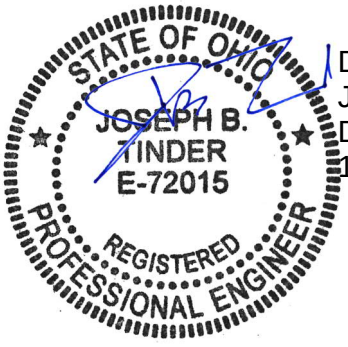
Med Rehab Hospital
Miamisburg, OH

Structural Calculations
Structural Connection Analysis

Book 1 of 1
Calculation Release #1

Prepared by
Vegazva Technologies, Inc.
Rolling Meadows, Illinois



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Joseph B. Tinder
Date: 2021.11.19
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Vegazva Technologies Inc.
3701 Algonquin Road, Suite 640
Rolling Meadows, IL 60008

Re: Med Rehab Hospital
Miamisburg, OH LEI Project No: 21210728.000

Engineer of Record or Delegated Design Reviewer:

The capacity of some connections, within the attached calculation book, is less than the required load per the engineer of record. LEI has noted these connections and we request that the engineer of record review the required load and current connection capacity. If no response is given during the review of shop drawings and calculations, then it is our understanding that the connection is structurally acceptable.

The sections of the calculations that should be reviewed are as follows:

- Conventional Single Plate Connection Analysis: See page XX/ZZ SPC1 of the calculations
- Extended Single Plate Connection Analysis: See page XX/ZZ SPE1 of the calculations
- Miscellaneous Connection Analysis: See page XX/ZZ MISC1 of the calculations

If you have any further questions regarding this matter, please feel free to contact our office.

Sincerely,

Connection Design Calculations Attached

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Design Criteria…… I to II

Conventional Single Plate Connection Analysis……. SPC1 to SPC7

Extended Single Plate Connection Analysis……. SPE1 to SPE5

Miscellaneous Connection Analysis……. MISC1

*** Shear Load required is the shear load capacity of the connection. LEI requests that the SER review that the shear load capacity of the connections is structurally acceptable. If no response is given during the review of shop drawings and calculations, then it is our understanding that the connection is structurally acceptable.

MED REHAB HOSPITAL
MIAMISBURG, OH

Design Criteria

Design Criteria

Project Information:

Project: Med Rehab Hospital
Project Location: Miamisburg, OH
Project Number: 21210728.000

Load Criteria

1. Structural calculations for shear connections based on Mound Technologies Inc drawings dated 11/15/2021.

2. Structural Loads per 2011 Ohio Building Code, Project Drawings and Specifications by BSE Structural Engineers LLC dated 03/19/2021.

3. Beam Connection designs are based on the following:
    - Capacity of the Connection

Structural Steel

1. Steel plates, shapes and bars shall meet the requirements of ASTM A-36 (F_y = 36 ksi, F_u = 58 ksi).

2. Square and rectangular steel tubes shall meet the requirements of ASTM A-500, Grade B, (F_y = 46 ksi, F_u = 58 ksi).

3. Steel members are designed per the "Manual of Steel Construction, Allowable Stress Design", Fourteenth Edition.

Fasteners, Welds & Anchors

1. Structural bolts shall be ASTM A325N at connections with diameters as shown on drawings.

2. Steel welding electrode to be minimum E70XX low hydrogen for Grade 50 steel and E70XX for Grade 36 steel.

3. All welding shall be by certified welders and shall conform to the latest "Structural Welding Code", AWS D1.1 and meet AISC minimum requirements for weld size.

4. Calculations are not performed for complete joint penetration weld connections.

5. Substitution requests for alternate products must be approved in writing by the engineer prior to use. Contractor shall provide product/technical information demonstrating that the substituted product is capable of achieving the performance values of the specified product including an icc-es report showing compliance with the relevant building code, seismic use, load resistance, installation category, in-service temperature, installation temperature, etc.

Disclaimers

1. These calculations are inclusive of revisions and markups shown in the calculation package and based on the shop drawings titled Post Acute Medical Rehab Hospital and dated 07/16/2021. See table of contents for location of markups, sketches and connection maps in the calculation package.

2. The following calculation package represents Vegazva Engineering's interpretation of the design intent of the shop drawings and specifications. Vegazva Engineering is not responsible for verification of dimensions, material take-offs, installation and coordination with other building trades. If as built conditions differ from the conditions shown in this calculation package, Vegazva Technologies, Inc. must bring these differences to the attention of Vegazva Engineering so that the as built conditions can be structurally verified.

3. The scope of this calculation package is limited to the shear connections. Steel members have not been checked by LEI except for local effects on members at HSS members, wide flange, plates, and angles. Miscellaneous steel items such as stairs, handrails, and ladders are not included.

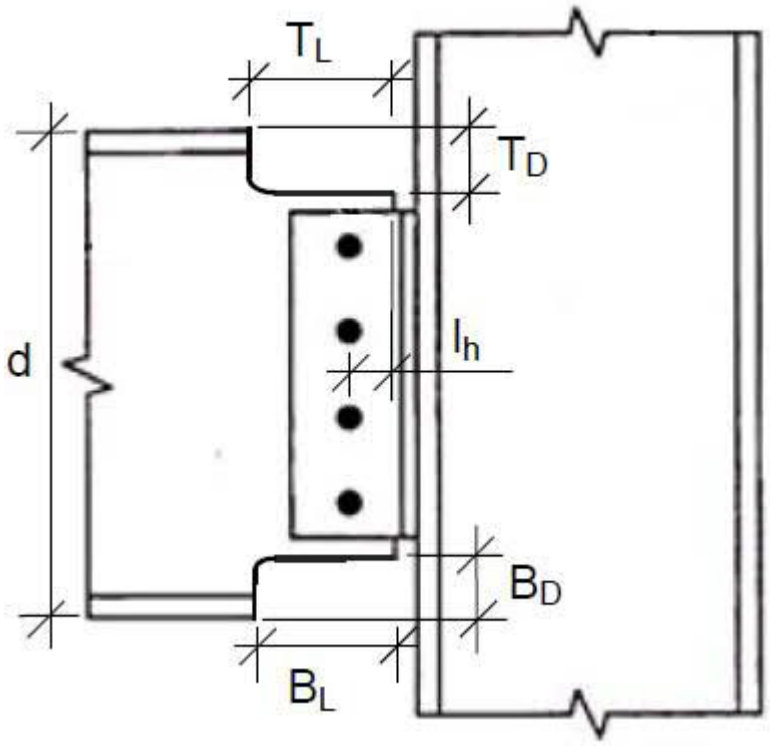
4. Shear Load required is the shear load capacity of the connection. LEI requests that the SER review that the shear load capacity of the connections is structurally acceptable. If no response is given during the review of shop drawings and calculations, then it is our understanding that the connection is structurally acceptable.

MED REHAB HOSPITAL
MIAMISBURG, OH

Conventional Single Plate Connection Analysis

MED REHAB HOSPITAL
MIAMISBURG, OH

CONVENTIONAL SINGLE PLATE CONNECTION



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NOTE: These sheets are example calculations of the tabulated sheets to follow. See the following section for the remainder of the connection calculations.

DESIGN CHECK SUMMARY:

Check Gross Shear Yielding in Web (per J4-2a):
Rn=0.6FyAg

Check Net Shear Rupture in Web (per J4-2b):
Rn=0.6FuAn

Check Block Shear in Web (per J4-3):
Rn=0.6FuAnv+UbsFuAnt ≤ 0.6FyAgv+UbsFuAnt

Check Flexural Rupture Strength in Web:
Mn=Fu*Snet

Check Flexural Local Buckling Strength in Web (per 9-14): Mn=Fcr*Snet

Check Gross Shear Yielding in Single-Plate Conn (per J4-2a): Rn=0.6*Fy*Ag

Check Net Shear Rupture in Single-Plate Conn (per J4-2b): Rn=0.6*Fu*Anv

Check Block Shear in Single-Plate Conn (per J4-3): Rn=0.6*Fu*Anv+Ubs*Fu*Ant ≤ 0.6*Fy*Agv+Ubs*Fu*Ant

Check Bolt Bearing in Single-Plate Conn (per J3-10): Rn=1.2*Lc*t*Fu ≤ 2.4*d*t*Fu

Check Weld Shear on Single-Plate Conn (per Table 2.5): Rn=0.6*Fexx*2^(1/2)/2*(D/16)*L

Check Bolt Bearing on Beam Web (per J3-10): Rn=1.2*Lc*t*Fu ≤ 2.4*d*t*Fu

Check Bolt Shear:
Rn=Fnv*Ab

Plate Yield Strength:	$Fy_p := 36ksi$
Plate Tensile Strength:	$Fu_p := 58ksi$
Beam Yield Strength:	$Fy_b := 50ksi$
Beam Tensile Strength:	$Fu_b := 65ksi$
Plate Width:	$Pl_w := 3.5 \cdot in$
Plate Thickness:	$t_p := 0.375 \cdot in$
Plate Height:	$Pl_h := 14.5 \cdot in$
Weld Thickness:	$W_t := 0.25 \cdot in$
Bolt Eccentricity:	$a := 2.25 \cdot in$
Bolt Diameter:	$Bolt_{dia} := 0.75in$
Weld Electrode:	$F_{EXX} := 70ksi$
Weld Size:	$D_w := 0.25in$

Check Gross Shear Yielding in Web (per J4-2a): $\Omega_1 := 1.5$
Rn=0.6FyAg

		Top Cope		Bottom Cope	
Beam Depth:	$d := 17.7 \cdot in$	Depth:	$T_D := 1.1875 \cdot in$	Depth:	$B_D := 1.1875 \cdot in$
Beam Web Thickness:	$t_w := 0.3 \cdot in$	Length:	$T_L := 4.8125 \cdot in$	Length:	$B_L := 3.5625 \cdot in$

Web Gross Depth: $d_{gross} := d - T_D - B_D = 15.325 \cdot in$

Gross Web Area: $A_g := d_{gross} \cdot t_w = 4.598 \cdot in^2$

Shear Yielding: $Rn_1 := \frac{(0.6 \cdot Fy_b \cdot A_g)}{\Omega_1} = 91.95 \cdot kip$

Check Net Shear Rupture in Web (per J4-2b): $\Omega_2 := 2.0$
Rn=0.6FuAn

		Top Cope		Bottom Cope	
Beam Depth:	$d = 17.7 \cdot in$	Depth:	$T_D = 1.188 \cdot in$	Depth:	$B_D = 1.188 \cdot in$
Beam Web Thickness:	$t_w = 0.3 \cdot in$	Length:	$T_L = 4.813 \cdot in$	Length:	$B_L = 3.563 \cdot in$
Number of Bolts:	$Blt_n := 5$	Hole Size:	$H_d := 0.875 \cdot in$		

Web Net Depth: $d_{net} := d - T_D - B_D - H_d \cdot Blt_n = 10.95 \cdot in$

Net Web Area: $A_n := d_{net} \cdot t_w = 3.285 \cdot in^2$

Shear Rupture: $Rn_2 := \frac{(0.6 \cdot Fu_b \cdot A_n)}{\Omega_2} = 64.058 \cdot kip$

Check Block Shear in Web (per J4-3): $\Omega_3 := 2.0$
Rn=0.6FuAnv+UbsFuAnt ≤ 0.6FyAgv+UbsFuAnt

		Top Cope		Bottom Cope	
Beam Depth:	$d = 17.7 \cdot in$	Depth:	$T_D = 1.188 \cdot in$	Depth:	$B_D = 1.188 \cdot in$
Beam Web Thickness:	$t_w = 0.3 \cdot in$	Length:	$T_L = 4.813 \cdot in$	Length:	$B_L = 3.563 \cdot in$
Distance to first bolt to top of beam:	$h_{bolt} := 3.0625 \cdot in$		$U_{bs} := 1$		
Distance to first bolt to end of beam:	$l_{hb} := 1.4375 \cdot in$	Bolt Spacing:	$s_b := 3in$	$l_{vb} := h_{bolt} - T_D = 1.875 \cdot in$	

Shear Gross Web Area: $A_{gv} := \left[l_{vb} + \left(Blt_n - 1\right) \cdot s_b\right] \cdot t_w = 4.162 \cdot in^2$

Shear Net Web Area: $A_{nv} := A_{gv} - \left[\left(Blt_n - 0.5\right) \cdot \left(H_d\right) \cdot t_w\right] = 2.981 \cdot in^2$

Tension Net Web Area: $A_{nt} := \left[l_{hb} - \left(0.5 \cdot H_d\right)\right] \cdot t_w = 0.3 \cdot in^2$

Block Shear: $Rn_3 := \frac{\min\left[\left(0.6 \cdot Fu_b \cdot A_{nv} + U_{bs} \cdot Fu_b \cdot A_{nt}\right), \left(0.6 \cdot Fy_b \cdot A_{gv} + U_{bs} \cdot Fu_b \cdot A_{nt}\right)\right]}{\Omega_3}$

$Rn_3 = 67.884 \cdot kip$

Check Flexural Rupture Strength in Web: $\Omega_4 := 2.0$
Mn=Fu*Snet

Moment Arm: $e_{arm} := \max\left(T_L, B_L\right) = 4.813 \cdot in$

Web Net Depth: $d_{gross} := d - T_D - B_D = 15.325 \cdot in$

$S_{net} := \frac{\left(d_{gross}^2 \cdot t_w\right)}{6} = 11.743 \cdot in^3$

Flexural Rupture: $Rn_4 := \frac{\left(Fu_b \cdot S_{net}\right)}{e_{arm} \cdot \Omega_4} = 79.302 \cdot kip$

Check Flexural Local Buckling Strength in Web (per 9-14): Mn=Fcr*Snet

$\Omega_5 := 1.67$

Web Gross Depth: $d_{gross} = 15.325 \cdot in$

$$\lambda := \frac{\left(d_{gross} \cdot \sqrt{\frac{Fy_b}{ksi}}\right)}{10 \cdot t_w \cdot \sqrt{475 + 280 \cdot \left(\frac{d_{gross}}{\min(T_L, B_L)}\right)^2}} = 0.48 \qquad Q := 1.0$$

