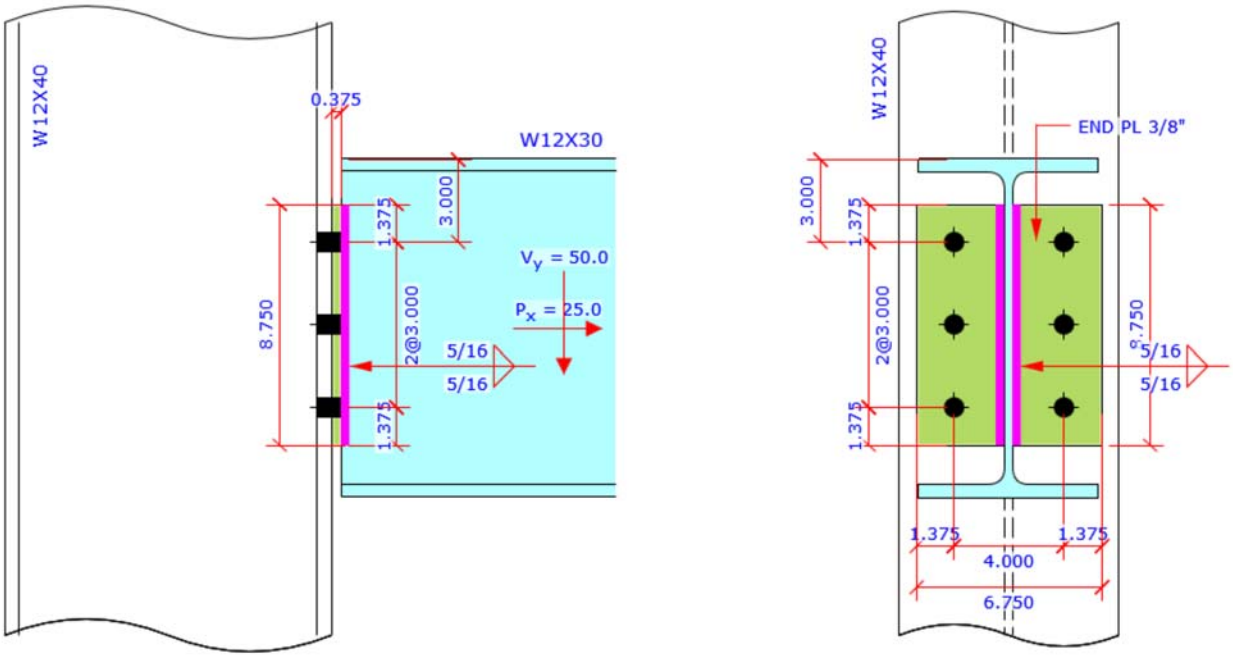
Beam to Column	End Plate Shear Connection	Code=AISC 360-10 LRFD

Result Summary	geometries & weld limitations = **PASS**	limit states max ratio = **0.90** **PASS**

Sketch	Shear Connection	Code=AISC 360-10 LRFD



Members & Components Summary

Member	Shear Connection			
End Plate				
Plate	W = 6.750	[in]	L = 8.750	[in]
	t = 0.375	[in]		
Steel Grade A992	F_y = 50.0	[ksi]	F_u = 65.0	[ksi]
Bolt end plate bolt				
Bolt	dia = 0.750	[in]		
	grade = A325-N		F_u = 120.0	[ksi]
	F_{nt} = 90.0	[ksi]	F_{nv} = 54.0	[ksi]
slip critical	SC = No			

Geometry Restriction Check - End Plate to Column — PASS

Min Bolt Edge Distance - End Plate to Column

Bolt diameter	d_b =	= 0.750	[in]		
Min edge distance allowed	$L_{e\text{-}min}$ =	= **1.000**	[in]	AISC 14th Table J3.4	
Min edge distance in End Plate to Column	L_e =	= **1.375**	[in]		
		> $L_{e\text{-}min}$	OK		

