McCormac

As a result of the preceding information, the AISC Specification (D2) states that the nominal strength of a tension member, P_n, is to be the smaller of the values obtained by substituting into the following two expressions:

For the limit state of yielding in the gross section (which is intended to prevent excessive elongation of the member),

$$P_n = F_y A_g \qquad \text{(AISC Equation D2-1)}$$

$$\phi_t P_n = \phi_t F_y A_g = \text{design tensile strength by LRFD } (\phi_t = 0.9)$$

$$\boxed{\frac{P_n}{\Omega_t} = \frac{F_y A_g}{\Omega_t} = \text{allowable tensile strength for ASD } (\Omega_t = 1.67)}$$

For tensile rupture in the net section, as where bolt or rivet holes are present,

$$P_n = F_u A_e \qquad \text{(AISC Equation D2-2)}$$

$$\phi_t P_n = \phi_t F_u A_e = \text{design tensile rupture strength for LRFD } (\phi_t = 0.75)$$

$$\boxed{\frac{P_n}{\Omega_t} = \frac{F_u A_e}{\Omega_t} \text{ allowable tensile rupture strength for ASD } (\Omega_t = 2.00)}$$

Table 2-4
Applicable ASTM Specifications for Various Structural Shapes

Steel Type	ASTM Designation		F_y Min. Yield Stress (ksi)	F_u Tensile Stress[a] (ksi)	Applicable Shape Series									
					W	M	S	HP	C	MC	L	HSS Rect.	HSS Round	Pipe
Carbon	A36		36	58–80[b]										
	A53 Gr. B		35	60										
	A500	Gr. B	42	58										
			46	58										
		Gr. C	46	62										
			50	62										
	A501	Gr. A	36	58										
		Gr. B	50	70										
	A529[c]	Gr. 50	50	65–100										
		Gr. 55	55	70–100										
High-Strength Low-Alloy	A572	Gr. 42	42	60										
		Gr. 50	50	65[d]										
		Gr. 55	55	70										
		Gr. 60[e]	60	75										
		Gr. 65[e]	65	80										
	A618[f]	Gr. I & II	50[g]	70[g]										
		Gr. III	50	65										
	A913	50	50[h]	60[h]										
		60	60	75										
		65	65	80										
		70	70	90										
	A992		50	65[i]										
Corrosion Resistant High-Strength Low-Alloy	A242		42[j]	63[j]										
			46[k]	67[k]										
			50[l]	70[l]										
	A588		50	70										
	A847		50	70										

= Preferred material specification
= Other applicable material specification, the availability of which should be confirmed prior to specification
= Material specification does not apply

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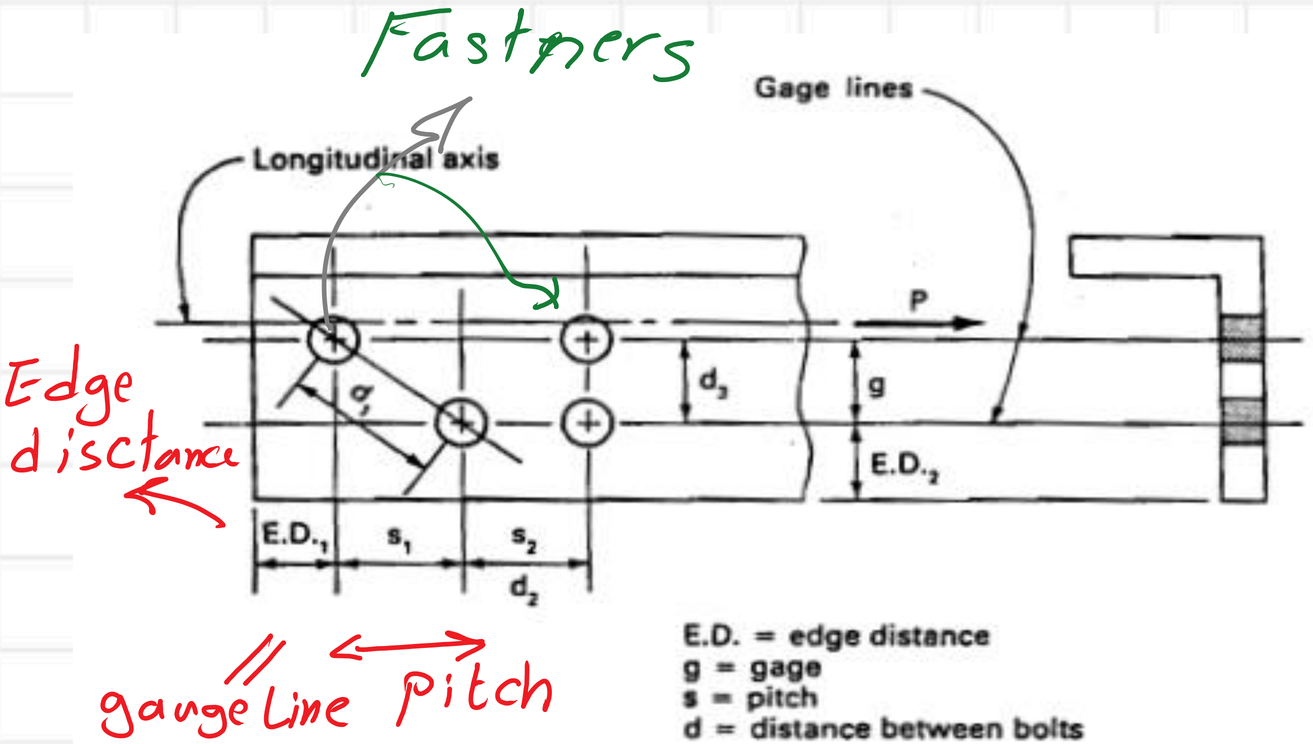
Table 2-5
Applicable ASTM Specifications for Plates and Bars

