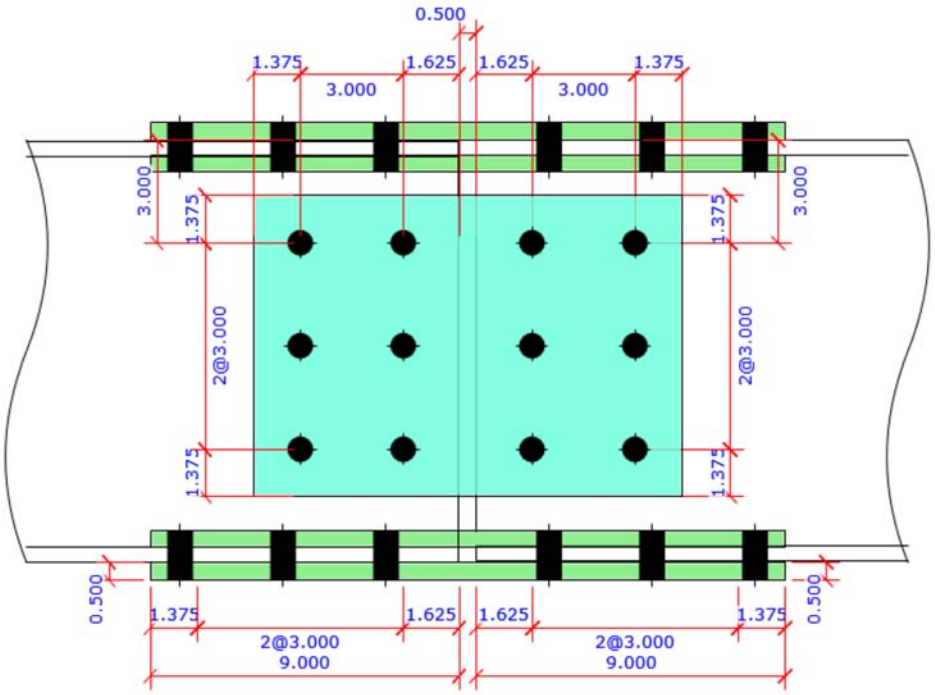
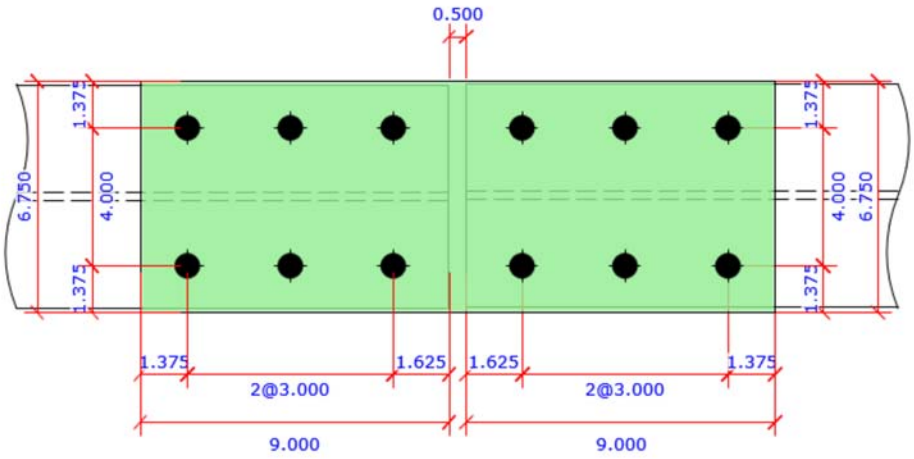
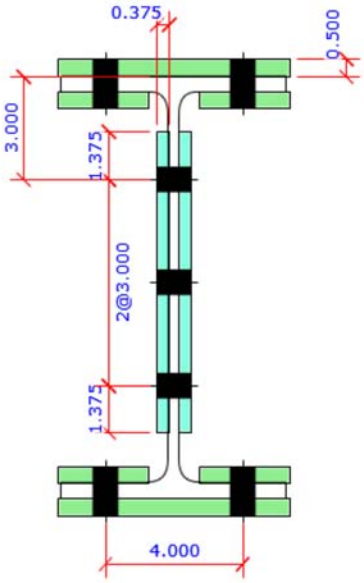
Result Summary - Overall	Moment Connection - Beam Splice	Code=AISC 360-10 LRFD

Result Summary - Overall	geometries & weld limitations = **PASS**	limit states max ratio = **0.91**	**PASS**
Right Beam	geometries & weld limitations = **PASS**	limit states max ratio = **0.91**	**PASS**
Left Beam	geometries & weld limitations = **PASS**	limit states max ratio = **0.91**	**PASS**

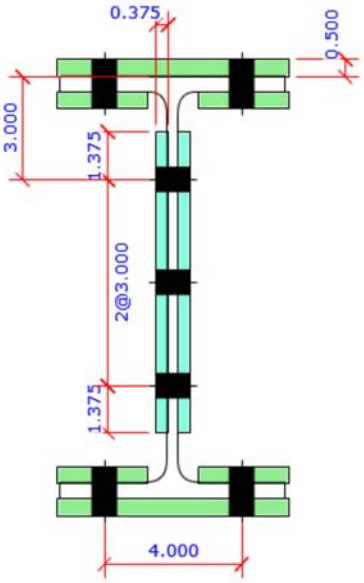
Sketch	Moment Connection - Beam Splice	Code=AISC 360-10 LRFD