Min Bolt Spacing - End Plate to Column

Bolt diameter	d_b =	= 0.750	[in]		
Min bolt spacing allowed	$L_{s\text{-}min}$ = 2.667 d_b	= **2.000**	[in]	AISC 14th J3.3	
Min Bolt spacing in End Plate to Column	L_s =	= **3.000**	[in]		
		> $L_{s\text{-}min}$	OK		

Geometry Restriction Check - End Plate-Bolt Gage Clearance — PASS

Bolt Gage Entering Clearance Check - Plate Welded to End Plate

Bolt diameter	d_b = 0.750 [in]	gage g = 4.000	[in]		
Bolt entering clearance	c_3 = from AISC manual Table 7-15	= **0.750**	[in]	AISC 14th Table 7-15	
Plate thickness	t = 0.260 [in]	dbl fillet w = 0.313	[in]		
Bolt center clearance distance to fillet toe	c = (g - t - 2 w) / 2	= **1.558**	[in]		
		> c_3	OK	AISC 14th Table 7-15	

Geometry Restriction Check - Column Flange-Bolt Gage Clearance — PASS

Bolt Gage Entering Clearance Check - Bolt on W Shape Flange

Bolt diameter	d_b = 0.750 [in]	gage g = 4.000	[in]		
Bolt entering clearance	c_3 = from AISC manual Table 7-15	= **0.750**	[in]	AISC 14th Table 7-15	
W section	t_w = 0.295 [in]	k_1 = 0.875	[in]		
Bolt center clearance distance to fillet toe	c = (g - 2 k_1) / 2	= **1.125**	[in]		
		> c_3	OK	AISC 14th Table 7-15	

Weld Limitation Check - Beam Web to End Plate — PASS

Min Fillet Weld Size

Thinner part joined thickness	t =	= 0.260	[in]		
Min fillet weld size allowed	w_{min} =	= **0.188**	[in]	AISC 14th Table J2.4	
Fillet weld size provided	w =	= **0.313**	[in]		
		> w_{min}	OK		

Min Fillet Weld Length

Fillet weld size provided	w =	= 0.313	[in]		
Min fillet weld length allowed	L_{min} = 4 x w	= **1.250**	[in]	AISC 14th J2.2b	
Min fillet weld length	L =	= **8.750**	[in]		
		> L_{min}	OK		

Beam Web - Shear Yielding			ratio = 50.00 / 95.94	= **0.52**	**PASS**
Plate Shear Yielding Check					
Plate size	width b_p = 12.300 [in]		thickness t_p = 0.260	[in]	
Plate yield strength	F_y = 50.0 [ksi]				
Plate gross area in shear	$A_{gv} = b_p t_p$		= 3.198	[in^2]	
Shear force required	V_u =		= **50.00**	[kips]	
Plate shear yielding strength	$R_n = 0.6 F_y A_{gv}$		= 95.94	[kips]	AISC 14th Eq J4-3
Resistance factor-LRFD	ϕ = 1.00				AISC 14th Eq J4-3
	ϕR_n =		= **95.94**	[kips]	
	ratio = **0.52**		> V_u	OK	

Beam Web - Shear Rupture			ratio = 50.00 / 93.54	= **0.53**	**PASS**
Plate Shear Rupture Check					
Plate size	width b_p = 12.300 [in]		thickness t_p = 0.260	[in]	
Plate tensile strength	F_u = 65.0 [ksi]				
Plate net area in shear	$A_{nv} = b_p t_p$		= 3.198	[in^2]	
Shear force in demand	V_u =		= **50.00**	[kips]	
Plate shear rupture strength	$R_n = 0.6 F_u A_{nv}$		= 124.72	[kips]	AISC 14th Eq J4-4
Resistance factor-LRFD	ϕ = 0.75				AISC 14th Eq J4-4
	ϕR_n =		= **93.54**	[kips]	
	ratio = **0.53**		> V_u	OK	