Steel Type	ASTM Designation		F_y Min. Yield Stress (ksi)	F_u Tensile Stress[a] (ksi)	Thickness of Plates and Bars, in.: to 0.75 incl.	over 0.75 to 1.25	over 1.25 to 1.5	over 1.5 to 2 incl.	over 2 to 2.5 incl.	over 2.5 to 4 incl.	over 4 to 5 incl.	over 5 to 6 incl.	over 6 to 8 incl.	over 8
Carbon	A36		32	58-80										■
			36	58-80	■	■	■	■	■	■	■	■	■	
	A529	Gr. 50	50	70-100	▒	▒ b	▒ b	▒ b	▒ b					
		Gr. 55	55	70-100	▒	▒ b	▒ b							
High-Strength Low-Alloy	A572	Gr. 42	42	60	▒	▒	▒	▒	▒	▒	▒	▒		
		Gr. 50	50	65	▒	▒	▒	▒	▒	▒				
		Gr. 55	55	70	▒	▒	▒	▒						
		Gr. 60	60	75	▒	▒								
		Gr. 65	65	80	▒	▒								
Corrosion Resistant High-Strength Low-Alloy	A242		42	63				▒	▒	▒				
			46	67		▒	▒							
			50	70	▒									
	A588		42	63								▒	▒	
			46	67							▒			
			50	70	▒	▒	▒	▒	▒	▒				
Quenched and Tempered	A514[c]		90	100-130						▒	▒	▒		
			[illegible]	[illegible]	▒	▒	▒	▒	▒					
Quenched and Tempered Low-Alloy	A852[c]		70	90-110	▒	▒	▒	▒	▒	▒				

■ = Preferred material specification
▒ = Other applicable material specification, the availability of which should be confirmed prior to specification
□ = Material specification does not apply

[a] Minimum unless a range is shown.
[b] Applicable to bars only above 1-in. thickness.
[c] Available as plates only.



S in the direction of Loading

g ⊥er to the Loading direction

Gauge Line - 1

Gauge Line - 2

g

Figure 2-3 shows a tension member composed of a single steel angle with a 4-bolt connection. The tensile load P is assumed to be applied parallel to and coincident with the longitudinal axis of the member. The bolt holes are located on *gage lines* that are also parallel to the longitudinal axis. The dimension g between the gage lines is called the *gage*. The dimension s parallel to the gage line and taken between centers of bolt holes is called the *pitch* (or the *bolt spacing*). The *distance between bolts* is a straight line distance between any two bolts. The *edge distance* is the perpendicular distance from the *center of a hole* to the nearest edge.

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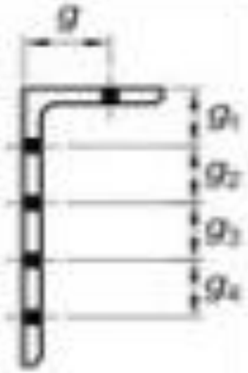
added

2 sizes 10",12"

Table 1-7A
Workable Gages in Angle Legs, in.