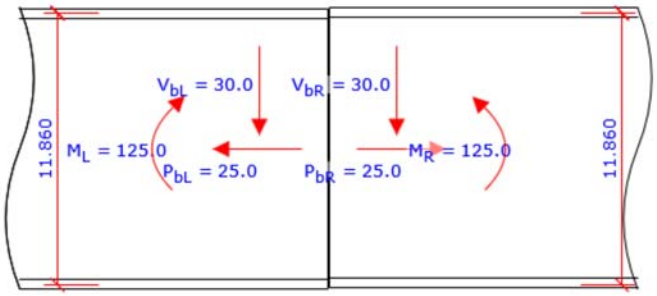




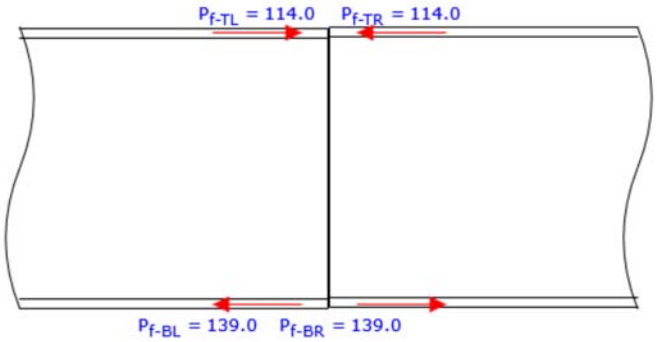
Left Side Beam



Right Side Beam



Design Load



Beam Flange Force & Panel Zone Shear Vp

Members & Components Summary

Member	Moment Connection				Code=AISC 360-10 LRFD
Right Side Beam Section					
W12X30	d = 12.300	[in]	b_f = 6.520	[in]	
	t_f = 0.440	[in]	t_w = 0.260	[in]	
	k_{des} = 0.740	[in]	k_{det} = 1.125	[in]	
	k_1 = 0.750	[in]	A = 8.790	[in^2]	
	S_x = 38.60	[in^3]	Z_x = 43.10	[in^3]	
Steel Grade A992	F_y = 50.0	[ksi]	F_u = 65.0	[ksi]	
Left Side Beam Section					
W12X30	d = 12.300	[in]	b_f = 6.520	[in]	
	t_f = 0.440	[in]	t_w = 0.260	[in]	
	k_{des} = 0.740	[in]	k_{det} = 1.125	[in]	
	k_1 = 0.750	[in]	A = 8.790	[in^2]	
	S_x = 38.60	[in^3]	Z_x = 43.10	[in^3]	
Steel Grade A992	F_y = 50.0	[ksi]	F_u = 65.0	[ksi]	

Beam Flange Force Calc

Beam Flange Force

Beam section	d_b = 12.300	[in]	t_{fb} = 0.440	[in]
Flange force moment arm	$d_m = d_b - t_{fb}$		= 11.860	[in]
User input load	axial P_{bR} = -25.00	[kips]	moment M_R = 125.00	[kip-ft]
	in tension			
Beam flange force - top	$P_{f\text{-}TR} = P_{bR}/2 + M_R/d_m$		= **113.98**	[kips]
Beam flange force - bottom	$P_{f\text{-}BR} = P_{bR}/2 - M_R/d_m$		= **-138.98**	[kips]

Right Beam	Splice MC Connection	Code=AISC 360-10 LRFD

Result Summary	geometries & weld limitations = **PASS**	limit states max ratio = **0.91** **PASS**

Geometry Restriction Checks - Exterior Flange Plate				PASS
Min Bolt Edge Distance - Exterior Flange Plate				
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 Exterior Flange Plate	L_e =	= **1.260**	[in]	
		> $L_{e\text{-}min}$	OK	
Min Bolt Spacing - Exterior Flange Plate				
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 Exterior Flange Plate	L_s =	= **3.000**	[in]	
		> $L_{s\text{-}min}$	OK	

Geometry Restriction Checks - Interior Flange Plate				PASS
Min Bolt Edge Distance - Interior Flange Plate				
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 Interior Flange Plate	L_e =	= **1.250**	[in]	
		> $L_{e\text{-}min}$	OK	
Min Bolt Spacing - Interior Flange Plate				
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 Interior Flange Plate	L_s =	= **3.000**	[in]	
		> $L_{s\text{-}min}$	OK	

Geometry Restriction Checks - Web Plate				PASS
Min Bolt Edge Distance - Web Plate				
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 Web Plate	L_e =	= **1.375**	[in]	
		> $L_{e\text{-}min}$	OK	
Min Bolt Spacing - Web Plate				
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 Web Plate	L_s =	= **3.000**	[in]	
		> $L_{s\text{-}min}$	OK	

Exterior Flange Plate - Bolt Shear					ratio = 67.23 / 107.35	= **0.63**	**PASS**
Flange force moment arm	$d_m = d_b$				= 12.300	[in]	
Beam flange force as shear	$V_u = P_b / 2 + M / d_m$				= 134.45	[kips]	
Shear on single flange plate	$V_u = V_u$ x 0.5 (2 shear plane)				= **67.23**	[kips]	
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]	
Number of bolt carried shear	n_s = 6.0				shear plane m = 1		
Required shear strength	V_u =				= **67.23**	[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
	ϕR_n =				= **107.35**	[kips]	
	ratio = **0.63**				> V_u	OK	

Exterior Flange Plate - Bolt Bearing					ratio = 69.49 / 107.35	= **0.65**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Beam flange force as shear	$V_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on single flange plate	$V_u = V_u$ x 0.5 (double shear plane)				= **69.49**	[kips]	
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 = 0.500	[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
	= 106.64 ≤ 73.13				= 73.13	[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
	= 47.23 ≤ 73.13				= 47.23	[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 =				= **69.49**	[kips]	
Bolt resistance factor-LRFD	ϕ = 0.75						AISC 14th J3-10
	ϕR_n =				= **107.35**	[kips]	
	ratio = **0.65**				> V_u	OK	

Exterior Flange Plate - Block Shear - 2 Side Strips					ratio = 69.49 / 197.44	= **0.35**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)				= **69.49**	[kips]	
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	$t_p = 0.500$	[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				= 7.375	[in^2]	
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p$ x2				= 5.188	[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				= 0.938	[in^2]	
Block shear strength required	$V_u =$				= **69.49**	[kips]	
Uniform tension stress factor	$U_{bs} = 1.00$					AISC 14th	Fig C-J4.2
Bolt shear resistance provided	$R_n = \min (0.6F_u A_{nv}, 0.6F_y A_{gv}) + U_{bs} F_u A_{nt}$				= 263.25	[kips]	AISC 14th Eq J4-5
Resistance factor-LRFD	$\phi = 0.75$					AISC 14th	Eq J4-5
	$\phi R_n =$				= **197.44**	[kips]	
	ratio = **0.35**				> V_u	OK	

Exterior Flange Plate - Block Shear - Center Strip				ratio = 69.49 / 189.82	= **0.37**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$			= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$			= 138.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)			= **69.49**	[kips]	
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	$t_p = 0.500$	[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			= 7.375	[in^2]	
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p$ x2			= 5.188	[in^2]	
Net area subject to tension when sheared out by center strip	$A_{nt} = (n_v - 1) (s_v - d_h) t_p$			= 1.563	[in^2]	
Block shear strength required	$V_u =$			= **69.49**	[kips]	
Uniform tension stress factor	$U_{bs} = 0.50$					AISC 14th Fig C-J4.2
Bolt shear resistance provided	$R_n = \min (0.6F_u A_{nv}, 0.6F_y A_{gv}) + U_{bs} F_u A_{nt}$			= 253.09	[kips]	AISC 14th Eq J4-5
Resistance factor-LRFD	$\phi = 0.75$					AISC 14th Eq J4-5
	$\phi R_n =$			= **189.82**	[kips]	
	ratio = **0.37**			> V_u	OK	

Exterior Flange Plate - Tensile Yielding				ratio = 69.49 / 151.88	= **0.46**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$			= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$			= 138.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)			= **69.49**	[kips]	
Plate Tensile Yielding Check						
Plate size	width $b_p = 6.750$	[in]	thickness $t_p = 0.500$		[in]	
Plate yield strength	$F_y = 50.0$	[ksi]				
Plate gross area in shear	$A_g = b_p t_p$			= 3.375	[in^2]	
Tensile force required	$P_u =$			= **69.49**	[kips]	
Plate tensile yielding strength	$R_n = F_y A_g$			= 168.75	[kips]	AISC 14th Eq J4-1
Resistance factor-LRFD	$\phi = 0.90$					AISC 14th Eq J4-1
	$\phi R_n =$			= **151.88**	[kips]	
	ratio = **0.46**			> P_u	OK	