Beam Web - Tensile Yielding			ratio = 25.00 / 395.55	= **0.06**	**PASS**
Gross area subject to tension	A_g =		= 8.790	[in^2]	
Steel yield strength	F_y =		= 50.0	[ksi]	
Tensile force required	P_u =		= **25.00**	[kips]	
Tensile yielding strength	$R_n = F_y A_g$		= 439.50	[kips]	AISC 14th Eq D2-1
Resistance factor-LRFD	ϕ = 0.90				AISC 14th D2 (a)
	ϕR_n =		= **395.55**	[kips]	AISC 14th Eq D2-1
	ratio = **0.06**		> P_u	OK	

Beam Web - Tensile Rupture					ratio = 25.00 / 102.98	= **0.24**	**PASS**
End Plate Direct Connect Length Calc							
Beam web-end plate weld length	L =				= 8.750	[in]	
Beam web-end plate fillet weld size	w =				= 0.313	[in]	
Beam web-end plate connect length	$L_w = L - 2w$				= 8.125	[in]	
Plate Tensile Rupture Check							
Plate size	width b_p = 8.125	[in]	thickness t_p = 0.260	[in]			
Plate tensile strength	F_u = 65.0	[ksi]					
Plate net area in tension	$A_{nt} = b_p t_p$				= 2.113	[in^2]	
Tensile force in demand	P_u =				= **25.00**	[kips]	
Plate tensile rupture strength	$R_n = F_u A_{nt}$				= 137.31	[kips]	AISC 14th Eq J4-2
Resistance factor-LRFD	ϕ = 0.75						AISC 14th Eq J4-2
	ϕR_n =				= **102.98**	[kips]	AISC 14th Eq J4-2
	ratio = **0.24**				> P_u	OK	

End Plate - Shear Yield					ratio = 25.00 / 98.44	= **0.25**	**PASS**
Plate Shear Yielding Check							
Plate size	width b_p = 8.750	[in]	thickness t_p = 0.375	[in]			
Plate yield strength	F_y = 50.0	[ksi]					
Plate gross area in shear	$A_{gv} = b_p t_p$				= 3.281	[in^2]	
Shear force required	V_u =				= **25.00**	[kips]	
Plate shear yielding strength	$R_n = 0.6 F_y A_{gv}$				= 98.44	[kips]	AISC 14th Eq J4-3
Resistance factor-LRFD	ϕ = 1.00						AISC 14th Eq J4-3
	ϕR_n =				= **98.44**	[kips]	
	ratio = **0.25**				> V_u	OK	

End Plate - Shear Rupture					ratio = 25.00 / 67.18	= **0.37**	**PASS**
Plate Shear Rupture Check							
Bolt hole diameter	bolt dia d_b = $^3/_4$	[in]	bolt hole dia d_h = $^7/_8$	[in]			AISC 14th B4.3b
Number of bolt	n = 3						
Plate size	width b_p = 8.750	[in]	thickness t_p = 0.375	[in]			
Plate tensile strength	F_u = 65.0	[ksi]					
Plate net area in shear	$A_{nv} = (b_p - n d_h) t_p$				= 2.297	[in^2]	
Shear force required	V_u =				= **25.00**	[kips]	
Plate shear rupture strength	$R_n = 0.6 F_u A_{nv}$				= 89.58	[kips]	AISC 14th Eq J4-4
Resistance factor-LRFD	ϕ = 0.75						AISC 14th Eq J4-4
	ϕR_n =				= **67.18**	[kips]	
	ratio = **0.37**				> V_u	OK	

End Plate - Block Shear - Center Strip ratio = 50.00 / 170.93 = **0.29** **PASS**

