

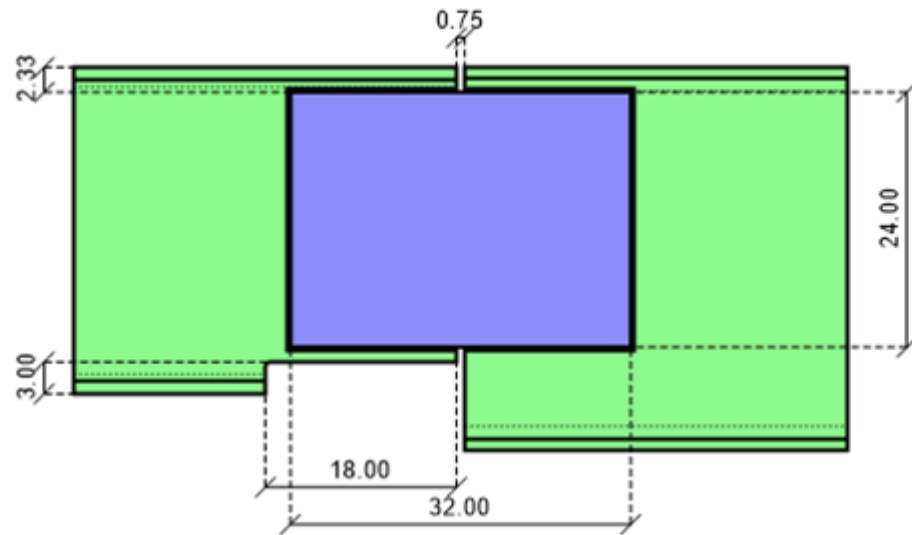
Global Parameters - Description:

Project Title	BRBF Collector Line
Company	
Designer	
Job Number	
Notes	

Global Parameters - Solution:

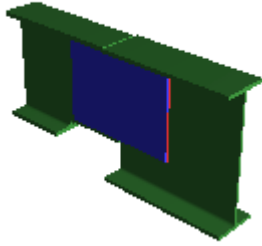
Design Method	AISC 15th (360-16): LRFD
Bolt Group Analysis Method	Center of Rotation
Weld Analysis Method	Center of Rotation
Consider Bolt Hole Deformation?	Yes
Check Rotational Ductility?	Yes
Check Weld Filler Metal Matching?	Yes
Full Shear Eccentricity Considered?	No
Panel-Zone Shear Deformation Considered?	No
Check Weld Base Material Thickness?	Yes
Reduce Available Bolt Strength by Prying Effects Factor Q?	No

Side view



GL G,E double: LRFD Results Report

Beam Shear Tab Splice Connection



Material Properties:

Left Beam	W30X148	A992	$F_y = 50.00$ ksi	$F_u = 65.00$ ksi
Right Beam	W36X160	A992	$F_y = 50.00$ ksi	$F_u = 65.00$ ksi
Plate	P0.62x32.00x24	A529 Gr.50	$F_y = 50.00$ ksi	$F_u = 65.00$ ksi
	.00			

Input Data:

Shear Load	50.00 kips	User Input Shear Load
Axial Load	636.20 kips	User Input Axial Force (compression)