Exterior Flange Plate - Tensile Rupture					ratio = 69.49 / 121.88	= **0.57**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)				= **69.49**	[kips]	
Plate Tensile 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 = 2						
Plate size	width b_p = 6.750	[in]	thickness t_p = 0.500	[in]			
Plate tensile strength	F_u = 65.0	[ksi]					
Plate net area in tension	$A_{nt} = (b_p - n\, d_h)\, t_p$				= 2.500	[in^2]	
Tensile force required	P_u =				= **69.49**	[kips]	
Plate tensile rupture strength	$R_n = F_u A_{nt}$				= 162.50	[kips]	AISC 14th Eq J4-2
Resistance factor-LRFD	ϕ = 0.75						AISC 14th Eq J4-2
	ϕR_n =				= **121.88**	[kips]	AISC 14th Eq J4-2
	ratio = **0.57**				> P_u	OK	

Exterior Flange Plate - Compression					ratio = 56.99 / 151.88	= **0.38**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - compression	$P_u = P_b / 2 + M / d_m$				= 113.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)				= **56.99**	[kips]	
Plate Compression Check							
Plate size	width b_p = 6.750	[in]	thickness t_p = 0.500	[in]			
	F_y = 50.0	[ksi]	E = 29000	[ksi]			
Plate gross area in compression	$A_g = b_p t_p$				= 3.375	[in^2]	
Plate radius of gyration	$r = t_p / \sqrt{12}$				= 0.144	[in]	
Plate effective length factor	K =				= 0.65		
Plate unbraced length	L_u =				= 3.750	[in]	
Plate slenderness	KL/r = 0.65 x L_u / r				= 16.89		
Plate compression required	P_u =				= **56.99**	[kips]	
	when $\frac{KL}{r} \le 25$						AISC 14th J4.4 (a)
Plate compression provided	$R_n = F_y$ x A_g				= 168.75	[kips]	AISC 14th Eq J4-6
Bolt resistance factor-LRFD	ϕ = 0.90						AISC 14th J4.4 (a)
	ϕR_n =				= **151.88**	[kips]	
	ratio = **0.38**				> P_u	OK	

Interior Flange Plate - Block Shear - 1 Side Strip					ratio = 34.75 / 95.67	= **0.36**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on inner flange plate	$V_u = V_u$ x 0.25 (2 side x 2 shear plane)				= **34.75**	[kips]	
Plate Block Shear - Side 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	$t_p = 0.500$	[in]					
Plate strength	$F_y = 50.0$	[ksi]	$F_u = 65.0$	[ksi]			
Bolt no in ver & hor dir	$n_v = 1$		$n_h = 3$				
Bolt spacing in hor dir	$s_h = 3.000$	[in]					
Bolt edge dist in ver & hor dir	$e_v = 1.250$	[in]	$e_h = 1.375$	[in]			
Gross area subject to shear	$A_{gv} = [(n_h - 1) s_h + e_h] t_p$				= 3.688	[in^2]	
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p$				= 2.594	[in^2]	
Net area subject to tension	$A_{nt} = (e_v - 0.5 d_h) t_p$				= 0.406	[in^2]	
Block shear strength required	$V_u =$				= **34.75**	[kips]	
Uniform tension stress factor	$U_{bs} = 1.00$					AISC 14th	Fig C-J4.2
Bolt shear resistance provided	$R_n = \min (0.6F_u A_{nv}, 0.6F_y A_{gv}) + U_{bs} F_u A_{nt}$				= 127.56	[kips]	AISC 14th Eq J4-5
Resistance factor-LRFD	$\phi = 0.75$					AISC 14th	Eq J4-5
	$\phi R_n =$				= **95.67**	[kips]	
	ratio = **0.36**				> V_u	OK	

Interior Flange Plate - Tensile Yielding					ratio = 34.75 / 59.06	= **0.59**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on inner flange plate	$V_u = V_u$ x 0.25 (2 side x 2 shear plane)				= **34.75**	[kips]	
Plate Tensile Yielding Check							
Plate size	width $b_p = 2.625$	[in]	thickness $t_p = 0.500$	[in]			
Plate yield strength	$F_y = 50.0$	[ksi]					
Plate gross area in shear	$A_g = b_p t_p$				= 1.313	[in^2]	
Tensile force required	$P_u =$				= **34.75**	[kips]	
Plate tensile yielding strength	$R_n = F_y A_g$				= 65.63	[kips]	AISC 14th Eq J4-1
Resistance factor-LRFD	$\phi = 0.90$					AISC 14th	Eq J4-1
	$\phi R_n =$				= **59.06**	[kips]	
	ratio = **0.59**				> P_u	OK	

Interior Flange Plate - Tensile Rupture					ratio = 34.75 / 42.66	= **0.81**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on inner flange plate	$V_u = V_u$ x 0.25 (2 side x 2 shear plane)				= **34.75**	[kips]	
Plate Tensile 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	$n = 1$						
Plate size	width $b_p = 2.625$	[in]	thickness $t_p = 0.500$	[in]			
Plate tensile strength	$F_u = 65.0$	[ksi]					
Plate net area in tension	$A_{nt} = (b_p - n\, d_h)\, t_p$				= 0.875	[in^2]	
Tensile force required	$P_u =$				= **34.75**	[kips]	
Plate tensile rupture strength	$R_n = F_u A_{nt}$				= 56.88	[kips]	AISC 14th Eq J4-2
Resistance factor-LRFD	$\phi = 0.75$						AISC 14th Eq J4-2
	$\phi R_n =$				= **42.66**	[kips]	AISC 14th Eq J4-2
	ratio = **0.81**				> P_u	OK	

Interior Flange Plate - Compression					ratio = 28.50 / 59.06	= **0.48**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - compression	$P_u = P_b / 2 + M / d_m$				= 113.98	[kips]	
Shear on inner flange plate	$V_u = V_u$ x 0.25 (2 side x 2 shear plane)				= **28.50**	[kips]	
Plate Compression Check							
Plate size	width $b_p = 2.625$	[in]	thickness $t_p = 0.500$	[in]			
	$F_y = 50.0$	[ksi]	$E = 29000$	[ksi]			
Plate gross area in compression	$A_g = b_p t_p$				= 1.313	[in^2]	
Plate radius of gyration	$r = t_p / \sqrt{12}$				= 0.144	[in]	
Plate effective length factor	$K =$				= 0.65		
Plate unbraced length	$L_u =$				= 3.750	[in]	
Plate slenderness	$KL/r = 0.65 \times L_u / r$				= 16.89		
Plate compression required	$P_u =$				= **28.50**	[kips]	
	when $\frac{KL}{r} \le 25$						AISC 14th J4.4 (a)
Plate compression provided	$R_n = F_y \times A_g$				= 65.63	[kips]	AISC 14th Eq J4-6
Bolt resistance factor-LRFD	$\phi = 0.90$						AISC 14th J4.4 (a)
	$\phi R_n =$				= **59.06**	[kips]	
	ratio = **0.48**				> P_u	OK	