Plate Block Shear - Center Strip

Bolt hole diameter	bolt dia d_b = $^3/_4$ [in]	bolt hole dia d_h = $^7/_8$ [in]		AISC 14th	B4.3b
Plate thickness	t_p = 0.375 [in]				
Plate strength	F_y = 50.0 [ksi]	F_u = 65.0 [ksi]			
Bolt no in ver & hor dir	n_v = 2	n_h = 3			
Bolt spacing in ver & hor dir	s_v = 4.000 [in]	s_h = 3.000 [in]			
Bolt edge dist in ver & hor dir	e_v = 1.375 [in]	e_h = 1.375 [in]			
Gross area subject to shear	$A_{gv} = [(n_h - 1) s_h + e_h] t_p$ x 2	= 5.531	[in^2]		
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p$ x2	= 3.891	[in^2]		
Net area subject to tension when sheared out by center strip	$A_{nt} = (n_v - 1) (s_v - d_h) t_p$	= 1.172	[in^2]		
Block shear strength required	V_u =	= **50.00**	[kips]		
Uniform tension stress factor	U_{bs} = 1.00			AISC 14th	Fig C-J4.2
Bolt shear resistance provided	R_n = min ($0.6F_u A_{nv}$, $0.6F_y A_{gv}$) + $U_{bs} F_u A_{nt}$	= 227.91	[kips]	AISC 14th	Eq J4-5
Resistance factor-LRFD	ϕ = 0.75			AISC 14th	Eq J4-5
	ϕR_n =	= **170.93**	[kips]		
	ratio = **0.29**	> V_u	OK		

End Plate - Block Shear - 2-Side Strip ratio = 50.00 / 148.08 = **0.34** **PASS**

Plate Block Shear - 2 Side Strips

Bolt hole diameter	bolt dia d_b = $^3/_4$ [in]	bolt hole dia d_h = $^7/_8$ [in]		AISC 14th	B4.3b
Plate thickness	t_p = 0.375 [in]				
Plate strength	F_y = 50.0 [ksi]	F_u = 65.0 [ksi]			
Bolt no in ver & hor dir	n_v = 2	n_h = 3			
Bolt spacing in ver & hor dir	s_v = 4.000 [in]	s_h = 3.000 [in]			
Bolt edge dist in ver & hor dir	e_v = 1.375 [in]	e_h = 1.375 [in]			
Gross area subject to shear	$A_{gv} = [(n_h - 1) s_h + e_h] t_p$ x 2	= 5.531	[in^2]		
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p$ x2	= 3.891	[in^2]		
Net area subject to tension when sheared out by 2 side strips	$A_{nt} = (e_v - 0.5 d_h) t_p$ x 2	= 0.703	[in^2]		
Block shear strength required	V_u =	= **50.00**	[kips]		
Uniform tension stress factor	U_{bs} = 1.00			AISC 14th	Fig C-J4.2
Bolt shear resistance provided	R_n = min ($0.6F_u A_{nv}$, $0.6F_y A_{gv}$) + $U_{bs} F_u A_{nt}$	= 197.44	[kips]	AISC 14th	Eq J4-5
Resistance factor-LRFD	ϕ = 0.75			AISC 14th	Eq J4-5
	ϕR_n =	= **148.08**	[kips]		
	ratio = **0.34**	> V_u	OK		