Note: Unless specified, all code references are from AISC 360-16

Limit State	Required	Available	Unity Check	Result
Left Beam Weld Limitations				PASS
Weld Max/Min Size, Length			(J2.2b)	
Check Weld Max Size	Pass			
D	0.31 in	Weld size		
D_{max}	0.56 in	Max Size Allowed		
t	0.62 in	Min shelf dimension		
Check Weld Min Size	Pass			
D	0.31 in	Weld size		
D_{min}	0.25 in	Min size allowed per Table J2.4		
t_{min}	0.62 in	Controlling member thickness		
Check Weld Min Length	Pass	Condition: $L_{min} \geq 4*D$ per J2.2b		
D	0.31 in	Weld size		
L_{min}	15.62 in	Min weld segment length		
Check Weld Max Length	Pass	Condition: $L_{max} \leq 100*D$		
D	0.31 in	Weld size		
L_{max}	24.00 in	Max weld segment length		
Right Beam Weld Limitations				PASS
Weld Max/Min Size, Length			(J2.2b)	
Check Weld Max Size	Pass			
D	0.31 in	Weld size		
D_{max}	0.56 in	Max Size Allowed		
t	0.62 in	Min shelf dimension		
Check Weld Min Size	Pass			
D	0.31 in	Weld size		
D_{min}	0.25 in	Min size allowed per Table J2.4		
t_{min}	0.62 in	Controlling member thickness		
Check Weld Min Length	Pass	Condition: $L_{min} \geq 4*D$ per J2.2b		
D	0.31 in	Weld size		
L_{min}	15.62 in	Min weld segment length		
Check Weld Max Length	Pass	Condition: $L_{max} \leq 100*D$		
D	0.31 in	Weld size		
L_{max}	24.00 in	Max weld segment length		

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GL G,E double: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
Plate Shear Yield	25.00 kips	450.00 kips	0.06	PASS
$R_n = 0.6 * F_y * A_{gv}$		$\phi = 1.00$ (J4-3)		
F_y	50.00 ksi	Minimum yield stress of material		
A_{gv}	15.00 in ²	Gross area subject to shear		
ϕR_n	450.00 kips	Shear yield strength		
Left Beam Shear Yield	50.00 kips	540.15 kips	0.09	PASS
$R_n = 0.6 * F_y * A_{gv} * C_{v1}$		$\phi = 1.00$ (G2-1)		
F_y	50.00 ksi	Minimum yield stress of material		
A_{gv}	18.00 in ²	Gross area subject to shear		
C_{v1}	1.00	Web shear coefficient (G2-2)		
ϕR_n	540.15 kips	Shear yield strength		
Right Beam Shear Yield	50.00 kips	702.00 kips	0.07	PASS
$R_n = 0.6 * F_y * A_{gv} * C_{v1}$		$\phi = 1.00$ (G2-1)		
F_y	50.00 ksi	Minimum yield stress of material		
A_{gv}	23.40 in ²	Gross area subject to shear		
C_{v1}	1.00	Web shear coefficient (G2-2)		
ϕR_n	702.00 kips	Shear yield strength		
Plate Shear Rupture at Left Beam	25.00 kips	438.75 kips	0.06	PASS
$R_n = 0.6 * F_u * A_{nv}$		$\phi = 0.75$ (J4-4)		
F_u	65.00 ksi	Minimum tensile stress of material		
A_{nv}	15.00 in ²	Net area subject to shear		
ϕR_n	438.75 kips	Shear rupture strength		
Plate Shear Rupture at Right Beam	25.00 kips	438.75 kips	0.06	PASS
$R_n = 0.6 * F_u * A_{nv}$		$\phi = 0.75$ (J4-4)		
F_u	65.00 ksi	Minimum tensile stress of material		
A_{nv}	15.00 in ²	Net area subject to shear		
ϕR_n	438.75 kips	Shear rupture strength		
Left Beam Shear Rupture	50.00 kips	526.65 kips	0.09	PASS
$R_n = 0.6 * F_u * A_{nv}$		$\phi = 0.75$ (J4-4)		
F_u	65.00 ksi	Minimum tensile stress of material		
A_{nv}	18.00 in ²	Net area subject to shear		
ϕR_n	526.65 kips	Shear rupture strength		
Right Beam Shear Rupture	50.00 kips	684.45 kips	0.07	PASS
$R_n = 0.6 * F_u * A_{nv}$		$\phi = 0.75$ (J4-4)		
F_u	65.00 ksi	Minimum tensile stress of material		
A_{nv}	23.40 in ²	Net area subject to shear		
ϕR_n	684.45 kips	Shear rupture strength		
Plate Axial Yield	318.10 kips	675.00 kips	0.47	PASS
$R_n = F_y * A_g$		$\phi = 0.90$ (J4-1)		
F_y	50.00 ksi	Minimum yield stress of material		
A_g	15.00 in ²	Gross area subject to compression		
ϕR_n	675.00 kips	Tensile yield strength		