Web Plate - Bolt Bearing					ratio = 15.00 / 107.35	= **0.14**	**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 =			= **15.00**	[kips]		
Bolt resistance factor-LRFD	ϕ = 0.75					AISC 14th J3-10	
	ϕ R_n =			= **107.35**	[kips]		
	ratio = **0.14**			> V_u	OK		

Web Plate - Shear Yielding					ratio = 15.00 / 98.44	= **0.15**	**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 =			= **15.00**	[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	
	ϕ R_n =			= **98.44**	[kips]		
	ratio = **0.15**			> V_u	OK		

Web Plate - Shear Rupture					ratio = 15.00 / 67.18	= **0.22**	**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 =		= **15.00**	[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		
	$\phi\, R_n$ =		= **67.18**	[kips]			
	ratio = **0.22**		> V_u	OK			

Web Plate - Block Shear - 1-Side Strip					ratio = 15.00 / 84.89	= **0.18**	**PASS**
Plate Block Shear - Side 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 = 3.000	[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	$A_{gv} = [(n_h - 1)\, s_h + e_h]\, t_p$		= 2.766	[in^2]			
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5]\, d_h\, t_p$		= 1.945	[in^2]			
Net area subject to tension when sheared out by side strip	$A_{nt} = [(n_v - 1)s_v + e_v - ((n_v - 1) + 0.5)d_h]\, t_p$		= 1.148	[in^2]			
Block shear strength required	V_u =		= **15.00**	[kips]			
Uniform tension stress factor	U_{bs} = 0.50				AISC 14th Fig C-J4.2		
Bolt shear resistance provided	R_n = min $(0.6F_u A_{nv}, 0.6F_y A_{gv}) + U_{bs} F_u A_{nt}$		= 113.19	[kips]	AISC 14th Eq J4-5		
Resistance factor-LRFD	ϕ = 0.75				AISC 14th Eq J4-5		
	$\phi\, R_n$ =		= **84.89**	[kips]			
	ratio = **0.18**		> V_u	OK			

Beam Flange - Bolt Shear			ratio = 134.45 / 214.71	= **0.63**	**PASS**
Flange force moment arm	$d_m = d_b$		= 12.300	[in]	
Beam flange force as shear	$V_u = P_b / 2 + M / d_m$		= **134.45**	[kips]	
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]	
Number of bolt carried shear	n_s = 6.0		shear plane m = 2		
Required shear strength	V_u =		= **134.45**	[kips]	
Bolt shear strength	$R_n = F_{nv} A_b n_s m C_{ec}$		= 286.28	[kips]	AISC 14th Eq J3-1
Bolt resistance factor-LRFD	ϕ = 0.75				AISC 14th Eq J3-1
	ϕR_n =		= **214.71**	[kips]	
	ratio = **0.63**		> V_u	OK	

Beam Flange - Bolt Bearing			ratio = 138.98 / 214.71	= **0.65**	**PASS**
Flange force moment arm	$d_m = d_b - t_{fb}$		= 11.860	[in]	
Beam flange force as shear	$V_u = P_b / 2 + M / d_m$		= **138.98**	[kips]	
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	$R_{n\text{-}bolt} = 2 \times F_{nv} A_b$		= 47.71	[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 = 1.625	[in]	
Plate tensile strength	F_u = 65.0 [ksi]				
Plate thickness	t = 0.440 [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
	= 93.84 ≤ 64.35		= 64.35	[kips]	
Bolt strength at interior	$R_{n\text{-}in} = \min(R_{n\text{-}t\&b\text{-}in}, R_{n\text{-}bolt})$		= 47.71	[kips]	
Edge Bolt					
Bolt hole edge clear distance	$L_c = L_e - d_h / 2$		= 1.219	[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
	= 52.28 ≤ 64.35		= 52.28	[kips]	
Bolt strength at edge	$R_{n\text{-}ed} = \min(R_{n\text{-}t\&b\text{-}ed}, R_{n\text{-}bolt})$		= 47.71	[kips]	
Number of bolt	interior n_{in} = 4		edge n_{ed} = 2		
Bolt bearing strength for all bolts	$R_n = n_{in} R_{n\text{-}in} + n_{ed} R_{n\text{-}ed}$		= 286.28	[kips]	
Required shear strength	V_u =		= **138.98**	[kips]	
Bolt resistance factor-LRFD	ϕ = 0.75				AISC 14th J3-10
	ϕR_n =		= **214.71**	[kips]	
	ratio = **0.65**		> V_u	OK	

Beam Flange - Block Shear - 2 Side Strips					ratio = 138.98 / 175.25	= **0.79**	**PASS**
Flange force moment arm	$d_m = d_b - t_{fb}$				= 11.860	[in]	
Beam flange force - tension	$V_u = P_b / 2 + M / d_m$				= **138.98**	[kips]	
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 = 0.440	[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 = 1.260	[in]	e_h = 1.625		[in]		
Gross area subject to shear	$A_{gv} = [(n_h - 1) s_h + e_h] t_p \times 2$		= 6.710		[in^2]		
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p \times 2$		= 4.785		[in^2]		
Net area subject to tension when sheared out by 2 side strips	$A_{nt} = (e_v - 0.5 d_h) t_p \times 2$		= 0.724		[in^2]		
Block shear strength required	V_u =		= **138.98**		[kips]		
Uniform tension stress factor	U_{bs} = 1.00					AISC 14th	Fig C-J4.2
Bolt shear resistance provided	$R_n = \min(0.6F_u A_{nv}, 0.6F_y A_{gv}) + U_{bs} F_u A_{nt}$		= 233.66		[kips]	AISC 14th	Eq J4-5
Resistance factor-LRFD	ϕ = 0.75					AISC 14th	Eq J4-5
	ϕR_n =		= **175.25**		[kips]		
	ratio = **0.79**		> V_u		OK		

Beam Web - Bolt Shear					ratio = 30.00 / 214.71	= **0.14**	**PASS**
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]		
Number of bolt carried shear	n_s = 6.0			shear plane m = 2			
Required shear strength	V_u =			= **30.00**	[kips]		
Bolt shear strength	$R_n = F_{nv} A_b n_s m C_{ec}$			= 286.28	[kips]	AISC 14th	Eq J3-1
Bolt resistance factor-LRFD	ϕ = 0.75					AISC 14th	Eq J3-1
	ϕR_n =			= **214.71**	[kips]		
	ratio = **0.14**			> V_u	OK		