End Plate - Bolt Bearing on End Plate					ratio = 50.00 / 107.35	= **0.47**	**PASS**
Single Bolt Shear Strength							
Bolt shear stress	bolt grade = A325-N			F_{nv} = 54.0	[ksi]	AISC 14th Table J3.2	
	bolt dia d_b = 0.750	[in]		bolt area A_b = 0.442	[in^2]		
Single bolt shear strength	$R_{n\text{-}bolt} = F_{nv} A_b$			= 23.86	[kips]	AISC 14th Eq J3-1	
Bolt Bearing / TearOut Strength on Plate							
Bolt hole diameter	bolt dia d_b = 3/4	[in]		bolt hole dia d_h = 13/16	[in]	AISC 14th Table J3.3	
Bolt spacing & edge distance	spacing L_s = 3.000	[in]		edge distance L_e = 1.375	[in]		
Plate tensile strength	F_u = 65.0	[ksi]					
Plate thickness	t = 0.375	[in]					
Interior Bolt							
Bolt hole edge clear distance	$L_c = L_s - d_h$			= 2.188	[in]		
Bolt tear out/bearing strength	$R_{n\text{-}t\&b\text{-}in} = 1.5\ L_c\ t\ F_u \le 3.0\ d_b\ t\ F_u$					AISC 14th Eq J3-6b	
	= 79.98 ≤ 54.84			= 54.84	[kips]		
Bolt strength at interior	$R_{n\text{-}in} = \min(R_{n\text{-}t\&b\text{-}in}, R_{n\text{-}bolt})$			= 23.86	[kips]		
Edge Bolt							
Bolt hole edge clear distance	$L_c = L_e - d_h / 2$			= 0.969	[in]		
Bolt tear out/bearing strength	$R_{n\text{-}t\&b\text{-}ed} = 1.5\ L_c\ t\ F_u \le 3.0\ d_b\ t\ F_u$					AISC 14th Eq J3-6b	
	= 35.42 ≤ 54.84			= 35.42	[kips]		
Bolt strength at edge	$R_{n\text{-}ed} = \min(R_{n\text{-}t\&b\text{-}ed}, R_{n\text{-}bolt})$			= 23.86	[kips]		
Number of bolt	interior n_{in} = 4			edge n_{ed} = 2			
Bolt bearing strength for all bolts	$R_n = n_{in} R_{n\text{-}in} + n_{ed} R_{n\text{-}ed}$			= 143.14	[kips]		
Required shear strength	V_u =			= **50.00**	[kips]		
Bolt resistance factor-LRFD	ϕ = 0.75					AISC 14th J3-10	
	ϕ R_n =			= **107.35**	[kips]		
	ratio = **0.47**			> V_u	OK		

End Plate / Column - Bolt Shear					ratio = 50.00 / 107.35	= **0.47**	**PASS**
Bolt shear stress	grade = A325-N			F_{nv} = 54.0	[ksi]	AISC 14th Table J3.2	
	bolt dia d_b = 0.750	[in]		bolt area A_b = 0.442	[in^2]		
Number of bolt carried shear	n_s = 6.0			shear plane m = 1			
Bolt group eccentricity coefficient	C_{ec} =			= 1.000			
Required shear strength	V_u =			= **50.00**	[kips]		
Bolt shear strength	$R_n = F_{nv} A_b n_s m C_{ec}$			= 143.14	[kips]	AISC 14th Eq J3-1	
Bolt resistance factor-LRFD	ϕ = 0.75					AISC 14th Eq J3-1	
	ϕ R_n =			= **107.35**	[kips]		
	ratio = **0.47**			> V_u	OK		

End Plate / Column - Bolt Bearing on Column					ratio = 50.00 / 107.35	= **0.47**	**PASS**
Single Bolt Shear Strength							
Bolt shear stress	bolt grade = A325-N				F_{nv} = 54.0	[ksi]	AISC 14th Table J3.2
	bolt dia d_b = 0.750	[in]		bolt area A_b = 0.442		[in^2]	
Single bolt shear strength	$R_{n\text{-}bolt} = F_{nv} A_b$				= 23.86	[kips]	AISC 14th Eq J3-1
Bolt Bearing / TearOut Strength on Plate							
Bolt hole diameter	bolt dia d_b = 3/4	[in]		bolt hole dia d_h = 13/16		[in]	AISC 14th Table J3.3
Bolt spacing	spacing L_s = 3.000	[in]					
Plate tensile strength	F_u = 65.0	[ksi]					
Plate thickness	t = 0.515	[in]					
Interior Bolt							
Bolt hole edge clear distance	$L_c = L_s - d_h$				= 2.188	[in]	
Bolt tear out/bearing strength	$R_{n\text{-}t\&b\text{-}in} = 1.5\ L_c\ t\ F_u \le 3.0\ d_b\ t\ m\ F_u$						AISC 14th Eq J3-6b
	= 109.84 ≤ 75.32				= 75.32	[kips]	
Bolt strength at interior	$R_{n\text{-}in} = \min(R_{n\text{-}t\&b\text{-}in}, R_{n\text{-}bolt})$				= 23.86	[kips]	
Number of bolt	interior n_{in} = 6						
Bolt bearing strength for all bolts	$R_n = n_{in} R_{n\text{-}in}$				= 143.14	[kips]	
Required shear strength	V_u =				= **50.00**	[kips]	
Bolt resistance factor-LRFD	ϕ = 0.75						AISC 14th J3-10
	ϕ R_n =				= **107.35**	[kips]	
	ratio = **0.47**				> V_u	OK	

