

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),

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

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

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

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

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

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

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

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.	Pipe
Carbon	A36		36	58-80 ^b									
	A53 Gr. B		35	60									
	A500	Gr. B	42	58									
			46	58									
	A501	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									
Corrosion Resistant High-Strength Low-Alloy	A992		50	65 ⁱ									
	A242		42 ^j	63 ^j									
			46 ^k	67 ^k									
	A588		50 ^l	70 ^l									
			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					
High-Strength Low-Alloy	A572	Gr. 55	55	70-100		b	b							
		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										
Quenched and Tempered	A514 ^c		90	100-130										
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

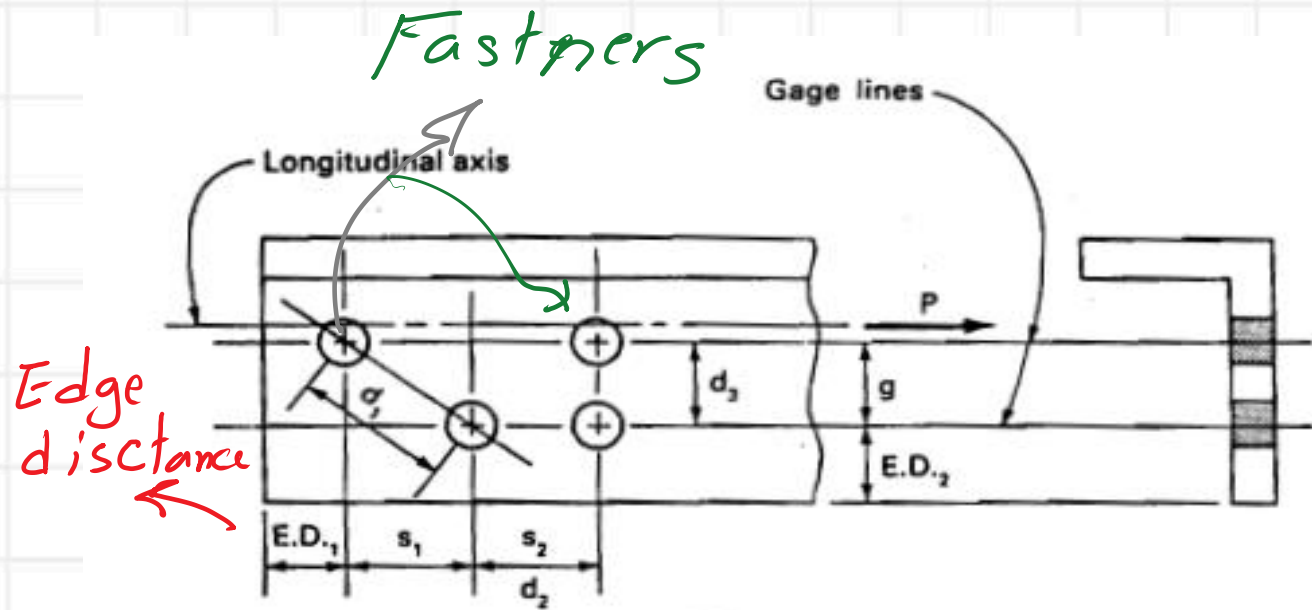
□ = Material specification does not apply

^a Minimum unless a range is shown.

^b Applicable to bars only above 1-in. thickness.

^c Available as plates only.

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E.D. = edge distance
 g = gage
 s = pitch
 d = distance between bolts

S in the direction of Loading
 g $\perp$ er to the Loading direction

Gauge Line - 1

Gauge Line - 2

g

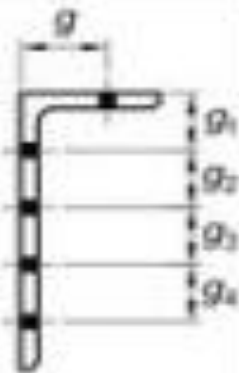
Gauge Line Pitch

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.

added

2 sizes
10", 12"

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



Leg	12	10	8	7	6	5	4	3½	3	2½	2	1¾	1½	1⅜	1¼	1
g	6	5	4½	4	3½	3	2½	2	1¾	1⅜	1½	1	¾	⅝	¾	⅝
g₁	3	3	3	2½	2¼	2	—	—	—	—	—	—	—	—	—	—
g₂	2½	2½	3	3	2½	2	—	—	—	—	—	—	—	—	—	—
g₃	2½	2½	—	—	—	—	—	—	—	—	—	—	—	—	—	—
g₄	2½	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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