Beam Web - Bolt Bearing					ratio = 30.00 / 171.11	= **0.18**	**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	$R_{n\text{-}bolt} = 2 \times F_{nv} A_b$				= 47.71	[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 = 0.260	[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
	= 55.45 ≤ 38.03				= 38.03	[kips]	
Bolt strength at interior	$R_{n\text{-}in} = \min(R_{n\text{-}t\&b\text{-}in}, R_{n\text{-}bolt})$				= 38.03	[kips]	
Number of bolt	interior n_{in} = 6						
Bolt bearing strength for all bolts	$R_n = n_{in} R_{n\text{-}in}$				= 228.15	[kips]	
Required shear strength	V_u =				= **30.00**	[kips]	
Bolt resistance factor-LRFD	ϕ = 0.75						AISC 14th J3-10
	ϕ R_n =				= **171.11**	[kips]	
	ratio = **0.18**				> V_u	OK	

Beam Web - Shear Yielding					ratio = 30.00 / 95.94	= **0.31**	**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 =				= **30.00**	[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
	ϕ R_n =				= **95.94**	[kips]	
	ratio = **0.31**				> V_u	OK	

Beam Web - Shear Rupture			ratio = 30.00 / 73.58	= **0.41**	**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 = 12.300	[in]	thickness t_p = 0.260	[in]	
Plate tensile strength	F_u = 65.0	[ksi]			
Plate net area in shear	$A_{nv} = (b_p - n\, d_h)\, t_p$		= 2.516	[in^2]	
Shear force required	V_u =		= **30.00**	[kips]	
Plate shear rupture strength	$R_n = 0.6\, F_u\, A_{nv}$		= 98.10	[kips]	AISC 14th Eq J4-4
Resistance factor-LRFD	ϕ = 0.75				AISC 14th Eq J4-4
	$\phi\, R_n$ =		= **73.58**	[kips]	
	ratio = **0.41**		> V_u	OK	

Beam Flange With Holes - Beam Flexural Rupture			ratio = 125.00 / 137.67	= **0.91**	**PASS**
Beam sect W12X30	b_f = 6.520	[in]	t_f = 0.440	[in]	
	S_x = 38.600	[in^3]			
	F_y = 50.0	[ksi]	F_u = 65.0	[ksi]	
Gross area of tension flange	$A_{fg} = b_f t_f$		= 2.869	[in^2]	
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 = 2				
Net area of tension flange	$A_{fn} = (b_f - n\, d_h)\, t_f$		= 2.099	[in^2]	
Moment in demand	M_u =		= **125.00**	[kips]	
Beam flexural rupture strength	$M_n = \frac{F_u A_{fn}}{A_{fg}} S_x$		= 152.96	[kip-ft]	AISC 14th Eq F13-1
Resistance factor-LRFD	ϕ = 0.90				AISC 14th F1
	$\phi\, M_n$ =		= **137.67**	[kips]	
	ratio = **0.91**		> M_u	OK	

Beam Section Tensile Rupture						ratio = 25.00 / 320.17	= **0.08**	**PASS**
Beam sect W12X30	t_f = 0.440	[in]		t_w = 0.260	[in]			
	A_g = 8.790	[in^2]		F_u = 65.0	[ksi]			
Beam flange bolt	bolt dia d_b = $^3/_4$	[in]		bolt hole dia d_h = $^7/_8$	[in]		AISC 14th	B4.3b
Number of bolt	n_{flg} = 2							
Beam web bolt	bolt dia d_b = $^3/_4$	[in]		bolt hole dia d_h = $^7/_8$	[in]		AISC 14th	B4.3b
Number of bolt	n_{web} = 3							
Net area of beam sect	$A_n = A_g - n_{flg} d_h t_f \times 2 - n_{web} d_h t_w$					= 6.568	[in^2]	
Shear lag factor	U = from Table D3.1 case 1					= 1.00		AISC 14th Table D3.1
Tensile force required	P_u =					= **25.00**	[kips]	
Tensile effective net area	$A_e = A_n U$					= 6.568	[in^2]	
Plate tensile strength	F_u =					= 65.0	[ksi]	
Tensile rupture strength	$R_n = F_u A_e$					= 426.89	[kips]	AISC 14th Eq D2-2
Resistance factor-LRFD	ϕ = 0.75							AISC 14th D2 (b)
	ϕR_n =					= **320.17**	[kips]	AISC 14th Eq D2-2
	ratio = **0.08**					> P_u	OK	

Left Beam | Splice MC Connection | Code=AISC 360-10 LRFD

Result Summary	geometries & weld limitations = **PASS**	limit states max ratio = **0.91**	**PASS**

Geometry Restriction Checks - Exterior Flange Plate				**PASS**
Min Bolt Edge Distance - Exterior Flange Plate				
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 Exterior Flange Plate	L_e =	= **1.260**	[in]	
		> $L_{e\text{-}min}$	OK	
Min Bolt Spacing - Exterior Flange Plate				
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 Exterior Flange Plate	L_s =	= **3.000**	[in]	
		> $L_{s\text{-}min}$	OK	

Geometry Restriction Checks - Interior Flange Plate				**PASS**
Min Bolt Edge Distance - Interior Flange Plate				
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 Interior Flange Plate	L_e =	= **1.250**	[in]	
		> $L_{e\text{-}min}$	OK	
Min Bolt Spacing - Interior Flange Plate				
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 Interior Flange Plate	L_s =	= **3.000**	[in]	
		> $L_{s\text{-}min}$	OK	

Geometry Restriction Checks - Web Plate				**PASS**
Min Bolt Edge Distance - Web Plate				
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 Web Plate	L_e =	= **1.375**	[in]	
		> $L_{e\text{-}min}$	OK	
Min Bolt Spacing - Web Plate				
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 Web Plate	L_s =	= **3.000**	[in]	
		> $L_{s\text{-}min}$	OK	

Exterior Flange Plate - Bolt Shear					ratio = 67.23 / 107.35	= **0.63**	**PASS**
Flange force moment arm	$d_m = d_b$				= 12.300	[in]	
Beam flange force as shear	$V_u = P_b / 2 + M / d_m$				= 134.45	[kips]	
Shear on single flange plate	$V_u = V_u$ x 0.5 (2 shear plane)				= **67.23**	[kips]	
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]	
Number of bolt carried shear	n_s = 6.0				shear plane m = 1		
Required shear strength	V_u =				= **67.23**	[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
	ϕR_n =				= **107.35**	[kips]	
	ratio = **0.63**				> V_u	OK	

Exterior Flange Plate - Bolt Bearing					ratio = 69.49 / 107.35	= **0.65**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Beam flange force as shear	$V_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on single flange plate	$V_u = V_u$ x 0.5 (double shear plane)				= **69.49**	[kips]	
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 = 0.500	[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
	= 106.64 ≤ 73.13				= 73.13	[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
	= 47.23 ≤ 73.13				= 47.23	[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 =				= **69.49**	[kips]	
Bolt resistance factor-LRFD	ϕ = 0.75						AISC 14th J3-10
	ϕR_n =				= **107.35**	[kips]	
	ratio = **0.65**				> V_u	OK	