Bolt Tensile Prying Action on End Plate					ratio = 4.17 / 6.91	= **0.60**	**PASS**
Bolt group forces	shear V = 50.00	[kips]		axial P = -25.00	[kips]		
Single Bolt Tensile Capacity Without Considering Prying							
Bolt grade	grade = A325-N						
Nominal tensile/shear stress	F_{nt} = 90.0	[ksi]		F_{nv} = 54.0	[ksi]	AISC 14th	Table J3.2
	bolt dia d_b = 0.750	[in]		bolt area A_b = 0.442	[in^2]		
Bolt group shear force	shear V = 50.00	[kips]		no of bolt n = 6			
Shear stress required	$f_{rv} = V / (n A_b)$			= 18.86	[ksi]		
Resistance factor-LRFD	ϕ = 0.75					AISC 14th	J3.7
Modified nominal tensile stress	$F'_{nt} = 1.3 F_{nt} - \frac{F_{nt}}{\phi F_{nv}} f_{rv} \le F_{nt}$			= **75.08**	[ksi]	AISC 14th	Eq J3-3a
Bolt norminal tensile strength	$r_n = F'_{nt} A_b$			= 33.17	[kips]	AISC 14th	Eq J3-1
Resistance factor-LRFD	ϕ = 0.75					AISC 14th	J3.6
Single bolt tensile capacity	ϕr_n =			= **24.88**	[kips]		
Single Bolt Tensile Capacity After Considering Prying							
End plate	width w = 6.750	[in]		bolt gage g = 4.000	[in]		
	web t_w = 0.260	[in]					
Dist from bolt center to plate edge	a = 0.5 (w - g)			= 1.375	[in]		
	$a' = a + 0.5 d_b \le (1.25 b + 0.5 d_b)$			= 1.750	[in]	AISC 14th	Eq 9-27
Bolt hole diameter	bolt dia d_b = 0.750	[in]		bolt hole dia d_h = 0.813	[in]	AISC 14th	B4.3b
Dist from bolt center to face of web	$b = 0.5(g - t_w)$			= 1.870	[in]		
	$b' = b - 0.5 d_b$			= 1.495	[in]	AISC 14th	Eq 9-21
Bolt pitch spacing	s_v = 3.000						
Bolt tributary length	$p = s_v$ $p \le 2b$ and $p \le s_v$			= 2.917	[in]	AISC 14th	Page 9-11
	$\rho = b' / a'$			= 0.854		AISC 14th	Eq 9-26
	$\delta = 1 - d_h / p$			= 0.721		AISC 14th	Eq 9-24
Tensile capacity per bolt before considering prying	B = from calc shown in above section			= 24.88	[kips]		
Resistance factor-LRFD	ϕ = 0.90					AISC 14th	Page 9-10
End plate thickness	t = 0.375	[in]		tensile F_u = 65.0	[ksi]		
Plate thickness req'd to develop bolt tensile capacity without prying	$t_c = (\frac{4 B b'}{\phi p F_u})^{0.5}$			= 0.934	[in]	AISC 14th	Eq 9-30a
	$\alpha' = \frac{1}{\delta (1 + \rho)} [(\frac{t_c}{t})^2 - 1]$			= 3.887		AISC 14th	Eq 9-35
when $\alpha' > 1$	$Q = (\frac{t}{t_c})^2 (1 + \delta)$			= 0.278		AISC 14th	Eq 9-34
Bolt tensile force per bolt in demand	T = from calc shown below			= **4.17**	[kips]		
Tensile strength per bolt after considering prying	$\phi r_n = B \times Q$			= **6.91**	[kips]	AISC 14th	Eq 9-31
	ratio = **0.60**			> T	OK		
Calculate Max Single Bolt Tensile Load							
Bolt group force	axial P = 25.00	[kips]					
Bolt number	Bolt Row n_h = 2			Bolt Col n_v = 3			
Bolt tensile force per bolt	$T = P / (n_v n_h)$			= **4.17**	[kips]		