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GL G,E double: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
Left Beam Axial Yield	636.20 kips	1342.24 kips	0.47	PASS
$R_n = F_y * A_g$		$\phi = 0.90$	(J4-1)	
F_y	50.00 ksi	Minimum yield stress of material		
A_g	29.83 in ²	Gross area subject to compression		
ϕR_n	1342.24 kips	Tensile yield strength		
Right Beam Axial Yield	636.20 kips	2115.00 kips	0.30	PASS
$R_n = F_y * A_g$		$\phi = 0.90$	(J4-1)	
F_y	50.00 ksi	Minimum yield stress of material		
A_g	47.00 in ²	Gross area subject to compression		
ϕR_n	2115.00 kips	Tensile yield strength		
Compression Buckling of the Plate	318.10 kips	675.00 kips	0.47	PASS
$R_n = F_y * A_g$		$\phi = 0.9$	(J4-6)	
K	1.00	Effective length factor		
L	0.75 in	Unbraced length		
r	0.18 in	Radius of gyration		
L_c	0.75 in	Effective length, $L_c = K * L$		
L_c / r	4.15	Plate slenderness check from J4-6		
F_y	50.00 ksi	Capacity = Minimum Yield stress for $L_c / r \leq 25$		
A_g	15.00 in ²	Gross area subject to compression		
ϕR_n	675.00 kips	Compressive strength		
Plate Flexural Yield			0.82	PASS
$(V_r / V_c)^2 + (P_r / P_c + M_r / M_c)^2 \leq 1$			(AISC 15 th Eq.10-5)	
P_r	318.10 kips	User input axial load (divided by 2 for double plates)		
V_r	25.00 kips	User input shear load (divided by 2 for double plates)		
F_y	50.00 ksi	Minimum yield stress of material		
A_g	15.00 in ²	Gross area of the plate		
Z_{pl}	90.00 in ³	Plastic modulus of the shear plate		
P_c	675.00 kips	Available tensile strength (see check 'Axial Yield')		
V_c	450.00 kips	Available shear strength (see check 'Shear Yield')		
e_x	23.16 in	Horizontal eccentricity		
e_y	3.67 in	Vertical eccentricity		
M_r	145.54 kips-ft	Moment due to eccentricity = $V_r * e_x + P_r * e_y$		
M_c	337.50 kips-ft	Available moment $M_c = \phi * (F_y * Z)$, $\phi = 0.90$		
UC	0.82	Unity check per interaction equation, $(V_r / V_c)^2 + (P_r / P_c + M_r / M_c)^2 \leq 1$		
Plate Flexural Rupture at Left Beam			0.16	PASS
$(V_r / V_c)^2 + (M_r / M_c)^2 \leq 1$			(Eq.10-5)	
V_r	25.00 kips	User input shear load (divided by 2 for double plates)		
F_u	65.00 ksi	Minimum tensile stress of material		
A_n	15.00 in ²	Net area of the plate		
Z_{net}	90.00 in ³	Plastic modulus of net section		
V_c	438.75 kips	Available shear strength (see check 'Shear Rupture')		
e_x	23.16 in	Horizontal eccentricity		
e_y	3.67 in	Vertical eccentricity		