$F_{cr} := Q \cdot Fy_b = 50 \cdot ksi$

Flexural Local Buckling: $Rn_5 := \frac{(F_{cr} \cdot S_{net})}{e_{arm} \cdot \Omega_5} = 73.056 \cdot kip$

Check Gross Shear Yielding in Single-Plate Conn (per J4-2a): Rn=0.6*Fy*Ag

$\Omega_1 := 1.5$

Gross Plate Area: $A_g := Pl_h \cdot t_p = 5.437 \cdot in^2$

Shear Yielding: $Rn_6 := \frac{(0.6 \cdot Fy_p \cdot A_g)}{\Omega_1} = 78.3 \cdot kip$

Check Net Shear Rupture in Single-Plate Conn (per J4-2b): Rn=0.6*Fu*Anv

$\Omega_2 := 2.0$

Plate Net Depth: $d_{net} := Pl_h - H_d \cdot Blt_n = 10.125 \cdot in$

Net Web Area: $A_n := d_{net} \cdot t_p = 3.797 \cdot in^2$

Shear Rupture: $Rn_7 := \frac{(0.6 \cdot Fu_p \cdot A_n)}{\Omega_2} = 66.066 \cdot kip$

Check Net Block Shear in Single-Plate Conn (per J4-3): Rn=0.6*Fu*Anv+Ubs*Fu*Ant ≤ 0.6*Fy*Agv+Ubs*Fu*Ant

$\Omega_6 := 2.0$

$$l_{vp} := \frac{\left[Pl_h - (Blt_n - 1) \cdot s_b\right]}{2} = 1.25 \cdot in \qquad l_{hp} := Pl_w - a = 1.25 \cdot in$$

Shear Gross Web Area: $A_{gv} := t_p \cdot \left[l_{vp} + (Blt_n - 1) \cdot s_b\right] = 4.97 \cdot in^2$

Shear Net Web Area: $A_{nv} := A_{gv} - \left[(Blt_n - 0.5) \cdot (H_d) \cdot t_p\right] = 3.49 \cdot in^2$

Tension Net Web Area: $A_{nt} := t_p \cdot \left[l_{hp} - \left[0.5 \cdot (H_d)\right]\right] = 0.305 \cdot in^2$

Block Shear: $Rn_8 := \frac{\min\left[\left(0.6 \cdot Fu_p \cdot A_{nv} + U_{bs} \cdot Fu_p \cdot A_{nt}\right), \left(0.6 \cdot Fy_p \cdot A_{gv} + U_{bs} \cdot Fu_p \cdot A_{nt}\right)\right]}{\Omega_6} = 62.498 \cdot kip$

$Rn_8 = 62.498 \cdot kip$

Check Bolt Bearing in Single-Plate Conn
(per J3-10): Rn=1.2*Lc*t*Fu ≤ 2.4*d*t*Fu

$\Omega_7 := 2.0$

Edge Distance:

$$L_h := \frac{1.2\left[l_{hp} - \left[\left(Bolt_{dia} + 0.0625in\right)\cdot 0.5\right]\right]\cdot t_p \cdot Fu_p}{\Omega_7} = 11.01\cdot kip$$

$$L_v := \frac{1.2\left[l_{vp} - \left[\left(Bolt_{dia} + 0.0625in\right)\cdot 0.5\right]\right]\cdot t_p \cdot Fu_p}{\Omega_7} = 11.01\cdot kip$$

Bolt Spacing:

$$S_p := \frac{1.2\left[s_b - \left(Bolt_{dia} + 0.0625in\right)\right]\cdot t_p \cdot Fu_p}{\Omega_7} = 28.55\cdot kip$$

$$Max := \frac{2.4\cdot Bolt_{dia}\cdot t_p \cdot Fu_p}{\Omega_7} = 19.57\cdot kip$$

Bolt Bearing in Plate: $Rn_9 := \min\left[Max\cdot Blt_n, L_v + Max\cdot\left(Blt_n - 1\right), L_v + S_p\cdot\left(Blt_n - 1\right)\right] = 89.31\cdot kip$

Check Weld Shear on Single-Plate Conn
(per Table 2.5): Rn=0.6*Fexx*2^(1/2)/2*(D/16)*L

$\Omega_8 := 2.0$

Length of weld: $L_w := Pl_h\cdot 2 = 29\cdot in$

Minimum Plate Thickness: $t_{pmin} := \frac{6.19\cdot D_w\cdot 16}{Fu_p}(ksi) = 0.427\cdot in$

Weld Shear: $$Rn_{10} := \frac{0.6\cdot F_{EXX}\cdot\frac{\sqrt{2}}{2}\cdot D_w\cdot L_w\cdot\min\left(1, \frac{t_p}{t_{pmin}}\right)}{\Omega_8} = 94.569\cdot kip$$

Check Bolt Bearing in Beam Web
(per J3-10): Rn=1.2*Lc*t*Fu ≤ 2.4*d*t*Fu

$\Omega_7 := 2.0$

Edge Distance:

$$L_h := \frac{1.2\left[l_{hb} - \left[\left(Bolt_{dia} + 0.0625in\right)\cdot 0.5\right]\right]\cdot t_w \cdot Fu_b}{\Omega_7} = 12.07\cdot kip$$

$$L_v := \frac{1.2\left[\left(h_{bolt} - T_D\right) - \left[\left(Bolt_{dia} + 0.0625in\right)\cdot 0.5\right]\right]\cdot t_w \cdot Fu_b}{\Omega_7} = 17.18\cdot kip$$

Bolt Spacing:

$$S_p := \frac{1.2\left[s_b - \left(Bolt_{dia} + 0.0625in\right)\right]\cdot t_w \cdot Fu_b}{\Omega_7} = 25.594\cdot kip$$

$$Max := \frac{2.4\cdot Bolt_{dia}\cdot t_w \cdot Fu_b}{\Omega_7} = 17.55\cdot kip$$

Bolt Bearing in Beam Web: $Rn_{11} := \min\left[Max\cdot Blt_n, L_v + Max\cdot\left(Blt_n - 1\right), L_v + S_p\cdot\left(Blt_n - 1\right)\right] = 87.384\cdot kip$

$Rn_{11} = 87.384\cdot kip$

Check Bolt Shear:
Rn=Fnv*Ab

Shear Capacity per Bolt (Table 7-1): $r_n := 11.9 \cdot kip$

$a := 2.25 \cdot in$

Design Eccentricity per Table 10-9: $e := \min\left(1.5in, \frac{a}{2}\right) = 1.125 \cdot in$

Eccentricity Coefficient per Table 7-6: $C := 4.54$

Bolt Shear: $Rn_{12} := r_n \cdot C = 54.026 \cdot kip$

CONNECTION CAPACITY: $Rn := \min\left(Rn_1, Rn_2, Rn_3, Rn_4, Rn_5, Rn_6, Rn_7, Rn_8, Rn_9, Rn_{10}, Rn_{11}, Rn_{12}\right) = 54.026 \cdot kip$

SHEET NO.	SPC1 of
PROJECT NO.	21210728.000
Shop Drawings	BY: JJG DATE: 11/19/2021

SPC-C = Single Plate Conn - Conv.
SPC-E = Single Plate Conn - Extended
DAC-B = Double Angle Conn - Bolted
DAC-W = Double Angle Conn - Welded

Beam Group: 1

								Analysis Results		
Beam Piece Mark	Beam Size	Fy (ksi)	Shear Load Per EOR (k)	Shear Type	Bolt Dia. (in)	Bolt Type	Connection Capacity (k)	End Condition	NG = No Good or OK	Remarks
A	W18X35	50	0	single	0.75	A325-N	54.0	SPC-C	OK	***
B	W16X26	50	0	single	0.75	A325-N	41.4	SPC-C	OK	***
C	W21X44	50	0	single	1	A325-N	79.4	SPC-C	OK	***
D	W21X44	50	0	single	1	A325-N	67.6	SPC-C	OK	***
E	W27X84	50	0	single	1	A325-N	85.6	SPC-C	OK	***
F	W21X55	50	0	single	1	A325-N	89.4	SPC-C	OK	***
G	W18X35	50	0	single	0.75	A325-N	41.4	SPC-C	OK	***
H	W18X40	50	0	single	0.75	A325-N	54.0	SPC-C	OK	***
I	W27X84	50	0	single	1	A325-N	133.6	SPC-C	OK	***
J	W16X31	50	0	single	0.75	A325-N	41.4	SPC-C	OK	***
354B2	W21X68	50	0	single	1	A325-N	89.4	SPC-C	OK	***
367B3	W18X50	50	0	single	0.75	A325-N	54.0	SPC-C	OK	***
K	W12X26	50	0	single	0.75	A325-N	28.8	SPC-C	OK	***
363B4-L	W30X90	50	0	single	1	A325-N	101.1	SPC-C	OK	***
364B4/365B1	W27X94	50	0	single	1	A325-N	88.9	SPC-C	OK	***
366B1	W21X62	50	0	single	1	A325-N	76.7	SPC-C	OK	***
L	W21X44	50	0	single	1	A325-N	52.2	SPC-C	OK	***
349B1-L	W18X35	50	0	single	0.75	A325-N	54.0	SPC-C	OK	***
361B2-L	W27X84	50	0	single	1	A325-N	139.7	SPC-C	OK	***
M	W16X26	50	0	single	0.75	A325-N	41.4	SPC-C	OK	***
0	0	0	0		0	0	#N/A	SPC-C	#N/A	
0	0	0	0		0	0	#N/A	SPC-C	#N/A	
0	0	0	0		0	0	#N/A	SPC-C	#N/A	
0	0	0	0		0	0	#N/A	SPC-C	#N/A	
0	0	0	0		0	0	#N/A	SPC-C	#N/A	

Beam Groups:

A: 337B1/337B2/338B1/338B2/338B3/339B2/341B1/341B2/346B4/347B1/347B2/347B3/347B4/348B1/348B2/348B3-L/348B4/349B1-R/349B2/349B3-L/349B4/350B1/350B2/350B3-L/359B1/360B3/364B3/364B5-R/364B6-L/364B7/367B5/367B6/368B7/370B4/371B1/371B2/371B3/371B4/372B1/372B2/372B4-R/373B1/373B3/373B2/373B4/374B1/374B2/374B4/374B3/374B5/375B1/375B3/375B4/375B5/376B1-L/376B2-L/376B3/376B4/377B1/377B2/377B3/377B4/378B1/378B3/378B2/378B4/379B1/379B2-R/379B3/379B4/380B1/38/383B40B2/380B4-L/380B3/381B1/381B2/381B4-R/381B3/382B1-L/382B2-L/382B3/382B4/383B1/383B2/383B4/383B3/384B2/396B3/397B2/400B4-L

B: 337B4/340B3/345B1/345B2/345B3/345B4/346B1/346B2/346B3/351B1/351B2/359B2/371B5/384B3/385B1/385B2/385B3/385B4-L/386B1/386B3-R/386B2/386B4-R/387B1/387B3/387B2/387B4/388B1/388B2/388B3/388B4/389B1/389B2/389B4/398B2/399B2/399B3/399B4/400B1/400B2/400B3

C: 337B3/339B3/339B4-L/340B1/341B3/351B4/352B1/352B2/352B3/352B4/353B1/353B2/353B3/353B4/353B5/365B3/365B4-L/366B3-L/366B2-L/366B4/367B1-L/367B2-L/390B5/391B6-L/397B3L/398B1-L

D: 339B4-R/365B4-R/366B3-R/366B2-R/367B2-R/368B6-R/391B5-R/397B3-R/398B1-R

E: 338B6/354B4/354B3/355B1/355B2/355B3/355B4/357B3/362B1

F: 339B1/354B1/392B6

G: 364B5-L/364B6-R/375B2-L/381B4-L/382B1-R/382B2-R/396B2/396B4/400B4-R

H: 367B4-L/368B1/368B2/368B3-L/368B4-L/368B5-L/369B3/369B2/369B1/370B1/370B3/388B5/390B6/397B4-L/398B4/399B1

I: 342B1/356B1/356B2/356B3/356B4/357B1/357B4/358B2/358B3/358B1/359B4/359B3/360B1/360B2/360B4/361B1/361B2-R/361B3/362B4/362B3/362B2-L/363B1/363B2/363B3/364B1-L/364B2/365B2-R/370B5/392V5-L/393B5/393B6/394B5/394B6/395B3

J: 384B1/395B1/398B3

K: 351B3-R/372B3-R/390B1-R/396B1-R/397B1-R

L: 367B1-R/368B6-L/391B5-L/391B6-R

M: 386B3-L/386B4-L

Steel Beam Web Analysis **Beam Group: 1**

Check Bolt Shear Capacity
See Summary of Beam Pieces

Check Gross Shear Yielding in Beam Web **Ω= 1.50**
Per (J4-2a) Rn/Ω or ØRn, Rn=0.6*Fy*Ag