Exterior Flange Plate - Block Shear - 2 Side Strips					ratio = 69.49 / 197.44	= **0.35**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)				= **69.49**	[kips]	
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	$t_p = 0.500$	[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				= 7.375	[in^2]	
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p$ x2				= 5.188	[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				= 0.938	[in^2]	
Block shear strength required	$V_u =$				= **69.49**	[kips]	
Uniform tension stress factor	$U_{bs} = 1.00$					AISC 14th	Fig C-J4.2
Bolt shear resistance provided	$R_n = \min (0.6F_u A_{nv}, 0.6F_y A_{gv}) + U_{bs} F_u A_{nt}$				= 263.25	[kips]	AISC 14th Eq J4-5
Resistance factor-LRFD	$\phi = 0.75$					AISC 14th	Eq J4-5
	$\phi R_n =$				= **197.44**	[kips]	
	ratio = **0.35**				> V_u	OK	

Exterior Flange Plate - Block Shear - Center Strip				ratio = 69.49 / 189.82	= **0.37**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$			= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$			= 138.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)			= **69.49**	[kips]	
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	$t_p = 0.500$	[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			= 7.375	[in^2]	
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p$ x2			= 5.188	[in^2]	
Net area subject to tension when sheared out by center strip	$A_{nt} = (n_v - 1) (s_v - d_h) t_p$			= 1.563	[in^2]	
Block shear strength required	$V_u =$			= **69.49**	[kips]	
Uniform tension stress factor	$U_{bs} = 0.50$					AISC 14th Fig C-J4.2
Bolt shear resistance provided	$R_n = \min (0.6F_u A_{nv}, 0.6F_y A_{gv}) + U_{bs} F_u A_{nt}$			= 253.09	[kips]	AISC 14th Eq J4-5
Resistance factor-LRFD	$\phi = 0.75$					AISC 14th Eq J4-5
	$\phi R_n =$			= **189.82**	[kips]	
	ratio = **0.37**			> V_u	OK	

Exterior Flange Plate - Tensile Yielding				ratio = 69.49 / 151.88	= **0.46**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$			= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$			= 138.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)			= **69.49**	[kips]	
Plate Tensile Yielding Check						
Plate size	width $b_p = 6.750$	[in]	thickness $t_p = 0.500$		[in]	
Plate yield strength	$F_y = 50.0$	[ksi]				
Plate gross area in shear	$A_g = b_p t_p$			= 3.375	[in^2]	
Tensile force required	$P_u =$			= **69.49**	[kips]	
Plate tensile yielding strength	$R_n = F_y A_g$			= 168.75	[kips]	AISC 14th Eq J4-1
Resistance factor-LRFD	$\phi = 0.90$					AISC 14th Eq J4-1
	$\phi R_n =$			= **151.88**	[kips]	
	ratio = **0.46**			> P_u	OK	

Exterior Flange Plate - Tensile Rupture					ratio = 69.49 / 121.88	= **0.57**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)				= **69.49**	[kips]	
Plate Tensile 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 = 2						
Plate size	width b_p = 6.750	[in]	thickness t_p = 0.500	[in]			
Plate tensile strength	F_u = 65.0	[ksi]					
Plate net area in tension	$A_{nt} = (b_p - n\, d_h)\, t_p$				= 2.500	[in^2]	
Tensile force required	P_u =				= **69.49**	[kips]	
Plate tensile rupture strength	$R_n = F_u A_{nt}$				= 162.50	[kips]	AISC 14th Eq J4-2
Resistance factor-LRFD	ϕ = 0.75						AISC 14th Eq J4-2
	ϕR_n =				= **121.88**	[kips]	AISC 14th Eq J4-2
	ratio = **0.57**				> P_u	OK	

Exterior Flange Plate - Compression					ratio = 56.99 / 151.88	= **0.38**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - compression	$P_u = P_b / 2 + M / d_m$				= 113.98	[kips]	
Shear on outer flange plate	$V_u = V_u$ x 0.5 (2 shear plane)				= **56.99**	[kips]	
Plate Compression Check							
Plate size	width b_p = 6.750	[in]	thickness t_p = 0.500	[in]			
	F_y = 50.0	[ksi]	E = 29000	[ksi]			
Plate gross area in compression	$A_g = b_p t_p$				= 3.375	[in^2]	
Plate radius of gyration	$r = t_p / \sqrt{12}$				= 0.144	[in]	
Plate effective length factor	K =				= 0.65		
Plate unbraced length	L_u =				= 3.750	[in]	
Plate slenderness	KL/r = 0.65 x L_u / r				= 16.89		
Plate compression required	P_u =				= **56.99**	[kips]	
	when $\frac{KL}{r} \le 25$						AISC 14th J4.4 (a)
Plate compression provided	$R_n = F_y$ x A_g				= 168.75	[kips]	AISC 14th Eq J4-6
Bolt resistance factor-LRFD	ϕ = 0.90						AISC 14th J4.4 (a)
	ϕR_n =				= **151.88**	[kips]	
	ratio = **0.38**				> P_u	OK	

Interior Flange Plate - Block Shear - 1 Side Strip					ratio = 34.75 / 95.67	= **0.36**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on inner flange plate	$V_u = V_u$ x 0.25 (2 side x 2 shear plane)				= **34.75**	[kips]	
Plate Block Shear - Side 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	$t_p = 0.500$	[in]					
Plate strength	$F_y = 50.0$	[ksi]	$F_u = 65.0$	[ksi]			
Bolt no in ver & hor dir	$n_v = 1$		$n_h = 3$				
Bolt spacing in hor dir	$s_h = 3.000$	[in]					
Bolt edge dist in ver & hor dir	$e_v = 1.250$	[in]	$e_h = 1.375$	[in]			
Gross area subject to shear	$A_{gv} = [(n_h - 1) s_h + e_h] t_p$				= 3.688	[in^2]	
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p$				= 2.594	[in^2]	
Net area subject to tension	$A_{nt} = (e_v - 0.5 d_h) t_p$				= 0.406	[in^2]	
Block shear strength required	$V_u =$				= **34.75**	[kips]	
Uniform tension stress factor	$U_{bs} = 1.00$					AISC 14th Fig C-J4.2	
Bolt shear resistance provided	$R_n = \min (0.6F_u A_{nv}, 0.6F_y A_{gv}) + U_{bs} F_u A_{nt}$				= 127.56	[kips]	AISC 14th Eq J4-5
Resistance factor-LRFD	$\phi = 0.75$					AISC 14th Eq J4-5	
	$\phi R_n =$				= **95.67**	[kips]	
	ratio = **0.36**				> V_u	OK	

Interior Flange Plate - Tensile Yielding					ratio = 34.75 / 59.06	= **0.59**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$				= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$				= 138.98	[kips]	
Shear on inner flange plate	$V_u = V_u$ x 0.25 (2 side x 2 shear plane)				= **34.75**	[kips]	
Plate Tensile Yielding Check							
Plate size	width $b_p = 2.625$	[in]	thickness $t_p = 0.500$	[in]			
Plate yield strength	$F_y = 50.0$	[ksi]					
Plate gross area in shear	$A_g = b_p t_p$				= 1.313	[in^2]	
Tensile force required	$P_u =$				= **34.75**	[kips]	
Plate tensile yielding strength	$R_n = F_y A_g$				= 65.63	[kips]	AISC 14th Eq J4-1
Resistance factor-LRFD	$\phi = 0.90$					AISC 14th Eq J4-1	
	$\phi R_n =$				= **59.06**	[kips]	
	ratio = **0.59**				> P_u	OK	