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GL G,E double: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
M _r	145.54 kips-ft	Moment due to eccentricity = V _r *ex + P _r *ey		
M _c	365.62 kips-ft	Available moment M _c = φ*(F _u * Znet), φ=0.75		
UC	0.16	Unity check per interaction equation, (V _r /V _c) ² + (M _r /M _c) ² <= 1		
Coped Left Beam Flexural Rupture	50.00 kips	178.24 kips	0.28	PASS
R _n = F _u *S _{net} /e		φ = 0.75	(AISC 360-05 (13 th) pg 9-6)	
F _u	65.00 ksi	Minimum tensile stress of material		
S _{net}	125.68 in ³	S _{net} =I _n /Y _{max} elastic section modulus of the cross section		
e	34.38 in	Distance from the face of the cope to the point of inflection		
I _n	2394.53 in ⁴	Moment of inertia with respect to the neutral axis		
Y _{max}	19.05 in	Maximum distance from the neutral plane		
h _o	27.70 in	Overall depth of coped section		
y _c	6.70 in	Position of the neutral plane		
φR _n	178.24 kips	Coped beam flexural rupture		
Coped Left Beam Local Web Buckling	50.00 kips	164.53 kips	0.30	PASS
R _n = min(F _{cr} , F _y) * S _{net} /e		φ = 0.9	(AISC 14 th Eq. 9-7)	
F _{cr}	75.83 ksi	Available buckling F _{cr} =π ² *E*(t _w /h _o) ² *f*k /(12*(1-ν ²))		
F _y	50.00 ksi	Minimum yield stress of material		
S _{net}	125.68 in ³	S _{net} =I _n /Y _{max} elastic section modulus of the cross section		
e	34.38 in	Distance from the face of the cope to the point of inflection		
E	29000.00 ksi	Modulus of elasticity of steel		
t _w	0.65 in	Beam web thickness		
h _o	27.70 in	Reduced beam depth		
ν	0.30	Poisson's ratio		
f	1.17	Plate buckling model adjustment factor		
k	4.48	Plate buckling coefficient		
φR _n	164.53 kips	Coped beam local web buckling		
Left Beam Weld Strength	638.16 kips	708.30 kips	0.90	PASS
R _n = 2 * C ₁ * α * C * D ₁₆ * L Single Fillet		φ = 0.75		
C ₁	1.00	Electrode strength coefficient (AISC 15 th table 8-3)		
t	0.65 in	Base material thickness (left beam)		
α	1.00	Base material proration factor (re-arrangement of AISC 15 th Eqn 9-2)		
C	3.93	Eccentricity modification factor (AISC 15 th Eqn 8-21)		
D ₁₆	5.00	Weld fillet size in sixteenths of an inch		
L	24.00 in	Weld length per side		
φRn	708.30 kips	Weld strength		
Right Beam Weld Strength	638.16 kips	709.48 kips	0.90	PASS
R _n = 2 * C ₁ * α * C * D ₁₆ * L Single Fillet		φ = 0.75		
C ₁	1.00	Electrode strength coefficient (AISC 15 th table 8-3)		
t	0.65 in	Base material thickness (right beam)		
α	1.00	Base material proration factor (re-arrangement of AISC 15 th Eqn 9-2)		
C	3.94	Eccentricity modification factor (AISC 15 th Eqn 8-21)		

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GL G,E double: LRFD Results Report (continued):

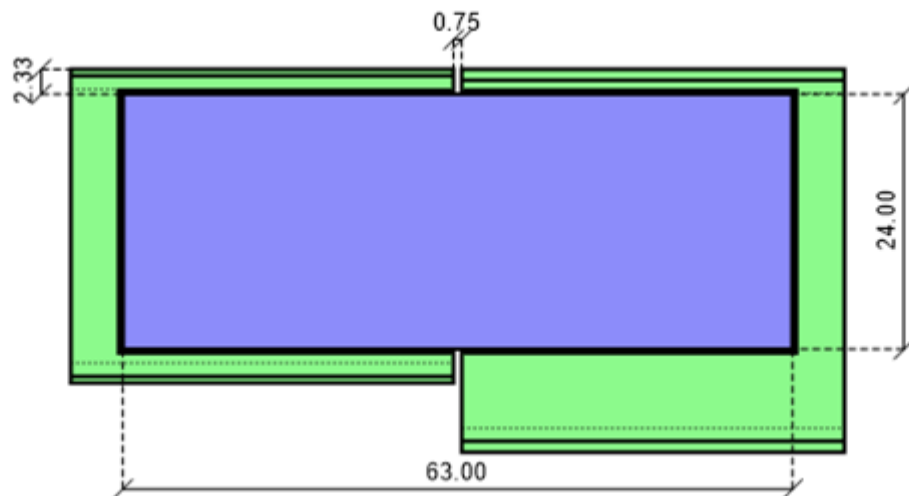
	Limit State	Required	Available	Unity Check	Result
	D ₁₆	5.00	<i>Weld fillet size in sixteenths of an inch</i>		
	L	24.00 in	<i>Weld length per side</i>		
	ϕR_n	709.48 kips	<i>Weld strength</i>		