Piece Mark	Beam Size	Beam Depth (in)	tw (in)	Top Cope Depth (in)	Top Cope Length (in)	Bottom Cope Depth (in)	Bottom Cope Length (in)	Gross Web Depth (in)	Fy (ksi)	Agv (in^2)	Rn/Ω (kips)	Va (kips)	Check
A	W18X35	17.7	0.300	1.1875	4.8125	1.1875	3.5625	15.325	50	4.60	91.95	0	OK
B	W16X26	15.7	0.250	1.1875	4.9375	1.125	2.625	13.3875	50	3.35	66.94	0	OK
C	W21X44	20.7	0.350	1.1875	5.25	1.125	3.1875	18.3875	50	6.44	128.71	0	OK
D	W21X44	20.7	0.350	1.0625	3.6875	3.8125	3.5625	15.825	50	5.54	110.78	0	OK
E	W27X84	26.7	0.460	0	0	0	0	26.7	50	12.28	245.64	0	OK
F	W21X55	20.8	0.375	1.25	4.75	0	0	19.55	50	7.33	146.63	0	OK
G	W18X35	17.7	0.300	1.1875	2.625	3	2.75	13.5125	50	4.05	81.08	0	OK
H	W18X40	17.9	0.315	1.3125	4.8125	1.1875	3.625	15.4	50	4.85	97.02	0	OK
I	W27X84	26.7	0.460	1.6875	4.75	1.625	4.75	23.3875	50	10.76	215.17	0	OK
J	W16X31	15.9	0.275	1.1875	4	0	0	14.7125	50	4.05	80.92	0	OK
354B2	W21X68	21.1	0.430	0	0	0	0	21.1	50	9.07	181.46	0	OK
367B3	W18X50	18	0.355	0	0	0	0	18	50	6.39	127.80	0	OK
K	W12X26	12.2	0.230	1.0625	3.375	0	0	11.1375	50	2.56	51.23	0	OK
363B4-L	W30X90	29.5	0.470	0	0	0	0	29.5	50	13.87	277.30	0	OK
364B4/365B1	W27X94	26.9	0.490	0	0	0	0	26.9	50	13.18	263.62	0	OK
366B1	W21X62	21	0.400	1.25	2	0	0	19.75	50	7.90	158.00	0	OK
L	W21X44	20.7	0.350	1.0625	2.625	5.875	2.5	13.7625	50	4.82	96.34	0	OK
349B1-L	W18X35	17.7	0.300	1.125	6.6875	0	0	16.575	50	4.97	99.45	0	OK
361B2-L	W27X84	26.7	0.460	1.625	4.1875	1.625	4.1875	23.45	50	10.79	215.74	0	OK
M	W16X26	15.7	0.250	0.9375	3.125	0	0	14.7625	50	3.69	73.81	0	OK
0	0	#N/A	#N/A	0	0	0	0	#N/A	0	#N/A	#N/A	0	#N/A
0	0	#N/A	#N/A	0	0	0	0	#N/A	0	#N/A	#N/A	0	#N/A
0	0	#N/A	#N/A	0	0	0	0	#N/A	0	#N/A	#N/A	0	#N/A
0	0	#N/A	#N/A	0	0	0	0	#N/A	0	#N/A	#N/A	0	#N/A
0	0	#N/A	#N/A	0	0	0	0	#N/A	0	#N/A	#N/A	0	#N/A

Note: Fu is based on Fy of Section.

Check Net Shear Rupture in Web **Ω= 2.00**
Per (J4-2b) Rn/Ω or ØRn, Rn=0.6*Fu*Anv

Piece Mark	Beam Size	Beam Depth (in)	tw (in)	Top Cope Depth (in)	Top Cope Length (in)	Bottom Cope Depth (in)	Bottom Cope Length (in)	# of Bolts	Bolt Diam (in)	Net Web Depth (in)	Fu (ksi)	Anv (in^2)	Rn/Ω (kips)	Va (kips)	Check
A	W18X35	17.7	0.300	1.1875	4.8125	1.1875	3.5625	5	0.75	10.95	65	3.29	64.06	0.00	OK
B	W16X26	15.7	0.250	1.1875	4.9375	1.125	2.625	4	0.75	9.8875	65	2.47	48.20	0.00	OK
C	W21X44	20.7	0.350	1.1875	5.25	1.125	3.1875	6	1	11.6375	65	4.07	79.43	0.00	OK
D	W21X44	20.7	0.350	1.0625	3.6875	3.8125	3.5625	5	1	10.2	65	3.57	69.62	0.00	OK
E	W27X84	26.7	0.460	0	0	0	0	7	1	18.825	65	8.66	168.86	0.00	OK
F	W21X55	20.8	0.375	1.25	4.75	0	0	6	1	12.8	65	4.80	93.60	0.00	OK
G	W18X35	17.7	0.300	1.1875	2.625	3	2.75	4	0.75	10.0125	65	3.00	58.57	0.00	OK
H	W18X40	17.9	0.315	1.3125	4.8125	1.1875	3.625	5	0.75	11.025	65	3.47	67.72	0.00	OK
I	W27X84	26.7	0.460	1.6875	4.75	1.625	4.75	7	1	15.5125	65	7.14	139.15	0.00	OK
J	W16X31	15.9	0.275	1.1875	4	0	0	4	0.75	11.2125	65	3.08	60.13	0.00	OK
354B2	W21X68	21.1	0.430	0	0	0	0	6	1	14.35	65	6.17	120.32	0.00	OK
367B3	W18X50	18	0.355	0	0	0	0	5	0.75	13.625	65	4.84	94.32	0.00	OK
K	W12X26	12.2	0.230	1.0625	3.375	0	0	3	0.75	8.5125	65	1.96	38.18	0.00	OK
363B4-L	W30X90	29.5	0.470	0	0	0	0	8	1	20.5	65	9.64	187.88	0.00	OK
364B4/365B1	W27X94	26.9	0.490	0	0	0	0	7	1	19.025	65	9.32	181.78	0.00	OK
366B1	W21X62	21	0.400	1.25	2	0	0	6	1	13	65	5.20	101.40	0.00	OK
L	W21X44	20.7	0.350	1.0625	2.625	5.875	2.5	4	1	9.2625	65	3.24	63.22	0.00	OK
349B1-L	W18X35	17.7	0.300	1.125	6.6875	0	0	5	0.75	12.2	65	3.66	71.37	0.00	OK
361B2-L	W27X84	26.7	0.460	1.625	4.1875	1.625	4.1875	7	1	15.575	65	7.16	139.71	0.00	OK
M	W16X26	15.7	0.250	0.9375	3.125	0	0	4	0.75	11.2625	65	2.82	54.90	0.00	OK
0	0	#N/A	#N/A	0	0	0	0	0	0	#N/A	58	#N/A	#N/A	0.00	#N/A
0	0	#N/A	#N/A	0	0	0	0	0	0	#N/A	58	#N/A	#N/A	0.00	#N/A
0	0	#N/A	#N/A	0	0	0	0	0	0	#N/A	58	#N/A	#N/A	0.00	#N/A
0	0	#N/A	#N/A	0	0	0	0	0	0	#N/A	58	#N/A	#N/A	0.00	#N/A
0	0	#N/A	#N/A	0	0	0	0	0	0	#N/A	58	#N/A	#N/A	0.00	#N/A

Steel Beam Shear Conn Calcs	SHEET NO.	SPC3	of 0
Shop Drawings	PROJECT NO	21210728.000	
	BY: JJG	DATE:	11/19/2021

Beam Group: 1

Check Block Shear in Web Ω= 2.00

Per (J4-3) Rn/Ω or ØRn, Rn=0.6*Fu*Anv+Ubs*Fu*Ant ≤ 0.6*Fy*Agv+Ubs*Fu*Ant

Ubs = 1.0

Piece Mark	Beam Size	tw (in)	dist to 1st bolt (in)	lv (in)	lh (in)	# of Bolts	Bolt Space (in)	Agv (in^2)	Anv (in^2)	Ant (in^2)	Fy (ksi)	Fu (ksi)	Rn/Ω (kips)	Va (kips)	Check
A	W18X35	0.300	3	1.8	1.5	5	3	4.14	2.96	0.32	50	65	68.13	0.00	OK
B	W16X26	0.250	3	1.8	1.5	4	3	2.70	1.94	0.27	50	65	46.41	0.00	OK
C	W21X44	0.350	3	1.8	2	6	3	5.88	3.72	0.50	50	65	88.87	0.00	OK
D	W21X44	0.350	3	1.9	1.9375	5	3	4.88	3.11	0.48	50	65	76.21	0.00	OK
E	W27X84	0.460	3.5	N/A	2	7	3	N/A	N/A	N/A	50	65	N/A	0.00	N/A
F	W21X55	0.375	3	1.8	2	6	3	6.28	3.96	0.54	50	65	94.76	0.00	OK
G	W18X35	0.300	3	1.8	1.5	4	3	3.24	2.33	0.32	50	65	55.70	0.00	OK
H	W18X40	0.315	3	1.7	1.8125	5	3	4.31	3.07	0.43	50	65	73.97	0.00	OK
I	W27X84	0.460	3.5	1.8	2	7	3	9.11	5.75	0.66	50	65	133.62	0.00	OK
J	W16X31	0.275	3	1.8	1.5	4	3	2.97	2.13	0.29	50	65	51.06	0.00	OK
354B2	W21X68	0.430	3	N/A	2	6	3	N/A	N/A	N/A	50	65	N/A	0.00	N/A
367B3	W18X50	0.355	3	N/A	1.5	5	3	N/A	N/A	N/A	50	65	N/A	0.00	N/A
K	W12X26	0.230	3	1.9	1.6875	3	3	1.83	1.32	0.29	50	65	35.13	0.00	OK
363B4-L	W30X90	0.470	3.5	N/A	2	8	3	N/A	N/A	N/A	50	65	N/A	0.00	N/A
364B4/365B1	W27X94	0.490	3.5	N/A	2	7	3	N/A	N/A	N/A	50	65	N/A	0.00	N/A
366B1	W21X62	0.400	3	1.8	2	6	3	6.70	4.23	0.58	50	65	101.08	0.00	OK
L	W21X44	0.350	3	1.9	2	4	3	3.83	2.45	0.50	50	65	64.13	0.00	OK
349B1-L	W18X35	0.300	3	1.9	2.625	5	3	4.16	2.98	0.66	50	65	79.46	0.00	OK
361B2-L	W27X84	0.460	3.5	1.9	2.75	7	3	9.14	5.78	1.01	50	65	145.39	0.00	OK
M	W16X26	0.250	3	2.1	2.625	4	3	2.77	2.00	0.55	50	65	56.77	0.00	OK
0	0	#N/A	0	N/A	0	0	0	N/A	N/A	N/A	0	58	N/A	0.00	N/A
0	0	#N/A	0	N/A	0	0	0	N/A	N/A	N/A	0	58	N/A	0.00	N/A
0	0	#N/A	0	N/A	0	0	0	N/A	N/A	N/A	0	58	N/A	0.00	N/A
0	0	#N/A	0	N/A	0	0	0	N/A	N/A	N/A	0	58	N/A	0.00	N/A
0	0	#N/A	0	N/A	0	0	0	N/A	N/A	N/A	0	58	N/A	0.00	N/A

Check Flexural Rupture Strength in Web Ω= 2.00

Note: Fu is based on Fy of Section.

Mn/Ω or ØMn, Mn = Fu*Snet

Piece Mark	Beam Size	Va (kips)	lh (in)	Moment Arm (in)	Ma (kip-in)	Gross Web Depth (in)	tw (in)	Snet (web) (in^3)	Fu (ksi)	Mn/Ω (kip-in)	Ma (kip-in)	Check
A	W18X35	0.00	1.5	4.8125	0.00	15.325	0.300	11.74	65	381.6	0.0	N/A
B	W16X26	0.00	1.5	4.9375	0.00	13.3875	0.250	7.47	65	242.7	0.0	N/A
C	W21X44	0.00	2	5.25	0.00	18.3875	0.350	19.72	65	641.0	0.0	N/A
D	W21X44	0.00	1.9375	3.6875	0.00	15.825	0.350	14.61	65	474.8	0.0	N/A
E	W27X84	0.00	2	0	0.00	26.7	0.460	N/A	65	N/A	0.0	N/A
F	W21X55	0.00	2	4.75	0.00	19.55	0.375	23.89	65	776.3	0.0	N/A
G	W18X35	0.00	1.5	2.75	0.00	13.5125	0.300	9.13	65	296.7	0.0	N/A
H	W18X40	0.00	1.8125	4.8125	0.00	15.4	0.315	12.45	65	404.7	0.0	N/A
I	W27X84	0.00	2	4.75	0.00	23.3875	0.460	41.93	65	1362.9	0.0	N/A
J	W16X31	0.00	1.5	4	0.00	14.7125	0.275	9.92	65	322.4	0.0	N/A
354B2	W21X68	0.00	2	0	0.00	21.1	0.430	N/A	65	N/A	0.0	N/A
367B3	W18X50	0.00	1.5	0	0.00	18	0.355	N/A	65	N/A	0.0	N/A
K	W12X26	0.00	1.6875	3.375	0.00	11.1375	0.230	4.76	65	154.5	0.0	N/A
363B4-L	W30X90	0.00	2	0	0.00	29.5	0.470	N/A	65	N/A	0.0	N/A
364B4/365B1	W27X94	0.00	2	0	0.00	26.9	0.490	N/A	65	N/A	0.0	N/A
366B1	W21X62	0.00	2	2	0.00	19.75	0.400	26.00	65	845.1	0.0	N/A
L	W21X44	0.00	2	2.625	0.00	13.7625	0.350	11.05	65	359.1	0.0	N/A
349B1-L	W18X35	0.00	2.625	6.6875	0.00	16.575	0.300	13.74	65	446.4	0.0	N/A
361B2-L	W27X84	0.00	2.75	4.1875	0.00	23.45	0.460	42.16	65	1370.2	0.0	N/A
M	W16X26	0.00	2.625	3.125	0.00	14.7625	0.250	9.08	65	295.1	0.0	N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	N/A	58	N/A	0.0	N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	N/A	58	N/A	0.0	N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	N/A	58	N/A	0.0	N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	N/A	58	N/A	0.0	N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	N/A	58	N/A	0.0	N/A