Bolt Tensile Prying Action on Column Flange			ratio = 4.17 / 13.62	= **0.31**	**PASS**
Bolt group forces	shear V = 50.00	[kips]	axial P = -25.00	[kips]	
Single Bolt Tensile Capacity Without Considering Prying					
Bolt grade	grade = A325-N				
Nominal tensile/shear stress	F_{nt} = 90.0	[ksi]	F_{nv} = 54.0	[ksi]	AISC 14th Table J3.2
	bolt dia d_b = 0.750	[in]	bolt area A_b = 0.442	[in^2]	
Bolt group shear force	shear V = 50.00	[kips]	no of bolt n = 6		
Shear stress required	$f_{rv} = V / (n A_b)$		= 18.86	[ksi]	
Resistance factor-LRFD	ϕ = 0.75				AISC 14th J3.7
Modified nominal tensile stress	$F'_{nt} = 1.3 F_{nt} - \frac{F_{nt}}{\phi F_{nv}} f_{rv} \le F_{nt}$		= **75.08**	[ksi]	AISC 14th Eq J3-3a
Bolt norminal tensile strength	$r_n = F'_{nt} A_b$		= 33.17	[kips]	AISC 14th Eq J3-1
Resistance factor-LRFD	ϕ = 0.75				AISC 14th J3.6
Single bolt tensile capacity	ϕr_n =		= **24.88**	[kips]	
Single Bolt Tensile Capacity After Considering Prying					
Column flange as tee	b_f = 8.010	[in]	bolt gage g = 4.000	[in]	
	web t_w = 0.295	[in]			
Dist from bolt center to flange edge	$a_{cf} = 0.5 (b_f - g)$		= 2.005	[in]	
End plate	width w = 6.750	[in]	bolt gage g = 4.000	[in]	
Dist from bolt center to plate edge	$a_{pl} = 0.5 (w - g)$		= 1.375	[in]	
Dist from bolt center to plate edge	$a = \min (a_{cf}, a_{pl})$		= 1.375	[in]	
	$a' = a + 0.5 d_b \le (1.25 b + 0.5 d_b)$		= 1.750	[in]	AISC 14th Eq 9-27
Bolt hole diameter	bolt dia d_b = 0.750	[in]	bolt hole dia d_h = 0.813	[in]	AISC 14th B4.3b
Dist from bolt center to face of web	$b = 0.5(g - t_w)$		= 1.853	[in]	
	$b' = b - 0.5 d_b$		= 1.478	[in]	AISC 14th Eq 9-21
Bolt pitch spacing	s_v = 3.000				
Bolt tributary length	$p = s_v$ $p \le 2b$ and $p \le s_v$		= 3.000	[in]	AISC 14th Page 9-11
	$\rho = b' / a'$		= 0.844		AISC 14th Eq 9-26
	$\delta = 1 - d_h / p$		= 0.729		AISC 14th Eq 9-24
Tensile capacity per bolt before considering prying	B = from calc shown in above section		= 24.88	[kips]	
Resistance factor-LRFD	ϕ = 0.90				AISC 14th Page 9-10
Column flange thickness	t = 0.515	[in]	tensile F_u = 65.0	[ksi]	
Plate thickness req'd to develop bolt tensile capacity without prying	$t_c = (\frac{4 B b'}{\phi p F_u})^{0.5}$		= 0.915	[in]	AISC 14th Eq 9-30a
	$\alpha' = \frac{1}{\delta (1 + \rho)} [(\frac{t_c}{t})^2 - 1]$		= 1.605		AISC 14th Eq 9-35
when $\alpha' > 1$	$Q = (\frac{t}{t_c})^2 (1 + \delta)$		= 0.547		AISC 14th Eq 9-34
Bolt tensile force per bolt in demand	T = from calc shown below		= **4.17**	[kips]	
Tensile strength per bolt after considering prying	ϕr_n = B x Q		= **13.62**	[kips]	AISC 14th Eq 9-31
	ratio = **0.31**		> T	OK	
Calculate Max Single Bolt Tensile Load					
Bolt group force	axial P = 25.00	[kips]			