GL G,E double: Components Report

Beam Shear Tab Splice Connection

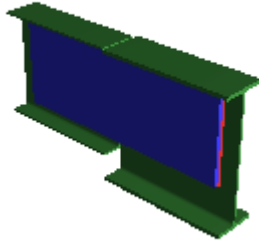
Plate		P0.62x32.00x24.00
Material		
Name	A529 Gr.50	<i>Material name</i>
F_y	50.00 ksi	<i>Minimum yield stress of material</i>
F_u	65.00 ksi	<i>Minimum tensile stress of material</i>
E	29000.00 ksi	<i>Modulus of elasticity</i>
Member Properties		
d	32.00 in	<i>Width</i>
t	0.62 in	<i>Thickness</i>
Left Beam Web Weld		E70
Weld Properties		
Type	Single Fillet	
Fillet Size	0.31 in	
Right Beam Web Weld		E70
Weld Properties		
Type	Single Fillet	
Fillet Size	0.31 in	

Side view



GL G,E single: LRFD Results Report

Beam Shear Tab Splice Connection



Material Properties:

Left Beam	W30X90	A992	$F_y = 50.00$ ksi	$F_u = 65.00$ ksi
Right Beam	W36X160	A992	$F_y = 50.00$ ksi	$F_u = 65.00$ ksi
Plate	P1.50x63.00x24	A529 Gr.50	$F_y = 50.00$ ksi	$F_u = 65.00$ ksi
	.00			

Input Data:

Shear Load	50.00 kips	User Input Shear Load
Axial Load	636.20 kips	User Input Axial Force (compression)

Note: Unless specified, all code references are from AISC 360-16

Limit State	Required	Available	Unity Check	Result
Left Beam Weld Limitations				PASS
Weld Max/Min Size, Length			(J2.2b)	
Check Weld Max Size	Pass			
D	0.38 in	Weld size		
D_{max}	1.44 in	Max Size Allowed		
t	1.50 in	Min shelf dimension		
Check Weld Min Size	Pass			
D	0.38 in	Weld size		
D_{min}	0.19 in	Min size allowed per Table J2.4		
t_{min}	0.47 in	Controlling member thickness		
Check Weld Min Length	Pass	Condition: $L_{min} \geq 4*D$ per J2.2b		
D	0.38 in	Weld size		
L_{min}	24.00 in	Min weld segment length		
Check Weld Max Length	Pass	Condition: $L_{max} \leq 100*D$		
D	0.38 in	Weld size		
L_{max}	31.12 in	Max weld segment length		
Right Beam Weld Limitations				PASS
Weld Max/Min Size, Length			(J2.2b)	
Check Weld Max Size	Pass			
D	0.38 in	Weld size		
D_{max}	1.44 in	Max Size Allowed		
t	1.50 in	Min shelf dimension		
Check Weld Min Size	Pass			
D	0.38 in	Weld size		
D_{min}	0.25 in	Min size allowed per Table J2.4		
t_{min}	0.65 in	Controlling member thickness		
Check Weld Min Length	Pass	Condition: $L_{min} \geq 4*D$ per J2.2b		
D	0.38 in	Weld size		
L_{min}	24.00 in	Min weld segment length		
Check Weld Max Length	Pass	Condition: $L_{max} \leq 100*D$		
D	0.38 in	Weld size		
L_{max}	31.12 in	Max weld segment length		