Beam Group: 1

Conventional Configuration Single-Plate Shear Connection Analysis

Check Flexural Local Buckling Strength in Web Ω= 1.67

Mn/Ω or ØMn, Mn = Fcr*Snet ***Fcr = Fy*Q***

Piece Mark	Beam Size	Va (kips)	lh (in)	Moment Arm (in)	Ma (kip-in)	Gross Web Depth (in)	tw (in)	Snet (web) (in^3)	Fy (ksi)	λ	Q	Mn/Ω (kip-in)	Ma (kip-in)	Check
A	W18X35	0.00	1.5	4.8125	0.00	15.325	0.300	11.74	50	0.63	1.00	351.6	0.0	OK
B	W16X26	0.00	1.5	4.9375	0.00	13.3875	0.250	7.47	50	0.75	0.97	217.9	0.0	OK
C	W21X44	0.00	2	5.25	0.00	18.3875	0.350	19.72	50	0.59	1.00	590.5	0.0	OK
D	W21X44	0.00	1.9375	3.6875	0.00	15.825	0.350	14.61	50	0.43	1.00	437.4	0.0	OK
E	W27X84	0.00	2	0	0.00	26.7	0.460	54.65	50	N/A	N/A	N/A	N/A	N/A
F	W21X55	0.00	2	4.75	0.00	19.55	0.375	23.89	50	0.51	1.00	715.2	0.0	OK
G	W18X35	0.00	1.5	2.75	0.00	13.5125	0.300	9.13	50	0.37	1.00	273.3	0.0	OK
H	W18X40	0.00	1.8125	4.8125	0.00	15.4	0.315	12.45	50	0.60	1.00	372.8	0.0	OK
I	W27X84	0.00	2	4.75	0.00	23.3875	0.460	41.93	50	0.42	1.00	1255.5	0.0	OK
J	W16X31	0.00	1.5	4	0.00	14.7125	0.275	9.92	50	0.58	1.00	297.0	0.0	OK
354B2	W21X68	0.00	2	0	0.00	21.1	0.430	31.91	50	N/A	N/A	N/A	N/A	N/A
367B3	W18X50	0.00	1.5	0	0.00	18	0.355	19.17	50	N/A	N/A	N/A	N/A	N/A
K	W12X26	0.00	1.6875	3.375	0.00	11.1375	0.230	4.76	50	0.58	1.00	142.4	0.0	OK
363B4-L	W30X90	0.00	2	0	0.00	29.5	0.470	68.17	50	N/A	N/A	N/A	N/A	N/A
364B4/365B1	W27X94	0.00	2	0	0.00	26.9	0.490	59.09	50	N/A	N/A	N/A	N/A	N/A
366B1	W21X62	0.00	2	2	0.00	19.75	0.400	26.00	50	0.21	1.00	778.6	0.0	OK
L	W21X44	0.00	2	2.625	0.00	13.7625	0.350	11.05	50	0.31	1.00	330.8	0.0	OK
349B1-L	W18X35	0.00	2.625	6.6875	0.00	16.575	0.300	13.74	50	0.83	0.93	384.4	0.0	OK
361B2-L	W27X84	0.00	2.75	4.1875	0.00	23.45	0.460	42.16	50	0.37	1.00	1262.3	0.0	OK
M	W16X26	0.00	2.625	3.125	0.00	14.7625	0.250	9.08	50	0.51	1.00	271.9	0.0	OK
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	0	N/A	N/A	N/A	N/A	N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	0	N/A	N/A	N/A	N/A	N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	0	N/A	N/A	N/A	N/A	N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	0	N/A	N/A	N/A	N/A	N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	0	N/A	N/A	N/A	N/A	N/A

Check Gross Shear Yielding in Single-Plate Conn Ω= 1.50

Per (J4-2a) Rn/Ω or ØRn, Rn=0.6*Fy*Ag

Piece Mark	Beam Size	Single-Plate depth (in)	Single-Plate thk (in)	Fy (ksi)	Agv (in^2)	Rn/Ω (kips)	Va (kips)	Check
A	W18X35	14.5	0.375	36	5.44	78.30	0.00	OK
B	W16X26	11.5	0.375	36	4.31	62.10	0.00	OK
C	W21X44	18.5	0.438	36	8.09	116.55	0.00	OK
D	W21X44	14.5	0.438	36	6.34	91.35	0.00	OK
E	W27X84	21	0.375	36	7.88	113.40	0.00	OK
F	W21X55	18.5	0.438	36	8.09	116.55	0.00	OK
G	W18X35	11.5	0.375	36	4.31	62.10	0.00	OK
H	W18X40	14.5	0.375	36	5.44	78.30	0.00	OK
I	W27X84	21.5	0.625	36	13.44	193.50	0.00	OK
J	W16X31	11.5	0.375	36	4.31	62.10	0.00	OK
354B2	W21X68	18.5	0.438	36	8.09	116.55	0.00	OK
367B3	W18X50	14.5	0.375	36	5.44	78.30	0.00	OK
K	W12X26	8.5	0.375	36	3.19	45.90	0.00	OK
363B4-L	W30X90	24.5	0.375	36	9.19	132.30	0.00	OK
364B4/365B1	W27X94	21.5	0.375	36	8.06	116.10	0.00	OK
366B1	W21X62	18.5	0.375	36	6.94	99.90	0.00	OK
L	W21X44	12.5	0.375	36	4.69	67.50	0.00	OK
349B1-L	W18X35	14.5	0.375	36	5.44	78.30	0.00	OK
361B2-L	W27X84	21.5	0.625	36	13.44	193.50	0.00	OK
M	W16X26	12.5	0.375	36	4.69	67.50	0.00	OK
0	0	0	0.000	0	0.00	0.00	0.00	NG
0	0	0	0.000	0	0.00	0.00	0.00	NG
0	0	0	0.000	0	0.00	0.00	0.00	NG
0	0	0	0.000	0	0.00	0.00	0.00	NG
0	0	0	0.000	0	0.00	0.00	0.00	NG

Post Acute Medical	SHEET NO. SPC5 of 0
Steel Beam Shear Conn Calcs	PROJECT NO
Shop Drawings	BY: JJG DATE: 11/19/2021

Beam Group: 1

Conventional Configuration Single-Plate Shear Connection Analysis

Check Net Shear Rupture in Single-Plate Conn **Ω= 2.00** ***Note: Fu is based on Plate Fy.***

Per (J4-2b) Rn/Ω or ØRn, Rn=0.6*Fu*Anv

Piece Mark	Beam Size	Single-Plate depth (in)	Single-Plate thk (in)	# of Bolts	Bolt Diam (in)	Net Web Depth (in)	Fu (ksi)	Anv (in^2)	Rn/Ω (kips)	Va (kips)	Check
A	W18X35	14.5	0.375	5	0.75	10.125	58	3.80	66.07	0.00	OK
B	W16X26	11.5	0.375	4	0.75	8	58	3.00	52.20	0.00	OK
C	W21X44	18.5	0.438	6	1	11.75	58	5.14	89.45	0.00	OK
D	W21X44	14.5	0.438	5	1	8.875	58	3.88	67.56	0.00	OK
E	W27X84	21	0.375	7	1	13.125	58	4.92	85.64	0.00	OK
F	W21X55	18.5	0.438	6	1	11.75	58	5.14	89.45	0.00	OK
G	W18X35	11.5	0.375	4	0.75	8	58	3.00	52.20	0.00	OK
H	W18X40	14.5	0.375	5	0.75	10.125	58	3.80	66.07	0.00	OK
I	W27X84	21.5	0.625	7	1	13.625	58	8.52	148.17	0.00	OK
J	W16X31	11.5	0.375	4	0.75	8	58	3.00	52.20	0.00	OK
354B2	W21X68	18.5	0.438	6	1	11.75	58	5.14	89.45	0.00	OK
367B3	W18X50	14.5	0.375	5	0.75	10.125	58	3.80	66.07	0.00	OK
K	W12X26	8.5	0.375	3	0.75	5.875	58	2.20	38.33	0.00	OK
363B4-L	W30X90	24.5	0.375	8	1	15.5	58	5.81	101.14	0.00	OK
364B4/365B1	W27X94	21.5	0.375	7	1	13.625	58	5.11	88.90	0.00	OK
366B1	W21X62	18.5	0.375	6	1	11.75	58	4.41	76.67	0.00	OK
L	W21X44	12.5	0.375	4	1	8	58	3.00	52.20	0.00	OK
349B1-L	W18X35	14.5	0.375	5	0.75	10.125	58	3.80	66.07	0.00	OK
361B2-L	W27X84	21.5	0.625	7	1	13.625	58	8.52	148.17	0.00	OK
M	W16X26	12.5	0.375	4	0.75	9	58	3.38	58.73	0.00	OK
0	0	0	0.000	0	0	0	58	0.00	0.00	0.00	NG
0	0	0	0.000	0	0	0	58	0.00	0.00	0.00	NG
0	0	0	0.000	0	0	0	58	0.00	0.00	0.00	NG
0	0	0	0.000	0	0	0	58	0.00	0.00	0.00	NG
0	0	0	0.000	0	0	0	58	0.00	0.00	0.00	NG

Check Block Shear in Single-Plate Conn **Ω= 2.00**

Per (J4-3) Rn/Ω or ØRn, Rn=0.6*Fu*Anv+Ubs*Fu*Ant ≤ 0.6*Fy*Agv+Ubs*Fu*Ant Ubs = 1.0

Piece Mark	Beam Size	Single-Plate thk (in)	lv (in)	lh (in)	# of Bolts	Bolt Space (in)	Agv (in^2)	Anv (in^2)	Ant (in^2)	Fy (ksi)	Fu (ksi)	Rn/Ω (kips)	Va (kips)	Check
A	W18X35	0.375	1.3	1.25	5	3	4.97	3.49	0.30	36	58	62.50	0.00	OK
B	W16X26	0.375	1.3	1.25	4	3	3.84	2.70	0.30	36	58	50.35	0.00	OK
C	W21X44	0.438	1.8	1.75	6	3	7.33	4.62	0.52	36	58	94.21	0.00	OK
D	W21X44	0.438	1.3	1.75	5	3	5.80	3.58	0.52	36	58	77.39	0.00	OK
E	W27X84	0.375	1.5	1.5	7	3	7.31	4.57	0.35	36	58	89.17	0.00	OK
F	W21X55	0.438	1.8	1.75	6	3	7.33	4.62	0.52	36	58	94.21	0.00	OK
G	W18X35	0.375	1.3	1.25	4	3	3.84	2.70	0.30	36	58	50.35	0.00	OK
H	W18X40	0.375	1.3	1.25	5	3	4.97	3.49	0.30	36	58	62.50	0.00	OK
I	W27X84	0.625	1.8	1.75	7	3	12.34	7.77	0.74	36	58	154.84	0.00	OK
J	W16X31	0.375	1.3	1.25	4	3	3.84	2.70	0.30	36	58	50.35	0.00	OK
354B2	W21X68	0.438	1.8	1.75	6	3	7.33	4.62	0.52	36	58	94.21	0.00	OK
367B3	W18X50	0.375	1.3	1.25	5	3	4.97	3.49	0.30	36	58	62.50	0.00	OK
K	W12X26	0.375	1.3	1.25	3	3	2.72	1.90	0.30	36	58	38.20	0.00	OK
363B4-L	W30X90	0.375	1.8	1.75	8	3	8.53	5.37	0.45	36	58	105.05	0.00	OK
364B4/365B1	W27X94	0.375	1.8	1.75	7	3	7.41	4.66	0.45	36	58	92.90	0.00	OK
366B1	W21X62	0.375	1.8	1.75	6	3	6.28	3.96	0.45	36	58	80.75	0.00	OK
L	W21X44	0.375	1.8	1.75	4	3	4.03	2.55	0.45	36	58	56.45	0.00	OK
349B1-L	W18X35	0.375	1.3	1.5	5	3	4.97	3.49	0.40	36	58	65.22	0.00	OK
361B2-L	W27X84	0.625	1.8	2	7	3	12.34	7.77	0.90	36	58	159.37	0.00	OK
M	W16X26	0.375	1.8	1.5	4	3	4.03	2.88	0.40	36	58	55.09	0.00	OK
0	0	0.000	0.0	0	0	0	0.00	0.00	0.00	0	58	0.00	0.00	NG
0	0	0.000	0.0	0	0	0	0.00	0.00	0.00	0	58	0.00	0.00	NG
0	0	0.000	0.0	0	0	0	0.00	0.00	0.00	0	58	0.00	0.00	NG
0	0	0.000	0.0	0	0	0	0.00	0.00	0.00	0	58	0.00	0.00	NG
0	0	0.000	0.0	0	0	0	0.00	0.00	0.00	0	58	0.00	0.00	NG

Beam Group: 1

Conventional Configuration Single-Plate Shear Connection Analysis

Check Bolt Bearing on Single-Plate Conn **Ω= 2.00**

J3-10 Rn/Ω or ØRn, Rn= 1.2Lc*t*Fu<=2.4d*t*Fu

Piece Mark	Beam Size	Single-Plate thk (in)	Lc (in)	# of Bolts	Design Hole Dia (in)	Bolt Diam. (in)	Fu (ksi)	Rn/Ω (kips)	Va (kips)	Check
A	W18X35	0.375	0.84	5	0.8125	0.75	58	89.3	0.00	OK
B	W16X26	0.375	0.84	4	0.8125	0.75	58	69.7	0.00	OK
C	W21X44	0.438	1.22	6	1.0625	1	58	166.0	0.00	OK
D	W21X44	0.438	0.72	5	1.0625	1	58	128.9	0.00	OK
E	W27X84	0.375	0.97	7	1.0625	1	58	164.3	0.00	OK
F	W21X55	0.438	1.22	6	1.0625	1	58	166.0	0.00	OK
G	W18X35	0.375	0.84	4	0.8125	0.75	58	69.7	0.00	OK
H	W18X40	0.375	0.84	5	0.8125	0.75	58	89.3	0.00	OK
I	W27X84	0.625	1.22	7	1.0625	1	58	279.4	0.00	OK
J	W16X31	0.375	0.84	4	0.8125	0.75	58	69.7	0.00	OK
354B2	W21X68	0.438	1.22	6	1.0625	1	58	166.0	0.00	OK
367B3	W18X50	0.375	0.84	5	0.8125	0.75	58	89.3	0.00	OK
K	W12X26	0.375	0.84	3	0.8125	0.75	58	50.2	0.00	OK
363B4-L	W30X90	0.375	1.22	8	1.0625	1	58	192.9	0.00	OK
364B4/365B1	W27X94	0.375	1.22	7	1.0625	1	58	167.6	0.00	OK
366B1	W21X62	0.375	1.22	6	1.0625	1	58	142.3	0.00	OK
L	W21X44	0.375	1.22	4	1.0625	1	58	91.8	0.00	OK
349B1-L	W18X35	0.375	0.84	5	0.8125	0.75	58	89.3	0.00	OK
361B2-L	W27X84	0.625	1.22	7	1.0625	1	58	279.4	0.00	OK
M	W16X26	0.375	1.09	4	0.8125	0.75	58	76.3	0.00	OK
0	0	0.000	-0.06	0	0.0625	0	58	0.0	0.00	NG
0	0	0.000	-0.06	0	0.0625	0	58	0.0	0.00	NG
0	0	0.000	-0.06	0	0.0625	0	58	0.0	0.00	NG
0	0	0.000	-0.06	0	0.0625	0	58	0.0	0.00	NG
0	0	0.000	-0.06	0	0.0625	0	58	0.0	0.00	NG