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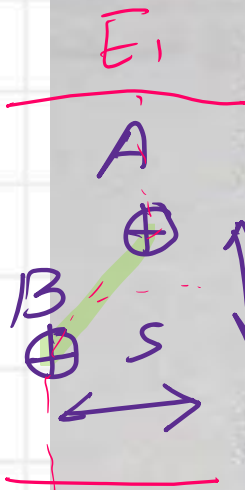
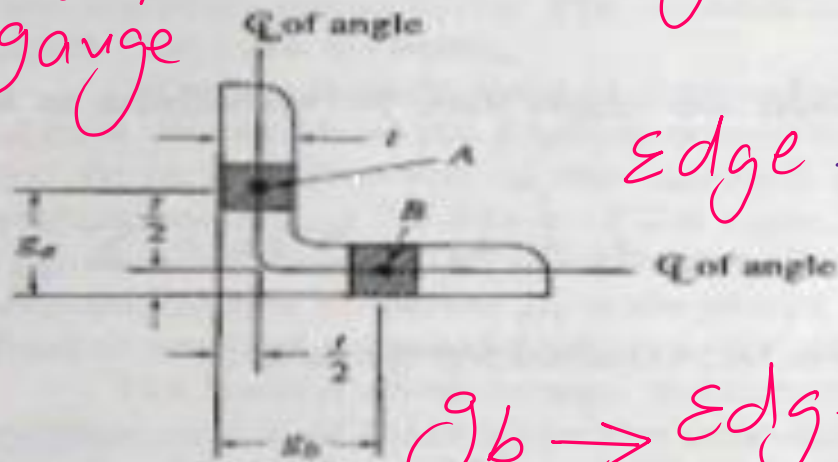
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Angles

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

$$g = g_a - \frac{t}{2} + g_b - \frac{t}{2} = g_a + g_b - t \quad (3.4.1)$$

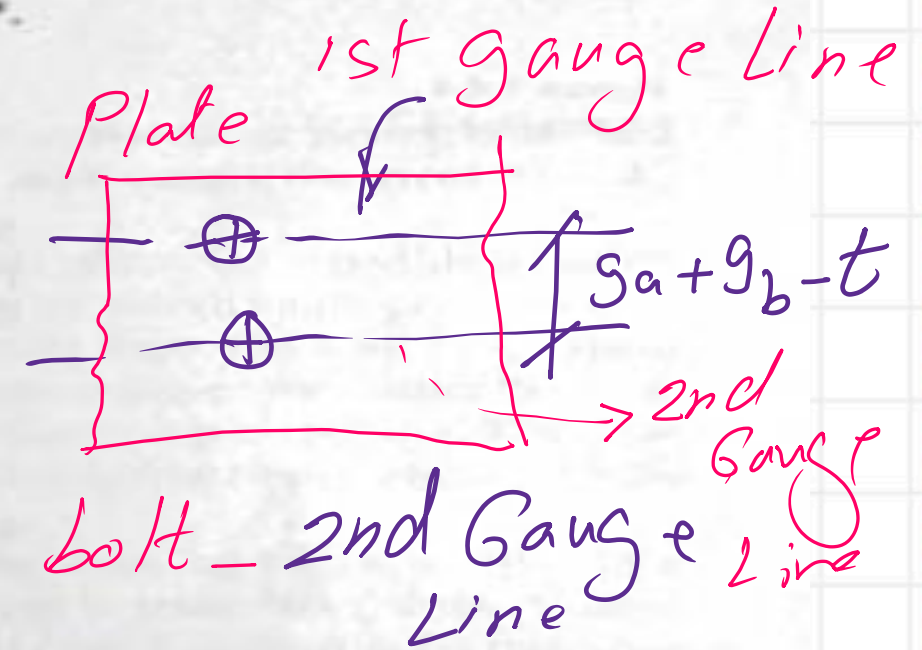
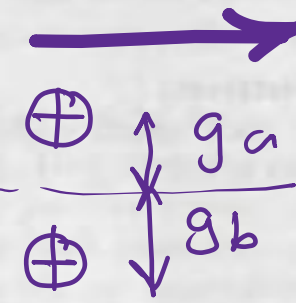
Every rolled angle has a standard value for the location of holes (i.e., gage distances g_a and g_b), depending on the length of the leg and the number of lines of holes. Table 3.4.1 shows usual gages for angles as listed in the *AISC Manual**.



E^2 Edge to First gauge

t angle thickness

edge



$g_b \rightarrow$ edge to ϕ of bolt - 2nd Gauge Line

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