Interior Flange Plate - Tensile Rupture				ratio = 34.75 / 42.66	= **0.81**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$			= 11.860	[in]	
Flange force - tension	$P_u = P_b / 2 + M / d_m$			= 138.98	[kips]	
Shear on inner flange plate	$V_u = V_u$ x 0.25 (2 side x 2 shear plane)			= **34.75**	[kips]	
Plate Tensile 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	$n = 1$					
Plate size	width $b_p = 2.625$	[in]	thickness $t_p = 0.500$		[in]	
Plate tensile strength	$F_u = 65.0$	[ksi]				
Plate net area in tension	$A_{nt} = (b_p - n\, d_h)\, t_p$			= 0.875	[in^2]	
Tensile force required	$P_u =$			= **34.75**	[kips]	
Plate tensile rupture strength	$R_n = F_u A_{nt}$			= 56.88	[kips]	AISC 14th Eq J4-2
Resistance factor-LRFD	$\phi = 0.75$					AISC 14th Eq J4-2
	$\phi R_n =$			= **42.66**	[kips]	AISC 14th Eq J4-2
	ratio = **0.81**			> P_u	OK	

Interior Flange Plate - Compression				ratio = 28.50 / 59.06	= **0.48**	**PASS**
Flange force moment arm	$d_m = d_b - t_f$			= 11.860	[in]	
Flange force - compression	$P_u = P_b / 2 + M / d_m$			= 113.98	[kips]	
Shear on inner flange plate	$V_u = V_u$ x 0.25 (2 side x 2 shear plane)			= **28.50**	[kips]	
Plate Compression Check						
Plate size	width $b_p = 2.625$	[in]	thickness $t_p = 0.500$		[in]	
	$F_y = 50.0$	[ksi]	$E = 29000$		[ksi]	
Plate gross area in compression	$A_g = b_p t_p$			= 1.313	[in^2]	
Plate radius of gyration	$r = t_p / \sqrt{12}$			= 0.144	[in]	
Plate effective length factor	$K =$			= 0.65		
Plate unbraced length	$L_u =$			= 3.750	[in]	
Plate slenderness	$KL/r = 0.65 \times L_u / r$			= 16.89		
Plate compression required	$P_u =$			= **28.50**	[kips]	
	when $\frac{KL}{r} \le 25$					AISC 14th J4.4 (a)
Plate compression provided	$R_n = F_y \times A_g$			= 65.63	[kips]	AISC 14th Eq J4-6
Bolt resistance factor-LRFD	$\phi = 0.90$					AISC 14th J4.4 (a)
	$\phi R_n =$			= **59.06**	[kips]	
	ratio = **0.48**			> P_u	OK	

Web Plate - Bolt Bearing					ratio = 15.00 / 107.35	= **0.14**	**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 =			= **15.00**	[kips]		
Bolt resistance factor-LRFD	ϕ = 0.75					AISC 14th J3-10	
	ϕ R_n =			= **107.35**	[kips]		
	ratio = **0.14**			> V_u	OK		

Web Plate - Shear Yielding					ratio = 15.00 / 98.44	= **0.15**	**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 =			= **15.00**	[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	
	ϕ R_n =			= **98.44**	[kips]		
	ratio = **0.15**			> V_u	OK		

Web Plate - Shear Rupture			ratio = 15.00 / 67.18	= **0.22**	**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 =		= **15.00**	[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
	ϕ R_n =		= **67.18**	[kips]	
	ratio = **0.22**		> V_u	OK	

Web Plate - Block Shear - 1-Side Strip			ratio = 15.00 / 84.89	= **0.18**	**PASS**
Plate Block Shear - Side 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 = 3.000	[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	$A_{gv} = [(n_h - 1)\, s_h + e_h]\, t_p$		= 2.766	[in^2]	
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5]\, d_h\, t_p$		= 1.945	[in^2]	
Net area subject to tension when sheared out by side strip	$A_{nt} = [(n_v - 1)s_v + e_v - ((n_v - 1) + 0.5)d_h]\, t_p$		= 1.148	[in^2]	
Block shear strength required	V_u =		= **15.00**	[kips]	
Uniform tension stress factor	U_{bs} = 0.50				AISC 14th Fig C-J4.2
Bolt shear resistance provided	R_n = min (0.6$F_u A_{nv}$, 0.6$F_y A_{gv}$) + $U_{bs} F_u A_{nt}$		= 113.19	[kips]	AISC 14th Eq J4-5
Resistance factor-LRFD	ϕ = 0.75				AISC 14th Eq J4-5
	ϕ R_n =		= **84.89**	[kips]	
	ratio = **0.18**		> V_u	OK	

Beam Flange - Bolt Shear			ratio = 134.45 / 214.71	= **0.63**	**PASS**
Flange force moment arm	$d_m = d_b$		= 12.300	[in]	
Beam flange force as shear	$V_u = P_b / 2 + M / d_m$		= **134.45**	[kips]	
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]	
Number of bolt carried shear	n_s = 6.0		shear plane m = 2		
Required shear strength	V_u =		= **134.45**	[kips]	
Bolt shear strength	$R_n = F_{nv} A_b n_s m C_{ec}$		= 286.28	[kips]	AISC 14th Eq J3-1
Bolt resistance factor-LRFD	ϕ = 0.75				AISC 14th Eq J3-1
	ϕR_n =		= **214.71**	[kips]	
	ratio = **0.63**		> V_u	OK	

Beam Flange - Bolt Bearing			ratio = 138.98 / 214.71	= **0.65**	**PASS**
Flange force moment arm	$d_m = d_b - t_{fb}$		= 11.860	[in]	
Beam flange force as shear	$V_u = P_b / 2 + M / d_m$		= **138.98**	[kips]	
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	$R_{n\text{-}bolt} = 2 \times F_{nv} A_b$		= 47.71	[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 = 1.625	[in]	
Plate tensile strength	F_u = 65.0 [ksi]				
Plate thickness	t = 0.440 [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
	= 93.84 ≤ 64.35		= 64.35	[kips]	
Bolt strength at interior	$R_{n\text{-}in} = \min(R_{n\text{-}t\&b\text{-}in}, R_{n\text{-}bolt})$		= 47.71	[kips]	
Edge Bolt					
Bolt hole edge clear distance	$L_c = L_e - d_h / 2$		= 1.219	[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
	= 52.28 ≤ 64.35		= 52.28	[kips]	
Bolt strength at edge	$R_{n\text{-}ed} = \min(R_{n\text{-}t\&b\text{-}ed}, R_{n\text{-}bolt})$		= 47.71	[kips]	
Number of bolt	interior n_{in} = 4		edge n_{ed} = 2		
Bolt bearing strength for all bolts	$R_n = n_{in} R_{n\text{-}in} + n_{ed} R_{n\text{-}ed}$		= 286.28	[kips]	
Required shear strength	V_u =		= **138.98**	[kips]	
Bolt resistance factor-LRFD	ϕ = 0.75				AISC 14th J3-10
	ϕR_n =		= **214.71**	[kips]	
	ratio = **0.65**		> V_u	OK	