Check Weld Shear on Single-Plate Conn **Ω= 2.00**

Per Table J2.5 ***Rn/Ω or ØRn, Rn=(0.6*F_{EXX})*(SQRT(2)/2)*(D/16)*L***

Piece Mark	Beam Size	Single-Plate thk (in)	Length of Weld L (in)	Weld Size D/16 in.	F_{EXX} (ksi)	Rn/Ω (kips)	Min PL thk (in)	Rn/Ω (adj) (kips)	Va (kips)	Check
A	W18X35	0.375	29.0	4	70	107.7	0.427	94.6	0.00	OK
B	W16X26	0.375	23.0	4	70	85.4	0.427	75.0	0.00	OK
C	W21X44	0.438	37.0	5	70	171.7	0.534	140.8	0.00	OK
D	W21X44	0.438	29.0	5	70	134.6	0.534	110.3	0.00	OK
E	W27X84	0.375	42.0	4	70	155.9	0.427	137.0	0.00	OK
F	W21X55	0.438	37.0	5	70	171.7	0.534	140.8	0.00	OK
G	W18X35	0.375	23.0	4	70	85.4	0.427	75.0	0.00	OK
H	W18X40	0.375	29.0	4	70	107.7	0.427	94.6	0.00	OK
I	W27X84	0.625	43.0	7	70	279.4	0.747	233.7	0.00	OK
J	W16X31	0.375	23.0	4	70	85.4	0.427	75.0	0.00	OK
354B2	W21X68	0.438	37.0	5	70	171.7	0.534	140.8	0.00	OK
367B3	W18X50	0.375	29.0	4	70	107.7	0.427	94.6	0.00	OK
K	W12X26	0.375	17.0	4	70	63.1	0.427	55.4	0.00	OK
363B4-L	W30X90	0.375	49.0	4	70	181.9	0.427	159.8	0.00	OK
364B4/365B1	W27X94	0.375	43.0	4	70	159.6	0.427	140.2	0.00	OK
366B1	W21X62	0.375	37.0	4	70	137.4	0.427	120.7	0.00	OK
L	W21X44	0.375	25.0	4	70	92.8	0.427	81.5	0.00	OK
349B1-L	W18X35	0.375	29.0	4	70	107.7	0.427	94.6	0.00	OK
361B2-L	W27X84	0.625	43.0	7	70	279.4	0.747	233.7	0.00	OK
M	W16X26	0.375	25.0	4	70	92.8	0.427	81.5	0.00	OK
0	0	0.000	0.0	0	0	0.0	0.000	#DIV/0!	0.00	#DIV/0!
0	0	0.000	0.0	0	0	0.0	0.000	#DIV/0!	0.00	#DIV/0!
0	0	0.000	0.0	0	0	0.0	0.000	#DIV/0!	0.00	#DIV/0!
0	0	0.000	0.0	0	0	0.0	0.000	#DIV/0!	0.00	#DIV/0!
0	0	0.000	0.0	0	0	0.0	0.000	#DIV/0!	0.00	#DIV/0!

Post Acute Medical	SHEET NO. SPC7 of 0
Steel Beam Shear Conn Calcs	PROJECT NO 21210728.000
Shop Drawings	BY: JJG DATE: 11/19/2021

Beam Group: 1

Check Bolt Bearing on Beam Web

J3-10 Rn/Ω or ØRn, Rn= 1.2Lc*t*Fu<=2.4d*t*Fu

Ω= 2.00

Piece Mark	Beam Size	tw (in)	Lc (in)	# of Bolts	Design Hole Diam (in)	Bolt Diam. (in)	Fu (ksi)	Rn/Ω (kips)	Va (kips)	Check
A	W18X35	0.300	1.09	5	0.8125	0.75	65	86.7	0.00	OK
B	W16X26	0.250	1.09	4	0.8125	0.75	65	57.6	0.00	OK
C	W21X44	0.350	1.28	6	1.0625	1	65	149.7	0.00	OK
D	W21X44	0.350	1.41	5	1.0625	1	65	125.0	0.00	OK
E	W27X84	0.460	1.47	7	1.0625	1	65	251.2	0.00	OK
F	W21X55	0.375	1.22	6	1.0625	1	65	159.5	0.00	OK
G	W18X35	0.300	1.09	4	0.8125	0.75	65	69.1	0.00	OK
H	W18X40	0.315	1.28	5	0.8125	0.75	65	89.5	0.00	OK
I	W27X84	0.460	1.28	7	1.0625	1	65	231.5	0.00	OK
J	W16X31	0.275	1.09	4	0.8125	0.75	65	63.3	0.00	OK
354B2	W21X68	0.430	1.47	6	1.0625	1	65	201.2	0.00	OK
367B3	W18X50	0.355	1.09	5	0.8125	0.75	65	103.8	0.00	OK
K	W12X26	0.230	1.28	3	0.8125	0.75	65	40.4	0.00	OK
363B4-L	W30X90	0.470	1.47	8	1.0625	1	65	293.3	0.00	OK
364B4/365B1	W27X94	0.490	1.47	7	1.0625	1	65	267.5	0.00	OK
366B1	W21X62	0.400	1.22	6	1.0625	1	65	170.1	0.00	OK
L	W21X44	0.350	1.41	4	1.0625	1	65	98.5	0.00	OK
349B1-L	W18X35	0.300	1.47	5	0.8125	0.75	65	87.4	0.00	OK
361B2-L	W27X84	0.460	1.34	7	1.0625	1	65	232.7	0.00	OK
M	W16X26	0.250	1.66	4	0.8125	0.75	65	58.5	0.00	OK
0	0	#N/A	-0.06	0	0.0625	0	58	#N/A	0.00	#N/A
0	0	#N/A	-0.06	0	0.0625	0	58	#N/A	0.00	#N/A
0	0	#N/A	-0.06	0	0.0625	0	58	#N/A	0.00	#N/A
0	0	#N/A	-0.06	0	0.0625	0	58	#N/A	0.00	#N/A
0	0	#N/A	-0.06	0	0.0625	0	58	#N/A	0.00	#N/A

Check Bolt Shear

Rn/Ω or ØRn, Rn= Fn*Ab

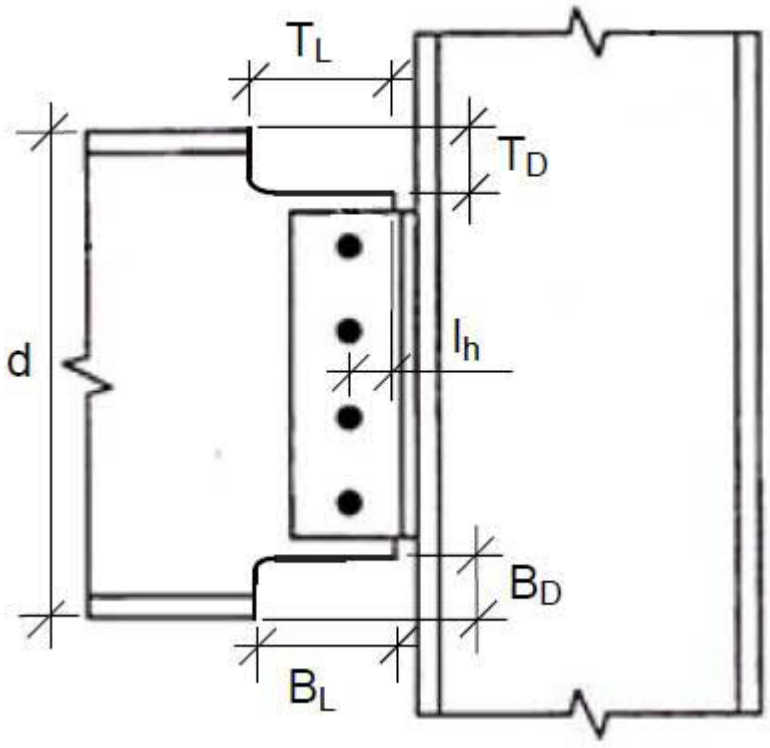
Ω= 2.00

59.5

Piece Mark	Beam Size	# of Bolts	Bolt Diam. (in)	Bolt Type	Shear Type	Hole Type	a (in)	e (in) min=1.5	Table 7-6 C	Bm or Pl t_max (in)	Allow t max for Bm & Pl max (in)	Rn/Ω (kips)	Va (kips)	Check
A	W18X35	5	0.75	A325-N	single	SSLT	2.25	1.5	4.54	0.375	none	54.0	0.00	OK
B	W16X26	4	0.75	A325-N	single	SSLT	2.25	1.5	3.48	0.375	none	41.4	0.00	OK
C	W21X44	6	1	A325-N	single	SSLT	2.75	1.5	5.58	0.438	0.5625	118.3	0.00	OK
D	W21X44	5	1	A325-N	single	SSLT	2.75	1.5	4.54	0.438	0.5625	96.2	0.00	OK
E	W27X84	7	1	A325-N	single	SSLT	2.5	1.5	6.61	0.460	0.5625	140.1	0.00	OK
F	W21X55	6	1	A325-N	single	SSLT	2.75	1.5	5.58	0.438	0.5625	118.3	0.00	OK
G	W18X35	4	0.75	A325-N	single	SSLT	2.25	1.5	3.48	0.375	none	41.4	0.00	OK
H	W18X40	5	0.75	A325-N	single	SSLT	2.25	1.5	4.54	0.375	none	54.0	0.00	OK
I	W27X84	7	1	A325-N	single	SSLT	2.75	1.5	6.61	0.625	0.5625	140.1	0.00	OK
J	W16X31	4	0.75	A325-N	single	SSLT	2.25	1.5	3.48	0.375	none	41.4	0.00	OK
354B2	W21X68	6	1	A325-N	single	SSLT	2.75	1.5	5.58	0.438	0.5625	118.3	0.00	OK
367B3	W18X50	5	0.75	A325-N	single	SSLT	2.25	1.5	4.54	0.375	none	54.0	0.00	OK
K	W12X26	3	0.75	A325-N	single	SSLT	2.25	1.5	2.42	0.375	none	28.8	0.00	OK
363B4-L	W30X90	8	1	A325-N	single	SSLT	2.75	1.5	7.63	0.470	0.5625	161.8	0.00	OK
364B4/365B1	W27X94	7	1	A325-N	single	SSLT	2.75	1.5	6.61	0.490	0.5625	140.1	0.00	OK
366B1	W21X62	6	1	A325-N	single	SSLT	2.75	1.5	5.58	0.400	0.5625	118.3	0.00	OK
L	W21X44	4	1	A325-N	single	SSLT	2.75	1.5	3.48	0.375	none	73.8	0.00	OK
349B1-L	W18X35	5	0.75	A325-N	single	SSLT	3	1.5	4.54	0.375	none	54.0	0.00	OK
361B2-L	W27X84	7	1	A325-N	single	SSLT	3	1.5	6.61	0.625	0.5625	140.1	0.00	OK
M	W16X26	4	0.75	A325-N	single	SSLT	3	1.5	3.48	0.375	none	41.4	0.00	OK
0	0	0	0	0	0	0	0	1.5	#REF!	#N/A	FALSE	#N/A	0.00	#N/A
0	0	0	0	0	0	0	0	1.5	#REF!	#N/A	FALSE	#N/A	0.00	#N/A
0	0	0	0	0	0	0	0	1.5	#REF!	#N/A	FALSE	#N/A	0.00	#N/A
0	0	0	0	0	0	0	0	1.5	#REF!	#N/A	FALSE	#N/A	0.00	#N/A
0	0	0	0	0	0	0	0	1.5	#REF!	#N/A	FALSE	#N/A	0.00	#N/A

Extended Single Plate Connection Analysis

EXTENDED SINGLE PLATE CONNECTION



Piece Mark: 348B3-R

NOTE: These sheets are example calculations of the tabulated sheets to follow. See the following section for the remainder of the connection calculations.