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GL G,E single: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
Plate Shear Yield	50.00 kips	1080.00 kips	0.05	PASS
$R_n = 0.6 * F_y * A_{gv}$		$\phi = 1.00$ (J4-3)		
F_y	50.00 ksi	Minimum yield stress of material		
A_{gv}	36.00 in ²	Gross area subject to shear		
ϕR_n	1080.00 kips	Shear yield strength		
Left Beam Shear Yield	50.00 kips	374.35 kips	0.13	PASS
$R_n = 0.6 * F_y * A_{gv} * C_{v1}$		$\phi = 0.90$ (G2-1)		
F_y	50.00 ksi	Minimum yield stress of material		
A_{gv}	13.86 in ²	Gross area subject to shear		
C_{v1}	1.00	Web shear coefficient (G2-3)		
ϕR_n	374.35 kips	Shear yield strength		
Right Beam Shear Yield	50.00 kips	702.00 kips	0.07	PASS
$R_n = 0.6 * F_y * A_{gv} * C_{v1}$		$\phi = 1.00$ (G2-1)		
F_y	50.00 ksi	Minimum yield stress of material		
A_{gv}	23.40 in ²	Gross area subject to shear		
C_{v1}	1.00	Web shear coefficient (G2-2)		
ϕR_n	702.00 kips	Shear yield strength		
Plate Shear Rupture at Left Beam	50.00 kips	1053.00 kips	0.05	PASS
$R_n = 0.6 * F_u * A_{nv}$		$\phi = 0.75$ (J4-4)		
F_u	65.00 ksi	Minimum tensile stress of material		
A_{nv}	36.00 in ²	Net area subject to shear		
ϕR_n	1053.00 kips	Shear rupture strength		
Plate Shear Rupture at Right Beam	50.00 kips	1053.00 kips	0.05	PASS
$R_n = 0.6 * F_u * A_{nv}$		$\phi = 0.75$ (J4-4)		
F_u	65.00 ksi	Minimum tensile stress of material		
A_{nv}	36.00 in ²	Net area subject to shear		
ϕR_n	1053.00 kips	Shear rupture strength		
Left Beam Shear Rupture	50.00 kips	405.55 kips	0.12	PASS
$R_n = 0.6 * F_u * A_{nv}$		$\phi = 0.75$ (J4-4)		
F_u	65.00 ksi	Minimum tensile stress of material		
A_{nv}	13.86 in ²	Net area subject to shear		
ϕR_n	405.55 kips	Shear rupture strength		
Right Beam Shear Rupture	50.00 kips	684.45 kips	0.07	PASS
$R_n = 0.6 * F_u * A_{nv}$		$\phi = 0.75$ (J4-4)		
F_u	65.00 ksi	Minimum tensile stress of material		
A_{nv}	23.40 in ²	Net area subject to shear		
ϕR_n	684.45 kips	Shear rupture strength		
Plate Axial Yield	636.20 kips	1620.00 kips	0.39	PASS
$R_n = F_y * A_g$		$\phi = 0.90$ (J4-1)		
F_y	50.00 ksi	Minimum yield stress of material		
A_g	36.00 in ²	Gross area subject to compression		
ϕR_n	1620.00 kips	Tensile yield strength		

