23	7.78	5.77	4.48	3.37															
4	2.79	48.46	24.23	16.15	12.11	9.69	8.08	6.92															
		0.02	0.06	0.14	0.26	0.40	0.58	0.79															
		48.46	22.30	13.76	9.61	7.21	5.65	4.57															
5	3.70	39.95	26.63	19.97	15.98	13.32	11.41	9.99															
		0.05	0.12	0.20	0.32	0.46	0.63	0.82															
		37.57	23.32	16.35	12.27	9.63	7.79	6.45															
6	4.03			34.73	26.05	20.84	17.37	14.88	13.02	11.58	10.42												
				0.09	0.17	0.26	0.38	0.52	0.68	0.85	1.06												
				31.01	21.74	16.27	12.70	10.21	8.23	6.19	4.83												
6	4.69			40.66	30.50	24.40	20.33	17.43	15.25	13.55	12.20												
				0.10	0.17	0.27	0.38	0.52	0.68	0.86	1.07												
				36.41	25.62	19.27	15.13	12.25	10.14	8.20	6.44												
7	5.80				44.04	35.23	29.36	25.17	22.02	19.57	17.62	16.01	14.68										
					0.15	0.23	0.33	0.45	0.59	0.74	0.91	1.11	1.32										
					37.93	28.63	22.55	18.29	15.16	12.78	10.17	8.14	6.66										
8	6.18				53.43	42.74	35.62	30.53	26.71	23.75	21.37	19.43	17.81	16.44	15.26								
					0.13	0.20	0.29	0.39	0.51	0.65	0.80	0.96	1.15	1.35	1.56								
					46.78	35.35	27.82	22.52	18.62	15.63	12.48	9.85	7.96	6.57	5.52								
8	7.02				60.99	48.80	40.66	34.85	30.50	27.11	24.40	22.18	20.33	18.77	17.43								
					0.13	0.20	0.29	0.39	0.51	0.65	0.80	0.97	1.15	1.35	1.57								
					53.56	40.57	32.03	26.03	21.62	18.25	15.59	12.38	10.07	8.35	7.04								
9	8.36				65.40	54.50	46.71	40.87	36.33	32.70	29.73	27.25	25.15	23.36	21.80								
					0.18	0.26	0.35	0.46	0.58	0.71	0.86	1.03	1.21	1.40	1.61								
					55.64	44.09	35.94	29.93	25.33	21.71	18.32	14.81	12.22	10.25	8.73								
10	8.65					62.49	53.56	46.87	41.66	37.49	34.08	31.24	28.84	26.78	25.00	23.43	22.05						
						0.23	0.31	0.40	0.51	0.63	0.77	0.91	1.07	1.24	1.42	1.62	1.83						
						51.77	42.30	35.27	29.87	25.61	22.16	17.73	14.48	12.05	10.17	8.70	7.53						
10	10.3					74.42	63.79	55.81	49.61	44.65	40.59	37.21	34.35	31.89	29.77	27.91	26.27						
						0.23	0.31	0.41	0.52	0.64	0.77	0.92	1.08	1.25	1.43	1.63	1.84						
						61.98	50.79	42.50	36.15	31.15	27.12	23.43	19.28	16.14	13.71	11.80	10.26						
12	11.7						86.86	76.00	67.56	60.80	55.27	50.67	46.77	43.43	40.53	38.00	35.76	33.78	32.00	30.40	28.95		
							0.26	0.34	0.43	0.53	0.64	0.76	0.89	1.04	1.19	1.35	1.53	1.71	1.91	2.12	2.33		
							71.63	60.08	51.17	44.12	38.41	33.71	28.84	23.80	19.96	16.96	14.58	12.67	11.10	9.81	8.73		
12	14.3						108.31	94.77	84.24	75.82	68.93	63.18	58.32	54.16	50.55	47.39	44.60	42.12	39.90	37.91	36.10		
							0.26	0.34	0.43	0.53	0.64	0.77	0.90	1.04	1.20	1.36	1.54	1.73	1.92	2.13	2.35		
							90.43	76.15	65.16	56.48	49.47	43.70	38.89	34.62	29.25	25.04	21.67	18.95	16.71	14.84	13.28		
14	16.0						142.18	124.41	110.59	99.53	90.48	82.94	76.56	71.09	66.35	62.20	58.55	55.29	52.38	49.76	47.39		
							0.22	0.29	0.37	0.45	0.55	0.65	0.77	0.89	1.02	1.16	1.31	1.47	1.64	1.81	2.00		
							122.35	103.32	88.62	76.95	67.48	59.66	53.12	47.57	42.29	35.82	30.70	26.60	23.26	20.50	18.21		

Notes

1. Load is applied at beam's neutral axis on a simply supported single span braced against twisting at supports.
2. Building-type structure.
3. For each beam size, first line is total load (k) for laterally braced beam, second line is deflection (in.) for laterally braced beam, and third line is total load (k) for beam not laterally braced.