Shear Reaction: $V_a := 0kip$

DESIGN CHECK SUMMARY:

Check Gross Shear Yielding in Web (per J4-2a):
Rn=0.6FyAg

Check Net Shear Rupture in Web (per J4-2b):
Rn=0.6FuAn

Check Block Shear in Web (per J4-3):
Rn=0.6FuAnv+UbsFuAnt ≤ 0.6FyAgv+UbsFuAnt

Check Flexural Rupture Strength in Web:
Mn=Fu*Snet

Check Flexural Local Buckling Strength in Web
(per 9-14): Mn=Fcr*Snet

Check Gross Shear Yielding in Single-Plate Conn
(per J4-2a): Rn=0.6*Fy*Ag

Check Net Shear Rupture in Single-Plate Conn
(per J4-2b): Rn=0.6*Fu*Anv

Check Block Shear in Single-Plate Conn
(per J4-3): Rn=0.6FuAnv+UbsFuAnt ≤
0.6FyAgv+UbsFuAnt

Check Bolt Bearing & Shear in Single-Plate Conn
(per J3-10): Rn=1.2LctFu ≤ 2.4dtFu
(per Table 7-7 thru 7-13): Rn=C*m

Check Weld Shear on Single-Plate Conn
(per Table 2.5): Rn=0.6Fexx*2^(1/2)/2*(D/16)*L

Check Maximum Single Plate Thickness
(per Page 10-104): tmax=(6*Mmax)/(Fy*d^2)

Check Flexural Yielding Strength & Shear Strength in Single plate
(per Page 10-104): Mn=Fy*Z

Check Flexural Local Buckling Strength in Single plate
(per Eqn. 9-19): Mn=Fcr*Snet

Check Bolt Bearing on Beam Web
(per J3-10): Rn=1.2LctFu ≤ 2.4dtFu

Check Flexural Rupture
Mn=Fu*Snet

Check if Stabilizer Plates are Required
Rn=(1500*π*L*tp^3)/(a^2)

Plate Yield Strength:	$Fy_p := 36ksi$	Plate Height:	$Pl_h := 14.5 \cdot in$
Plate Tensile Strength:	$Fu_p := 58ksi$	Weld Thickness:	$W_t := 0.25 \cdot in$
Beam Yield Strength:	$Fy_b := 50ksi$	Bolt Eccentricity:	$e := 6.5 \cdot in$
Beam Tensile Strength:	$Fu_b := 65ksi$	Bolt Diameter:	$Bolt_{dia} := 0.75in$
Plate Width:	$Pl_w := 8 \cdot in$	Weld Electrode:	$F_{EXX} := 70ksi$
Plate Thickness:	$t_p := 0.375 \cdot in$	Weld Size:	$D_w := 0.25in$

Check Gross Shear Yielding in Web (per J4-2a):

$\Omega_1 := 1.5$

Rn=0.6FyAg

		Top Cope		Bottom Cope	
Beam Depth:	$d := 17.7 \cdot in$	Depth:	$T_D := 1.25 \cdot in$	Depth:	$B_D := 0 \cdot in$
Beam Web Thickness:	$t_w := 0.3 \cdot in$	Length:	$T_L := 11.3125 \cdot in$	Length:	$B_L := 0 \cdot in$

Web Gross Depth: $d_{gross} := d - T_D - B_D = 16.45 \cdot in$

Gross Web Area: $A_g := d_{gross} \cdot t_w = 4.935 \cdot in^2$

Shear Yielding: $Rn_1 := \frac{(0.6 \cdot Fy_b \cdot A_g)}{\Omega_1} = 98.7 \cdot kip$

Check Net Shear Rupture in Web (per J4-2b):

$\Omega_2 := 2.0$

Rn=0.6FuAn

		Top Cope		Bottom Cope	
Beam Depth:	$d = 17.7 \cdot in$	Depth:	$T_D = 1.25 \cdot in$	Depth:	$B_D = 0 \cdot in$
Beam Web Thickness:	$t_w = 0.3 \cdot in$	Length:	$T_L = 11.313 \cdot in$	Length:	$B_L = 0 \cdot in$

Number of Bolts: $Blt_n := 5$ Hole Size: $H_d := 0.875 \cdot in$

Web Net Depth: $d_{net} := d - T_D - B_D - H_d \cdot Blt_n = 12.075 \cdot in$

Net Web Area: $A_n := d_{net} \cdot t_w = 3.623 \cdot in^2$

Shear Rupture: $Rn_2 := \frac{(0.6 \cdot Fu_b \cdot A_n)}{\Omega_2} = 70.639 \cdot kip$

Check Block Shear in Web (per J4-3):

$\Omega_3 := 2.0$

Rn=0.6FuAnv+UbsFuAnt ≤ 0.6FyAgv+UbsFuAnt

		Top Cope		Bottom Cope	
Beam Depth:	$d = 17.7 \cdot in$	Depth:	$T_D = 1.25 \cdot in$	Depth:	$B_D = 0 \cdot in$
Beam Web Thickness:	$t_w = 0.3 \cdot in$	Length:	$T_L = 11.313 \cdot in$	Length:	$B_L = 0 \cdot in$

Distance to first bolt to top of beam: $h_{bolt} := 3 \cdot in$ $U_{bs} := 1$

Distance to first bolt to end of beam: $l_{hb} := 6.125 \cdot in$ Bolt Spacing: $s_b := 3in$ $l_{vb} := h_{bolt} - T_D = 1.75 \cdot in$

Shear Gross Web Area: $A_{gv} := \left[l_{vb} + \left(Blt_n - 1\right) \cdot s_b\right] \cdot t_w = 4.125 \cdot in^2$

Shear Net Web Area: $A_{nv} := A_{gv} - \left[\left(Blt_n - 0.5\right) \cdot \left(H_d\right) \cdot t_w\right] = 2.944 \cdot in^2$

Tension Net Web Area: $A_{nt} := \left[l_{hb} - \left(0.5 \cdot H_d\right)\right] \cdot t_w = 1.706 \cdot in^2$

Block Shear: $Rn_3 := \frac{\min\left[\left(0.6 \cdot Fu_b \cdot A_{nv} + U_{bs} \cdot Fu_b \cdot A_{nt}\right), \left(0.6 \cdot Fy_b \cdot A_{gv} + U_{bs} \cdot Fu_b \cdot A_{nt}\right)\right]}{\Omega_3}$

$Rn_3 = 112.856 \cdot kip$

Check Flexural Rupture Strength in Web:

$\Omega_4 := 2.0$

Mn=Fu*Snet

Moment Arm: $e_{arm} := \max\left(T_L, B_L\right) = 11.313 \cdot i$ $S_{net} := \frac{\left(d_{gross}^2 \cdot t_w\right)}{6} = 13.53 \cdot in^3$

Web Net Depth: $d_{net} = 12.075 \cdot in$

Flexural Rupture: $Rn_4 := \frac{\left(Fy_b \cdot S_{net}\right)}{e_{arm} \cdot \Omega_4} = 29.901 \cdot kip$

Check Flexural Local Buckling Strength in Web (per 9-14):

Mn=Fcr*Snet

$\Omega_5 := 2.0$

Web Gross Depth: $d_{gross} = 16.45 \cdot in$

$$\lambda := \frac{\left(d_{gross} \cdot \sqrt{\frac{Fy_b}{ksi}}\right)}{10 \cdot t_w \cdot \sqrt{475 + 280 \cdot \left(\frac{d_{gross}}{\min(T_L, B_L)}\right)^2}} = \blacksquare \qquad Q := 1.0$$

$F_{cr} := Q \cdot Fy_b = 50 \cdot ksi$

Flexural Local Buckling: $Rn_5 := \frac{(F_{cr} \cdot S_{net})}{e_{arm} \cdot \Omega_5} = 29.901 \cdot kip$

Check Gross Shear Yielding in Single-Plate Conn (per J4-2a): Rn=0.6*Fy*Ag

$\Omega_6 := 1.5$

Gross Plate Area: $A_g := Pl_h \cdot t_p = 5.437 \cdot in^2$

Shear Yielding: $Rn_6 := \frac{(0.6 \cdot Fy_p \cdot A_g)}{\Omega_6} = 78.3 \cdot kip$

Check Net Shear Rupture in Single-Plate Conn (per J4-2b): Rn=0.6*Fu*Anv

$\Omega_7 := 2.0$

Plate Net Depth: $d_{net} := Pl_h - H_d \cdot Blt_n = 10.125 \cdot in$

Net Web Area: $A_n := d_{net} \cdot t_p = 3.797 \cdot in^2$

Shear Rupture: $Rn_7 := \frac{(0.6 \cdot Fu_p \cdot A_n)}{\Omega_7} = 66.066 \cdot kip$

Check Block Shear in Single-Plate Conn (per J4-3): Rn=0.6*Fu*Anv+Ubs*Fu*Ant ≤ 0.6*Fy*Agv+Ubs*Fu*Ant

$\Omega_8 := 2.0$

$$l_{vp} := \frac{\left[Pl_h - (Blt_n - 1) \cdot s_b\right]}{2} = 1.25 \cdot in \qquad l_{hp} := Pl_w - e = 1.5 \cdot in$$

Shear Gross Web Area: $A_{gv} := t_p \cdot \left[l_{vp} + (Blt_n - 1) \cdot s_b\right] = 4.969 \cdot in^2$

Shear Net Web Area: $A_{nv} := A_{gv} - \left[(Blt_n - 0.5) \cdot (H_d + 0.0625in) \cdot t_p\right] = 3.492 \cdot in^2$

Tension Net Web Area: $A_{nt} := t_p \cdot \left[l_{hp} - \left[0.5 \cdot (H_d + 0.0625in)\right]\right] = 0.398 \cdot in^2$

Block Shear: $$Rn_8 := \frac{\min\left[(0.6 \cdot Fu_p \cdot A_{nv} + U_{bs} \cdot Fu_p \cdot A_{nt}), (0.6 \cdot Fy_p \cdot A_{gv} + U_{bs} \cdot Fu_p \cdot A_{nt})\right]}{\Omega_8}$$

$Rn_8 = 65.217 \cdot kip$

Check Bolt Bearing & Shear on Single-Plate Conn

$\Omega_9 := 2.0$

(per J3-10): Rn=1.2LctFu ≤ 2.4dtFu
(per Table 7-7 thru 7-13): Rn=C*m

Edge Distance:

Clear Distance to Edge of Single-Plate: $L_{ce} := l_{vp} - \left[0.5 \cdot \left(H_d + 0.0625in\right)\right] = 0.813 \cdot in$

$$r_{ne} := \frac{\min\left(1.2 \cdot L_{ce} \cdot t_p \cdot Fu_p, 2.4 \cdot Bolt_{dia} \cdot t_p \cdot Fu_p\right)}{\Omega_9} = 10.603 \cdot kip$$

Bolt Spacing:

Clear Distance between bolts: $L_{cs} := s_b - \left(H_d + 0.0625in\right) = 2.125 \cdot in$

$$r_{ns} := \frac{\min\left(1.2 \cdot L_{cs} \cdot t_p \cdot Fu_p, 2.4 \cdot Bolt_{dia} \cdot t_p \cdot Fu_p\right)}{\Omega_9} = 19.575 \cdot kip$$

Bolt Bearing in Plate: $Rn_9 := r_{ne} + r_{ns} \cdot \left(Blt_n - 1\right) = 88.903 \cdot kip$

Bolt Shear:

Bolt Diameter: $Bolt_{dia} := in$

Number of Bolts: $Blt_n = 5$

Bolt Shear Strength: $Bolt_v := 11.9kip$

Table 7-7 thru 7-13 C: $C := 2.435$

Bolt Shear Strength: $Rn_{10} := Bolt_v \cdot C = 28.977 \cdot kip$

Check Weld Shear on Single-Plate Conn

$\Omega_{10} := 2.0$

(per Table 2.5): Rn=0.6*Fexx*2^(1/2)/2*(D/16)*L

Length of weld: $L_w := Pl_h \cdot 2 = 29 \cdot in$

Minimum Plate Thickness: $t_{pmin} := 0.427in$

Weld Shear:

$$Rn_{11} := \frac{0.6 \cdot F_{EXX} \cdot \frac{\sqrt{2}}{2} \cdot D_w \cdot L_w \cdot \min\left(1, \frac{t_p}{t_{pmin}}\right)}{\Omega_{10}} = 94.547 \cdot kip$$

Check Maximum Single Plate Thickness

(per page 10-104): tmax=(6*Mmax)/(Fy*d^2)

Plate Depth: $Pl_h = 14.5 \cdot in$

Nominal Shear Strength of Bolts: $F_{nv} := 54ksi$

BoltArea: $A_b := 0.442in^2$

Table 7-7 thru 7-13 C': $C' := 17.1$

Plate Yield Strength: $Fy_p = 36 \cdot ksi$

$$t_{max} := \frac{6 \cdot 1.25 \cdot F_{nv} \cdot A_b \cdot C'}{0.9 \cdot Fy_p \cdot Pl_h^2} = 0.449$$

Check Flexural Yielding Strength & Shear Strength in Single plate (per Page 10-104): Mn=Fy*Z

$\Omega_{11} := 1.67$

$\Omega_{12} := 1.50$

Plate Thickness: $t_p = 0.375 \cdot in$

Plate Depth: $Pl_h = 14.5 \cdot in$

Bolt Eccentricity: $e = 6.5 \cdot in$

Plate Yield Strength: $Fy_p = 36 \cdot ksi$

Plate Shear Strength: $Rn_a := \frac{0.6 \cdot Fy_p \cdot Pl_h \cdot t_p}{\Omega_{12}} = 78.3 \cdot kip$

Plate Plastic Section Modulus: $Z_p := \frac{t_p \cdot Pl_h^2}{4} = 19.711 \cdot in^3$

Plate Moment Strength: $Mn_a := \frac{Fy_p \cdot Z_p}{\Omega_{11}} = 424.906 \cdot kip \cdot in$

Moment Reaction: $M_a := V_a \cdot e = 0 \cdot kip \cdot in$

Interaction Check: $\left(\frac{V_a}{Rn_a}\right)^2 + \left(\frac{M_a}{Mn_a}\right)^2 = 0$

Connection Capacity: $Rn_{12} := \sqrt{\frac{0.0225 \cdot Fy_p^2 \cdot t_p^2 \cdot Pl_h^4}{0.0625 \cdot \Omega_{12}^2 \cdot Pl_h^2 + 0.36 \Omega_{11}^2 \cdot e^2}} = 50.181 \cdot kip$

Check Flexural Local Buckling Strength Single plate (per Eqn. 9-19): Mn=Fcr*Snet

$\Omega_{13} := 1.67$

Bolt Eccentricity: $e = 6.5 \cdot in$

Moment Reaction: $M_a := V_a \cdot e = 0 \cdot kip \cdot in$

Plate Depth: $Pl_h = 14.5 \cdot in$

Plate Thickness: $t_p = 0.375 \cdot in$

Number of Bolts per Line: $Blt_n := 4$

Net Section Modulus: $S_p := \frac{t_p \cdot Pl_h^2}{6} = 13.141 \cdot in^3$

Plate Yield Strength: $Fy_p = 36 \cdot ksi$

$$\lambda := \frac{\left(Pl_h \cdot \sqrt{\frac{Fy_p}{ksi}}\right)}{10 \cdot t_p \cdot \sqrt{475 + 280 \cdot \left(\frac{Pl_h}{\min(T_L, B_L)}\right)^2}} = \blacksquare \qquad Q := 1.0$$