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GL G,E single: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
Left Beam Axial Yield	636.20 kips	1183.50 kips	0.54	PASS
$R_n = F_y * A_g$		$\phi = 0.90$	(J4-1)	
F_y	50.00 ksi	Minimum yield stress of material		
A_g	26.30 in ²	Gross area subject to compression		
ϕR_n	1183.50 kips	Tensile yield strength		
Right Beam Axial Yield	636.20 kips	2115.00 kips	0.30	PASS
$R_n = F_y * A_g$		$\phi = 0.90$	(J4-1)	
F_y	50.00 ksi	Minimum yield stress of material		
A_g	47.00 in ²	Gross area subject to compression		
ϕR_n	2115.00 kips	Tensile yield strength		
Compression Buckling of the Plate	636.20 kips	1620.00 kips	0.39	PASS
$R_n = F_y * A_g$		$\phi = 0.9$	(J4-6)	
K	1.00	Effective length factor		
L	0.75 in	Unbraced length		
r	0.43 in	Radius of gyration		
L_c	0.75 in	Effective length, $L_c = K * L$		
L_c / r	1.73	Plate slenderness check from J4-6		
F_y	50.00 ksi	Capacity = Minimum Yield stress for $L_c / r \leq 25$		
A_g	36.00 in ²	Gross area subject to compression		
ϕR_n	1620.00 kips	Compressive strength		
Plate Flexural Yield			0.71	PASS
$(V_r / V_c)^2 + (P_r / P_c + M_r / M_c)^2 \leq 1$			(AISC 15 th Eq.10-5)	
P_r	636.20 kips	User input axial load		
V_r	50.00 kips	User input shear load		
F_y	50.00 ksi	Minimum yield stress of material		
A_g	36.00 in ²	Gross area of the plate		
Z_{pl}	216.00 in ³	Plastic modulus of the shear plate		
P_c	1620.00 kips	Available tensile strength (see check 'Axial Yield')		
V_c	1080.00 kips	Available shear strength (see check 'Shear Yield')		
e_x	40.54 in	Horizontal eccentricity		
e_y	3.67 in	Vertical eccentricity		
M_r	363.47 kips-ft	Moment due to eccentricity = $V_r * e_x + P_r * e_y$		
M_c	810.00 kips-ft	Available moment $M_c = \phi * (F_y * Z)$, $\phi = 0.90$		
UC	0.71	Unity check per interaction equation, $(V_r / V_c)^2 + (P_r / P_c + M_r / M_c)^2 \leq 1$		
Plate Flexural Rupture at Left Beam			0.17	PASS
$(V_r / V_c)^2 + (M_r / M_c)^2 \leq 1$			(Eq.10-5)	
V_r	50.00 kips	User input shear load		
F_u	65.00 ksi	Minimum tensile stress of material		
A_n	36.00 in ²	Net area of the plate		
Z_{net}	216.00 in ³	Plastic modulus of net section		
V_c	1053.00 kips	Available shear strength (see check 'Shear Rupture')		
e_x	40.54 in	Horizontal eccentricity		
e_y	3.67 in	Vertical eccentricity		

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GL G,E single: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
M_r	363.47 kips-ft	Moment due to eccentricity = $V_r * e_x + P_r * e_y$		
M_c	877.50 kips-ft	Available moment $M_c = \phi * (F_u * Z_{net})$, $\phi = 0.75$		
UC	0.17	Unity check per interaction equation, $(V_r/V_c)^2 + (M_r/M_c)^2 \leq 1$		
Left Beam Weld Strength	638.16 kips	695.75 kips	0.92	PASS
$R_n = C_1 * \alpha * C * D_{16} * L$		$\phi = 0.75$		
Single Fillet				
C_1	1.00	Electrode strength coefficient (AISC 15 th table 8-3)		
t	0.47 in	Base material thickness (left beam)		
α	1.00	Base material proration factor (re-arrangement of AISC 15 th Eqn 9-2)		
C	6.44	Eccentricity modification factor (AISC 15 th Eqn 8-21)		
D_{16}	6.00	Weld fillet size in sixteenths of an inch		
L	24.00 in	Weld length per side		
ϕR_n	695.75 kips	Weld strength		
Right Beam Weld Strength	638.16 kips	696.82 kips	0.92	PASS
$R_n = C_1 * \alpha * C * D_{16} * L$		$\phi = 0.75$		
Single Fillet				
C_1	1.00	Electrode strength coefficient (AISC 15 th table 8-3)		
t	0.65 in	Base material thickness (right beam)		
α	1.00	Base material proration factor (re-arrangement of AISC 15 th Eqn 9-2)		
C	6.45	Eccentricity modification factor (AISC 15 th Eqn 8-21)		
D_{16}	6.00	Weld fillet size in sixteenths of an inch		
L	24.00 in	Weld length per side		
ϕR_n	696.82 kips	Weld strength		

GL G,E single: Components Report

Beam Shear Tab Splice Connection

Plate			P1.50x63.00x24.00
Material			
Name	A529 Gr.50	Material name	
F _y	50.00 ksi	Minimum yield stress of material	
F _u	65.00 ksi	Minimum tensile stress of material	
E	29000.00 ksi	Modulus of elasticity	
Member Properties			
d	63.00 in	Width	
t	1.50 in	Thickness	
Left Beam Web Weld		E70	
Weld Properties			
Type	Single Fillet		
Fillet Size	0.38 in		
Right Beam Web Weld		E70	
Weld Properties			
Type	Single Fillet		
Fillet Size	0.38 in		