Leg	12	10	8	7	6	5	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{3}{4}$	$1\frac{1}{2}$	$1\frac{3}{8}$	$1\frac{1}{4}$	1
g	6	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{3}{4}$	$1\frac{3}{8}$	$1\frac{1}{8}$	1	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{5}{8}$
g_1	3	3	3	$2\frac{1}{2}$	$2\frac{1}{4}$	2	–	–	–	–	–	–	–	–	–	–
g_2	$2\frac{1}{2}$	$2\frac{1}{2}$	3	3	$2\frac{1}{2}$	2	–	–	–	–	–	–	–	–	–	–
g_3	$2\frac{1}{2}$	$2\frac{1}{2}$	–	–	–	–	–	–	–	–	–	–	–	–	–	–
g_4	$2\frac{1}{2}$	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Note: Other gages are permitted to suit specific requirements subject to clearances and edge distance limitations.

TABLES OF DESIGN DIMENSIONS, DETAILING DIMENSIONS, AND AXIAL, STRONG-AXIS FLEXURAL, AND WEAK-AXIS FLEXURAL PROPERTIES 1-12

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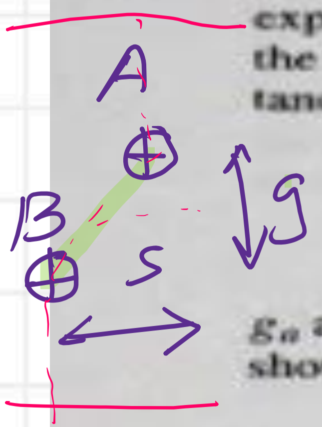
Angles

When holes are staggered on two legs of an angle, the gage length g for use in the $s^2/4g$ expression is obtained by using a length between the centers of the holes measured along the centerline of the angle thickness, i.e., the distance A–B in Fig. 3.4.3. Thus the gage distance g is



P →

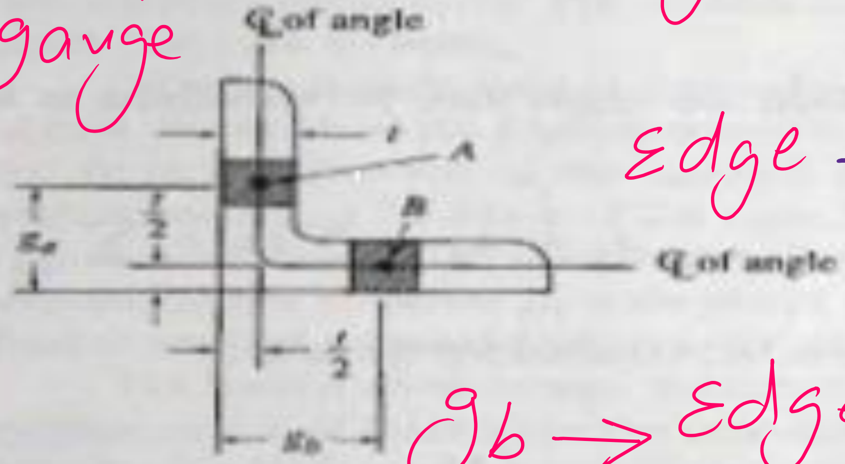
$$g = g_a - \frac{t}{2} + g_b - \frac{t}{2} = g_a + g_b - t \tag{3.4.1}$$

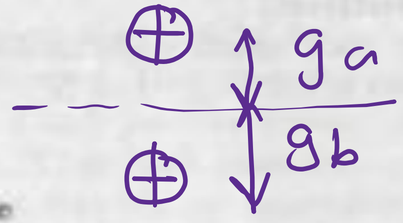
Every rolled angle has a standard value for the location of holes (i.e., gage distances g_a and g_b), depending on the length of the leg and the number of lines of holes. Table 3.4.1 shows *usual gages* for angles as listed in the *AISC Manual**.

E2 Edge to First gauge

t angle thickness

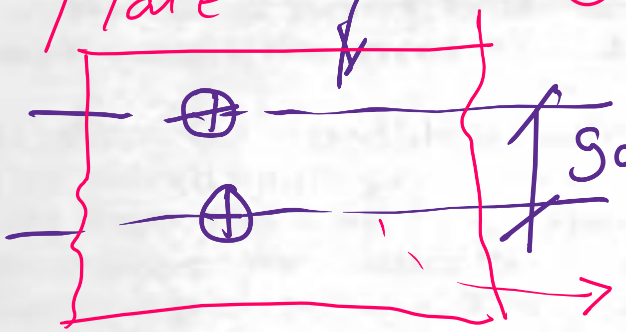
ga





Plate

1st gauge line



gb → Edge to ℄ of bolt _ 2nd Gauge Line

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