Beam Web to End Plate Weld Strength							ratio = 6.88 / 7.61	= **0.90**	**PASS**
Weld Group Forces									
	shear V = 50.00	[kips]			axial P = -25.00	[kips]	in tension		
Beam web-end plate weld length	L =				= 8.750	[in]			
Beam web-end plate fillet weld size	w =				= 0.313	[in]			
Beam web-end plate weld length used for design	L_w = L - 2 w				= 8.125	[in]			
Combined Weld Stress									
Weld stress from axial force	f_a = P / L				= -3.077	[kip/in]	in tension		
Weld stress from shear force	f_v = V / L				= 6.154	[kip/in]			
Weld stress combined - max	$f_{max} = (f_a^2 + f_v^2)^{0.5}$				= **6.880**	[kip/in]	AISC 14th Eq 8-11		
Weld stress load angle	$\theta = \tan^{-1} (\frac{f_a}{f_v})$				= 26.6	[°]			
Fillet Weld Strength Calc									
Fillet weld leg size	w = 5/16	[in]		load angle θ = 26.6		[°]			
Electrode strength	F_{EXX} = 70.0	[ksi]		strength coeff C_1 = 1.00			AISC 14th Table 8-3		
Number of weld line	n = 2 for double fillet								
Load angle coefficient	$C_2 = (1 + 0.5 \sin^{1.5} \theta)$				= 1.15		AISC 14th Page 8-9		
Fillet weld shear strength	R_{n-w} = 0.6 (C_1 x 70 ksi) 0.707 w n C_2				= 21.334	[kip/in]	AISC 14th Eq 8-1		
Base metal - beam web	thickness t = 0.260	[in]			tensile F_u = 65.0	[ksi]			
Base metal - beam web is in shear, shear rupture as per AISC 14th Eq J4-4 is checked							AISC 14th J2.4		
Base metal shear rupture	R_{n-b} = 0.6 F_u t				= 10.140	[kip/in]	AISC 14th Eq J4-4		
Double fillet linear shear strength	$R_n = \min (R_{n-w}, R_{n-b})$				= **10.140**	[kip/in]	AISC 14th Eq 9-2		
Resistance factor-LRFD	ϕ = 0.75						AISC 14th Eq 8-1		
	ϕ R_n =				= **7.605**	[kip/in]			
	ratio = **0.90**				> f_{max}	OK			

Column Web Local Yielding							ratio = 25.00 / 204.29	= **0.12**	**PASS**
Concentrated force from gusset	P_u =				= **25.00**	[kips]			
Column section	d = 11.900	[in]			t_f = 0.515	[in]			
	t_w = 0.295	[in]			k = 1.020	[in]			
	yield F_y = 50.0	[ksi]							
Length of bearing	l_b = end plate length				= 8.750	[in]			
Column web local yielding strength	$R_n = F_y t_w (5 k + l_b)$				= 204.29	[kips]	AISC 14th Eq J10-2		
Resistance factor-LRFD	ϕ = 1.00								
	ϕ R_n =				= **204.29**	[kips]			
	ratio = **0.12**				> P_u	OK			

Column Flange Local Bending		ratio = 25.00 / 74.59	= **0.34**	**PASS**
Concentrated force from gusset	P_u =	= **25.00**	[kips]	
Column w section	t_f = 0.515 [in]	yield F_y = 50.0	[ksi]	
Column flange local bending strength	$R_n = 6.25\ F_y t_f^2$	= 82.88	[kips]	AISC 14th Eq J10-1
Resistance factor-LRFD	ϕ = 0.90			AISC 14th J10.1
	ϕR_n =	= **74.59**	[kips]	
	ratio = **0.34**	> P_u	OK	