Beam Flange - Block Shear - 2 Side Strips					ratio = 138.98 / 175.25	= **0.79**	**PASS**
Flange force moment arm	$d_m = d_b - t_{fb}$				= 11.860	[in]	
Beam flange force - tension	$V_u = P_b / 2 + M / d_m$				= **138.98**	[kips]	
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 = 0.440	[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 = 1.260	[in]	e_h = 1.625		[in]		
Gross area subject to shear	$A_{gv} = [(n_h - 1) s_h + e_h] t_p \times 2$				= 6.710	[in^2]	
Net area subject to shear	$A_{nv} = A_{gv} - [(n_h - 1) + 0.5] d_h t_p \times 2$				= 4.785	[in^2]	
Net area subject to tension when sheared out by 2 side strips	$A_{nt} = (e_v - 0.5 d_h) t_p \times 2$				= 0.724	[in^2]	
Block shear strength required	V_u =				= **138.98**	[kips]	
Uniform tension stress factor	U_{bs} = 1.00						AISC 14th Fig C-J4.2
Bolt shear resistance provided	$R_n = \min(0.6F_u A_{nv}, 0.6F_y A_{gv}) + U_{bs} F_u A_{nt}$				= 233.66	[kips]	AISC 14th Eq J4-5
Resistance factor-LRFD	ϕ = 0.75						AISC 14th Eq J4-5
	ϕR_n =				= **175.25**	[kips]	
	ratio = **0.79**				> V_u	OK	

Beam Web - Bolt Shear					ratio = 30.00 / 214.71	= **0.14**	**PASS**
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]		
Number of bolt carried shear	n_s = 6.0			shear plane m = 2			
Required shear strength	V_u =			= **30.00**	[kips]		
Bolt shear strength	$R_n = F_{nv} A_b n_s m C_{ec}$			= 286.28	[kips]		AISC 14th Eq J3-1
Bolt resistance factor-LRFD	ϕ = 0.75						AISC 14th Eq J3-1
	ϕR_n =			= **214.71**	[kips]		
	ratio = **0.14**			> V_u	OK		

Beam Web - Bolt Bearing					ratio = 30.00 / 171.11	= **0.18**	**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	$R_{n\text{-}bolt} = 2 \times F_{nv} A_b$				= 47.71	[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 = 0.260	[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
	= 55.45 ≤ 38.03				= 38.03	[kips]	
Bolt strength at interior	$R_{n\text{-}in} = \min(R_{n\text{-}t\&b\text{-}in}, R_{n\text{-}bolt})$				= 38.03	[kips]	
Number of bolt	interior n_{in} = 6						
Bolt bearing strength for all bolts	$R_n = n_{in} R_{n\text{-}in}$				= 228.15	[kips]	
Required shear strength	V_u =				= **30.00**	[kips]	
Bolt resistance factor-LRFD	ϕ = 0.75						AISC 14th J3-10
	ϕ R_n =				= **171.11**	[kips]	
	ratio = **0.18**				> V_u	OK	

Beam Web - Shear Yielding					ratio = 30.00 / 95.94	= **0.31**	**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 =				= **30.00**	[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
	ϕ R_n =				= **95.94**	[kips]	
	ratio = **0.31**				> V_u	OK	

Beam Web - Shear Rupture			ratio = 30.00 / 73.58	= **0.41**	**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 = 12.300	[in]	thickness t_p = 0.260	[in]	
Plate tensile strength	F_u = 65.0	[ksi]			
Plate net area in shear	$A_{nv} = (b_p - n\, d_h)\, t_p$		= 2.516	[in^2]	
Shear force required	V_u =		= **30.00**	[kips]	
Plate shear rupture strength	$R_n = 0.6\, F_u\, A_{nv}$		= 98.10	[kips]	AISC 14th Eq J4-4
Resistance factor-LRFD	ϕ = 0.75				AISC 14th Eq J4-4
	$\phi\, R_n$ =		= **73.58**	[kips]	
	ratio = **0.41**		> V_u	OK	

Beam Flange With Holes - Beam Flexural Rupture			ratio = 125.00 / 137.67	= **0.91**	**PASS**
Beam sect W12X30	b_f = 6.520	[in]	t_f = 0.440	[in]	
	S_x = 38.600	[in^3]			
	F_y = 50.0	[ksi]	F_u = 65.0	[ksi]	
Gross area of tension flange	$A_{fg} = b_f t_f$		= 2.869	[in^2]	
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 = 2				
Net area of tension flange	$A_{fn} = (b_f - n\, d_h)\, t_f$		= 2.099	[in^2]	
Moment in demand	M_u =		= **125.00**	[kips]	
Beam flexural rupture strength	$M_n = \frac{F_u A_{fn}}{A_{fg}} S_x$		= 152.96	[kip-ft]	AISC 14th Eq F13-1
Resistance factor-LRFD	ϕ = 0.90				AISC 14th F1
	$\phi\, M_n$ =		= **137.67**	[kips]	
	ratio = **0.91**		> M_u	OK	

Beam Section Tensile Rupture			ratio = 25.00 / 320.17	= **0.08**	**PASS**
Beam sect W12X30	t_f = 0.440	[in]	t_w = 0.260	[in]	
	A_g = 8.790	[in^2]	F_u = 65.0	[ksi]	
Beam flange bolt	bolt dia d_b = $^3/_4$	[in]	bolt hole dia d_h = $^7/_8$	[in]	AISC 14th B4.3b
Number of bolt	n_{flg} = 2				
Beam web bolt	bolt dia d_b = $^3/_4$	[in]	bolt hole dia d_h = $^7/_8$	[in]	AISC 14th B4.3b
Number of bolt	n_{web} = 3				
Net area of beam sect	$A_n = A_g - n_{flg} d_h t_f$ x 2 - $n_{web} d_h t_w$		= 6.568	[in^2]	
Shear lag factor	U = from Table D3.1 case 1		= 1.00		AISC 14th Table D3.1
Tensile force required	P_u =		= **25.00**	[kips]	
Tensile effective net area	$A_e = A_n U$		= 6.568	[in^2]	
Plate tensile strength	F_u =		= 65.0	[ksi]	
Tensile rupture strength	$R_n = F_u A_e$		= 426.89	[kips]	AISC 14th Eq D2-2
Resistance factor-LRFD	ϕ = 0.75				AISC 14th D2 (b)
	ϕ R_n =		= **320.17**	[kips]	AISC 14th Eq D2-2
	ratio = **0.08**		> P_u	OK	