$F_{cr} := Q \cdot Fy_p = 36 \cdot ksi$

Flexural Local Buckling: $Rn_{13} := \frac{(F_{cr} \cdot S_p)}{e \cdot \Omega_{13}} = 43.58 \cdot kip$

Check Bolt Bearing in Beam Web

$\Omega_{14} := 2.0$

(per J3-10): Rn=1.2*Lc*t*Fu < 2.4*d*t*Fu

Edge Distance:

Clear Distance to Edge of Beam Web: $L_{ce} := l_{vb} - \left[0.5 \cdot \left(H_d + 0.0625in\right)\right] = 1.312 \cdot in$

$$r_{ne} := \frac{\min\left(1.2 \cdot L_{ce} \cdot t_w \cdot Fu_b, 2.4 \cdot Bolt_{dia} \cdot t_w \cdot Fu_b\right)}{\Omega_{14}} = 15.356 \cdot kip$$

Bolt Spacing:

Clear Distance between bolts: $L_{cs} := s_b - \left(H_d + 0.0625in\right) = 2.125 \cdot in$

$$r_{ns} := \frac{\min\left(1.2 \cdot L_{cs} \cdot t_w \cdot Fu_b, 2.4 \cdot Bolt_{dia} \cdot t_w \cdot Fu_b\right)}{\Omega_{14}} = 23.4 \cdot kip$$

Bolt Bearing in Beam Web: $Rn_{14} := r_{ne} + r_{ns} \cdot \left(Blt_n - 1\right) = 85.556 \cdot kip$

Check Flexural Rupture

$\Omega_{15} := 2.0$

Mn=Fu*Snet

Plate Depth: $Pl_h = 14.5 \cdot in$
Plate Thickness: $t_p = 0.375 \cdot in$
Number of Bolts per Line: $Blt_n := 5$
Plate Tensile Strength: $Fu_p := 58ksi$
Hole Size: $H_d := 0.875in$
Bolt Spacing: $s_b := 3in$

Net Plastic Section Modulus: $$Z_{po} := \frac{t_p \cdot \left(s_b - H_d\right) \cdot \left(Blt_n^2 \cdot s_b + H_d\right)}{4} = 15.116 \cdot in^3$$

Plate Moment Strength: $$Mn_a := \frac{Fu_p \cdot Z_{po}}{\Omega_{15}} = 438.356 \cdot kip \cdot in$$

$$Rn_{15} := \frac{\left(Mn_a\right)}{e} = 67.439 \cdot kip$$

Check if Stabilizer Plates are Required

$\Omega_{16} := 1.67$

Rn=(1500*π*L*tp^3)/(a^2)

Plate Depth: $Pl_h = 14.5 \cdot in$
Plate Thickness: $t_p = 0.375 \cdot in$

$$Rn_{16} := \frac{1500 \cdot \pi \cdot Pl_h \cdot t_p^3 \cdot ksi}{e^2 \cdot \Omega_{16}} = 51.069 \cdot kip$$

CONNECTION CAPACITY: $Rn := \min\left(Rn_1, Rn_2, Rn_3, Rn_6, Rn_7, Rn_8, Rn_9, Rn_{10}, Rn_{11}, Rn_{12}, Rn_{13}, Rn_{14}, Rn_{15}, Rn_{16}\right) = 28.977 \cdot kip$

Post Acute Medical	SHEET NO. SPE1 of SPE5
Steel Beam Shear Conn Calcs	PROJECT NO. 21210728.000
Shop Drawings	BY: JJG DATE: 11/18/2021

SPC-C = Single Plate Conn - Conv.
SPC-E = Single Plate Conn - Extended
DAC-B = Double Angle Conn - Bolted
DAC-W = Double Angle Conn - Welded

Beam Group: 1

Beam Piece Mark	Beam Size	Fy (ksi)	Shear Load Per EOR (k)	Shear Type	Bolt Dia. (in)	Bolt Type	Connection Capacity (k)	Stabilizer Plates Required	Analysis Results NG = No Good or OK	Remarks
N	W18X35	50	0	single	0.75	A325-N	29.0	NO	OK	
357B2	W27X84	50	0	single	1	A325-N	96.9	NO	OK	
O	W27X84	50	0	single	1	A325-N	78.0	NO	OK	
363B4-R	W30X90	50	0	single	1	A325-N	80.2	NO	OK	
P	W18X40	50	0	single	0.75	A325-N	20.6	NO	OK	
Q	W18X35	50	0	single	0.75	A325-N	30.8	NO	OK	
0	0	0	0		0	0	#N/A	#DIV/0!	#N/A	
0	0	0	0		0	0	#N/A	#DIV/0!	#N/A	
0	0	0	0		0	0	#N/A	#DIV/0!	#N/A	
0	0	0	0		0	0	#N/A	#DIV/0!	#N/A	

Beam Group: 2

Beam Piece Mark	Beam Size	Fy (ksi)	Shear Load Per EOR (k)	Shear Type	Bolt Dia. (in)	Bolt Type	Connection Capacity (k)	Stabilizer Plates Required	Analysis Results NG = No Good or OK	Remarks
0	0	0	0		0	0	#N/A	NO	#N/A	
0	0	0	0		0	0	#N/A	NO	#N/A	
0	0	0	0		0	0	#N/A	NO	#N/A	
0	0	0	0		0	0	#N/A	NO	#N/A	
0	0	0	0		0	0	#N/A	NO	#N/A	
0	0	0	0		0	0	#N/A	NO	#N/A	
0	0	0	0		0	0	#N/A	NO	#N/A	
0	0	0	0		0	0	#N/A	NO	#N/A	
0	0	0	0		0	0	#N/A	NO	#N/A	
0	0	0	0		0	0	#N/A	NO	#N/A	

Beam Groups:
N: 348B3-R/349B3-R/350B3-R
O: 361B4/362B2-R/364B1-R/365B2-L/392B5-R
P: 367B4-R/368B4-R/368B5-R
Q: 375B2-R/376B1-R/376B2-R

Steel Beam Web Analysis — **Beam Group: 1**

Check Bolt Shear Capacity
See Summary of Beam Pieces

Check Gross Shear Yielding in Beam Web — **Ω= 1.50**
Per (J4-2a) Rn/Ω or ØRn, Rn=0.6*Fy*Ag

Piece Mark	Beam Size	Beam Depth (in)	tw (in)	Top Cope Depth (in)	Top Cope Length (in)	Bottom Cope Depth (in)	Bottom Cope Length (in)	Gross Web Depth (in)	Fy (ksi)	Agv (in^2)	Rn/Ω (kips)	Va (kips)	Check
N	W18X35	17.7	0.300	1.25	11.3125	0	0	16.45	50	4.94	98.70	0	OK
357B2	W27X84	26.7	0.460	1.75	7.5	1.5	7.5	23.45	50	10.79	215.74	0	OK
O	W27X84	26.7	0.460	1.625	2.625	11.875	2.625	13.2	50	6.07	121.44	0	OK
363B4-R	W30X90	29.5	0.470	1.625	2.625	14.625	2.625	13.25	50	6.23	124.55	0	OK
P	W18X40	17.9	0.315	0	0	2.0625	7.125	15.8375	50	4.99	99.78	0	OK
Q	W18X35	17.7	0.300	1.125	7.3125	1.3125	7.375	15.2625	50	4.58	91.58	0	OK
0	0	#N/A	#N/A	0	0	0	0	#N/A	0	#N/A	#N/A	0	#N/A
0	0	#N/A	#N/A	0	0	0	0	#N/A	0	#N/A	#N/A	0	#N/A
0	0	#N/A	#N/A	0	0	0	0	#N/A	0	#N/A	#N/A	0	#N/A
0	0	#N/A	#N/A	0	0	0	0	#N/A	0	#N/A	#N/A	0	#N/A

Note: Fu is based on Fy of Section

Check Net Shear Rupture in Web — **Ω= 2.00**
Per (J4-2b) Rn/Ω or ØRn, Rn=0.6*Fu*Anv

Piece Mark	Beam Size	Beam Depth (in)	# of Bolt Columns	tw (in)	Top Cope Depth (in)	Top Cope Length (in)	Bottom Cope Depth (in)	Bottom Cope Length (in)	# of Bolts/line	Bolt Size (in)	Net Web Depth (in)	Fu (ksi)	Anv (in^2)	Rn/Ω (kips)	Va (kips)	Check
N	W18X35	17.7	1	0.300	1.25	11.3125	0	0	5	0.75	12.075	65	3.62	70.64	0.00	OK
357B2	W27X84	26.7	1	0.460	1.75	7.5	1.5	7.5	7	1	15.575	65	7.16	139.71	0.00	OK
O	W27X84	26.7	2	0.460	1.625	2.625	11.875	2.625	4	1	8.7	65	4.00	78.04	0.00	OK
363B4-R	W30X90	29.5	2	0.470	1.625	2.625	14.625	2.625	4	1	8.75	65	4.11	80.19	0.00	OK
P	W18X40	17.9	1	0.315	0	0	2.0625	7.125	4	0.75	12.3375	65	3.89	75.78	0.00	OK
Q	W18X35	17.7	1	0.300	1.125	7.3125	1.3125	7.375	5	0.75	10.8875	65	3.27	63.69	0.00	OK
0	0	#N/A	0	#N/A	0	0	0	0	0	0	#N/A	58	#N/A	#N/A	0.00	#N/A
0	0	#N/A	0	#N/A	0	0	0	0	0	0	#N/A	58	#N/A	#N/A	0.00	#N/A
0	0	#N/A	0	#N/A	0	0	0	0	0	0	#N/A	58	#N/A	#N/A	0.00	#N/A
0	0	#N/A	0	#N/A	0	0	0	0	0	0	#N/A	58	#N/A	#N/A	0.00	#N/A

Check Block Shear in Web — **Ω= 2.00**
Per (J4-3) Rn/Ω or ØRn, Rn=0.6*Fu*Anv+Ubs*Fu*Ant ≤ 0.6*Fy*Agv+Ubs*Fu*Ant — Ubs = 1.0

Piece Mark	Beam Size	tw (in)	dist to 1st bolt (in)	lv (in)	lh (in)	# of Bolts/line	Bolt Space (in)	Agv (in^2)	Anv (in^2)	Ant (in^2)	Fy (ksi)	Fu (ksi)	Rn/Ω (kips)	Va (kips)	Check
N	W18X35	0.300	3.0	1.8	6.125	5	3	4.13	2.94	1.71	50	65	112.86	0.00	OK
357B2	W27X84	0.460	4.0	2.3	4.875	7	3	9.32	5.95	1.98	50	65	180.52	0.00	OK
O	W27X84	0.460	3.5	1.9	2	4	3	5.00	3.19	0.66	50	65	83.72	0.00	OK
363B4-R	W30X90	0.470	3.5	1.9	2	4	3	5.11	3.26	0.68	50	65	85.54	0.00	OK
P	W18X40	0.315	3.2	3.2	6.125	4	3	3.84	2.87	1.79	50	65	114.28	0.00	OK
Q	W18X35	0.300	3.1	1.9	6.125	5	3	4.18	3.00	1.71	50	65	113.95	0.00	OK
0	0	#N/A	0.0	0.0	0	0	0	#N/A	#N/A	#N/A	0	58	#N/A	0.00	#N/A
0	0	#N/A	0.0	0.0	0	0	0	#N/A	#N/A	#N/A	0	58	#N/A	0.00	#N/A
0	0	#N/A	0.0	0.0	0	0	0	#N/A	#N/A	#N/A	0	58	#N/A	0.00	#N/A
0	0	#N/A	0.0	0.0	0	0	0	#N/A	#N/A	#N/A	0	58	#N/A	0.00	#N/A

Check Flexural Rupture Strength in Web — **Ω= 2.00**
Mn/Ω or ØMn, Mn = Fu*Snet

Piece Mark	Beam Size	Va (kips)	lh (in)	Moment Arm (in)	Ma (kip-in)	Gross Web Depth (in)	tw (in)	Snet (web) (in^3)	Fu (ksi)	Mn/Ω (kip-in)	Ma (kip-in)	Check
N	W18X35	0.00	6.125	0	0.00	16.45	0.300	13.53	65	439.7	0.0	OK
357B2	W27X84	0.00	4.875	2.625	0.00	23.45	0.460	42.16	65	1370.2	0.0	OK
O	W27X84	0.00	2	0.625	0.00	13.2	0.460	13.36	65	434.1	0.0	OK
363B4-R	W30X90	0.00	2	0.625	0.00	13.25	0.470	13.75	65	447.0	0.0	OK
P	W18X40	0.00	6.125	0	0.00	15.8375	0.315	13.17	65	428.0	0.0	OK
Q	W18X35	0.00	6.125	1.25	0.00	15.2625	0.300	11.65	65	378.5	0.0	OK
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	58	#N/A	0.0	#N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	58	#N/A	0.0	#N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	58	#N/A	0.0	#N/A
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	58	#N/A	0.0	#N/A

Beam Group: 1

Check Flexural Local Buckling Strength in Web Ω= 1.67

Mn/Ω or ØMn, Mn = Fcr*Snet ***Fcr = Fy*Q***

Piece Mark	Beam Size	Va (kips)	lh (in)	Moment Arm (in)	Ma (kip-in)	Gross Web Depth (in)	tw (in)	Snet (web) (in^3)	Fy (ksi)	λ	Q	Mn/Ω (kip-in)	Ma (kip-in)	Check
N	W18X35	0.00	6.125	0	0.00	16.45	0.300	13.53	50	N/A	N/A	N/A	N/A	OK
357B2	W27X84	0.00	4.875	2.625	0.00	23.45	0.460	42.16	50	0.64	1.00	1262.3	0.0	OK
O	W27X84	0.00	2	0.625	0.00	13.2	0.460	13.36	50	0.23	1.00	400.0	0.0	OK
363B4-R	W30X90	0.00	2	0.625	0.00	13.25	0.470	13.75	50	0.23	1.00	411.7	0.0	OK
P	W18X40	0.00	6.125	0	0.00	15.8375	0.315	13.17	50	N/A	N/A	N/A	N/A	OK
Q	W18X35	0.00	6.125	1.25	0.00	15.2625	0.300	11.65	50	0.87	0.92	319.2	0.0	OK
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	0	N/A	N/A	N/A	N/A	OK
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	0	N/A	N/A	N/A	N/A	OK
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	0	N/A	N/A	N/A	N/A	OK
0	0	0.00	0	0	0.00	#N/A	#N/A	#N/A	0	N/A	N/A	N/A	N/A	OK

Extended Configuration Single-Plate Shear Connection Analysis

Check Gross Shear Yielding in Single-Plate Conn Ω= 1.50

Per (J4-2a) Rn/Ω or ØRn, Rn=0.6*Fy*Ag

Piece Mark	Beam Size	Single-Plate depth (in)	Single-Plate thk (in)	Fy (ksi)	Agv (in^2)	Rn/Ω (kips)	Va (kips)	Check
N	W18X35	14.5	0.375	36	5.44	78.30	0.00	OK
357B2	W27X84	21.5	0.625	36	13.44	193.50	0.00	OK
O	W27X84	12.5	0.625	36	7.81	112.50	0.00	OK
363B4-R	W30X90	12.5	0.625	36	7.81	112.50	0.00	OK
P	W18X40	11.5	0.375	36	4.31	62.10	0.00	OK
Q	W18X35	14.5	0.375	36	5.44	78.30	0.00	OK
0	0	0	0.000	0	0.00	0.00	0.00	NG
0	0	0	0.000	0	0.00	0.00	0.00	NG
0	0	0	0.000	0	0.00	0.00	0.00	NG
0	0	0	0.000	0	0.00	0.00	0.00	NG

Extended Configuration Single-Plate Shear Connection Analysis

Note: Fu is based on Fy of Plate

Check Net Shear Rupture in Single-Plate Conn Ω= 2.00

Per (J4-2b) Rn/Ω or ØRn, Rn=0.6*Fu*Anv

Piece Mark	Beam Size	Single-Plate depth (in)	Single-Plate thk (in)	# of Bolts	Bolt Size (in)	Net Web Depth (in)	Fu (ksi)	Anv (in^2)	Rn/Ω (kips)	Va (kips)	Check
N	W18X35	14.5	0.375	5	0.75	10.125	58	3.80	66.07	0.00	OK
357B2	W27X84	21.5	0.625	7	1	13.625	58	8.52	148.17	0.00	OK
O	W27X84	12.5	0.625	4	1	8	58	5.00	87.00	0.00	OK
363B4-R	W30X90	12.5	0.625	4	1	8	58	5.00	87.00	0.00	OK
P	W18X40	11.5	0.375	4	0.75	8	58	3.00	52.20	0.00	OK
Q	W18X35	14.5	0.375	5	0.75	10.125	58	3.80	66.07	0.00	OK
0	0	0	0.000	0	0	0	58	0.00	0.00	0.00	NG
0	0	0	0.000	0	0	0	58	0.00	0.00	0.00	NG
0	0	0	0.000	0	0	0	58	0.00	0.00	0.00	NG
0	0	0	0.000	0	0	0	58	0.00	0.00	0.00	NG

Check Block Shear in Single-Plate Conn Ω= 2.00

Per (J4-3) Rn/Ω or ØRn, Rn=0.6*Fu*Anv+Ubs*Fu*Ant ≤ 0.6*Fy*Agv+Ubs*Fu*Ant Ubs = 1.0

Piece Mark	Beam Size	Single-Plate thk (in)	lv (in)	lh (in)	# of Bolts	Bolt Space (in)	Agv (in^2)	Anv (in^2)	Ant (in^2)	Fy (ksi)	Fu (ksi)	Rn/Ω (kips)	Va (kips)	Check
N	W18X35	0.375	1.25	1.50	5	3	4.97	3.49	0.40	36	58	65.22	0.00	OK
357B2	W27X84	0.625	1.75	2.03	7	3	12.34	7.77	0.91	36	58	159.82	0.00	OK
O	W27X84	0.625	1.75	3.38	4	3	6.72	4.26	1.76	36	58	123.54	0.00	OK
363B4-R	W30X90	0.625	1.75	3.38	4	3	6.72	4.26	1.76	36	58	123.54	0.00	OK
P	W18X40	0.375	1.25	1.63	4	3	3.84	2.70	0.45	36	58	54.43	0.00	OK
Q	W18X35	0.375	1.25	1.63	5	3	4.97	3.49	0.45	36	58	66.58	0.00	OK
0	0	0.000	0.00	0.00	0	0	0.00	0.00	0.00	0	58	0.00	0.00	NG
0	0	0.000	0.00	0.00	0	0	0.00	0.00	0.00	0	58	0.00	0.00	NG
0	0	0.000	0.00	0.00	0	0	0.00	0.00	0.00	0	58	0.00	0.00	NG
0	0	0.000	0.00	0.00	0	0	0.00	0.00	0.00	0	58	0.00	0.00	NG

Beam Group: 1

Check Bolt Bearing & Shear on Single-Plate Conn **Ω= 2.00**

J3-10 Rn/Ω or ØRn, Rn= 1.2Lc*t*Fu<=2.4d*t*Fu

Per Table 7-7 thru 7-14 Rn= C*rn

Piece Mark	Beam Size	e (in)	Col. Spa.	C per Tables 7-6 thru 7-13	rn/Ω kip/bolt	Single-Plate thk (in)	Lc (in)	# of Bolts/line	Design Hole Diam. (in)	Bolt Diam. (in)	Fu (ksi)	Rn/Ω (J3-6a) (kips)	Rn/Ω (Table 7) (kips)	Va (kips)	Check
N	W18X35	6.5	3	2.435	11.9	0.375	0.84	5	0.8125	0.75	58	47.67	28.98	0.00	OK
357B2	W27X84	5.125	3	4.57	21.2	0.625	1.22	7	1.0625	1	58	182.38	96.88	0.00	OK
O	W27X84	4.125	3	4.21	21.2	0.625	1.22	4	1.0625	1	58	160.96	89.25	0.00	OK
363B4-R	W30X90	4.125	3	4.21	21.2	0.625	1.22	4	1.0625	1	58	160.96	89.25	0.00	OK
P	W18X40	6	3	1.73	11.9	0.375	0.84	4	0.8125	0.75	58	33.86	20.59	0.00	OK
Q	W18X35	6	3	2.59	11.9	0.375	0.84	5	0.8125	0.75	58	50.70	30.82	0.00	OK
0	0	0	3		#VALUE!	0.000	-0.06	0	0.0625	0	58	######	######	0.00	#DIV/0!
0	0	0	3		#VALUE!	0.000	-0.06	0	0.0625	0	58	######	######	0.00	#DIV/0!
0	0	0	3		#VALUE!	0.000	-0.06	0	0.0625	0	58	######	######	0.00	#DIV/0!
0	0	0	3		#VALUE!	0.000	-0.06	0	0.0625	0	58	######	######	0.00	#DIV/0!

Check Weld Shear on Single-Plate Conn **Ω= 2.00**

Per Table J2.5 Rn/Ω or ØRn, Rn=(0.6*F_{EXX})*(SQRT(2)/2)*(D/16)*L

Piece Mark	Beam Size	Single-Plate thk (in)	Col Web thk (in)	Length of Weld L (in)	Weld Size D/16 in.	F_{EXX} (ksi)	Rn/Ω (kips)	Min PL thk (in)	Rn/Ω (adj) (kips)	Va (kips)	Check
N	W18X35	0.375		29.0	4	70	107.7	0.4268966	94.6	0.00	OK
357B2	W27X84	0.625		43.0	7	70	279.4	0.747069	233.7	0.00	OK
O	W27X84	0.625		25.0	7	70	162.4	0.747069	135.9	0.00	OK
363B4-R	W30X90	0.625		25.0	7	70	162.4	0.747069	135.9	0.00	OK
P	W18X40	0.375		23.0	4	70	85.4	0.4268966	75.0	0.00	OK
Q	W18X35	0.375		29.0	4	70	107.7	0.4268966	94.6	0.00	OK
0	0	0.000		0.0	0	70	0.0	0	#DIV/0!	0.00	#DIV/0!
0	0	0.000		0.0	0	70	0.0	0	#DIV/0!	0.00	#DIV/0!
0	0	0.000		0.0	0	70	0.0	0	#DIV/0!	0.00	#DIV/0!
0	0	0.000		0.0	0	70	0.0	0	#DIV/0!	0.00	#DIV/0!

Check Maximum Single Plate Thickness

Per page 10-104 t max = (6*Mmax)/ (Fy*d^2)

Piece Mark	Beam Size	Single-Plate thk (in)	Plate Depth (in)	Fnv bolts (ksi)	Bolt Area (in^2)	C' per Tables 7-6 thru 7-13	Fy Plate (ksi)	thk max (in)	Check
N	W18X35	0.375	14.5	54	0.442	17.1	36	0.45	OK
357B2	W27X84	0.625	21.5	54	0.785	33.8	36	0.72	OK
O	W27X84	0.625	12.5	54	0.785	26	36	1.63	OK
363B4-R	W30X90	0.625	12.5	54	0.785	26	36	1.63	OK
P	W18X40	0.375	11.5	54	0.442	11.3	36	0.47	OK
Q	W18X35	0.375	14.5	54	0.442	17.1	36	0.45	OK
0	0	0.000	0	#N/A	#NAME?		0	#N/A	#N/A
0	0	0.000	0	#N/A	#NAME?		0	#N/A	#N/A
0	0	0.000	0	#N/A	#NAME?		0	#N/A	#N/A
0	0	0.000	0	#N/A	#NAME?		0	#N/A	#N/A

Check Flexural Yielding Strength **Ωb= 1.67** **Ωv= 1.50**

& Shear Strength in Single Plate

Per page 10-104 Mn/Ω or ØMn, Mn =Fy*Z

Piece Mark	Beam Size	Single-Plate thk (in)	Plate Depth (in)	e (in)	Va (kips)	Vn/Ω (kips)	Fy (ksi)	Z (in^3)	Mn/Ωb (k*in)	Ma (k*in)	(Vn/Ωv/Va)^2+(Mn/Ωb/Ma)	Check
N	W18X35	0.375	14.5	6.5	0.00	78.30	36	19.71094	424.91	0	0.00	OK
357B2	W27X84	0.625	21.5	5.125	0.00	193.50	36	72.22656	1556.98	0	0	OK
O	W27X84	0.625	12.5	4.125	0.00	112.50	36	24.41406	526.29	0	0	OK
363B4-R	W30X90	0.625	12.5	4.125	0.00	112.50	36	24.41406	526.29	0	0	OK
P	W18X40	0.375	11.5	6	0.00	62.10	36	12.39844	267.27	0	0	OK
Q	W18X35	0.375	14.5	6	0.00	78.30	36	19.71094	424.91	0	0	OK
0	0	0.000	0	0	0.00	0.00	0	0	0.00	0	#DIV/0!	#DIV/0!
0	0	0.000	0	0	0.00	0.00	0	0	0.00	0	#DIV/0!	#DIV/0!
0	0	0.000	0	0	0.00	0.00	0	0	0.00	0	#DIV/0!	#DIV/0!
0	0	0.000	0	0	0.00	0.00	0	0	0.00	0	#DIV/0!	#DIV/0!

Post Acute Medical	SHEET NO.	SPE5 of SPE5	
Steel Beam Shear Conn Calcs	PROJECT NO.	21210728.000	
Shop Drawings	BY:	JJG DATE:	11/18/2021

Beam Group: 1

Check Flexural Local Buckling Strength in Single Plate **Ω= 1.67**

Mn/Ω or ØMn, Mn = Fcr*Snet (Eqn 9-19) ***Fcr = Fy*Q***

Piece Mark	Beam Size	Va (kips)	e (in)	Moment (kip-in)	ho (in)	Plate thk (in)	Bolts/line	S (in^3)	Fy (ksi)	λ	Q	Mn/Ω (kip-in)	Ma (kip-in)	Check
N	W18X35	0.00	6.5	0	14.50	0.375	5	13.14	36	0.54	1.00	283.3	0.0	OK
357B2	W27X84	0.00	5.125	0	21.50	0.625	7	48.15	36	0.28	1.00	1038.0	0.0	OK
O	W27X84	0.00	4.125	0	12.50	0.625	4	16.28	36	0.22	1.00	350.9	0.0	OK
363B4-R	W30X90	0.00	4.125	0	12.50	0.625	4	16.28	36	0.22	1.00	350.9	0.0	OK
P	W18X40	0.00	6	0	11.50	0.375	4	8.27	36	0.47	1.00	178.2	0.0	OK
Q	W18X35	0.00	6	0	14.50	0.375	5	13.14	36	0.51	1.00	283.3	0.0	OK
0	0	0.00	0	0	0.00	0.000	0	0.00	0	N/A	NA	N/A	NA	NG
0	0	0.00	0	0	0.00	0.000	0	0.00	0	N/A	NA	N/A	NA	NG
0	0	0.00	0	0	0.00	0.000	0	0.00	0	N/A	NA	N/A	NA	NG
0	0	0.00	0	0	0.00	0.000	0	0.00	0	N/A	NA	N/A	NA	NG

Check Bolt Bearing on Beam Web **Ω= 2.00**

J3-10 Rn/Ω or ØRn, Rn= 1.2Lc*t*Fu<=2.4d*t*Fu

Piece Mark	Beam Size	tw (in)	C per Tables 7-6 thru 7-13	Lc (in)	# of Bolts/line	Hole Diam. (in)	Bolt Diam. (in)	Fu (ksi)	Rn/Ω (kips)	Va (kips)	Check
N	W18X35	0.300	2.435	1.34375	5	0.8125	0.75	65.0	42.73	0.0	OK
357B2	W27X84	0.460	4.57	1.71875	7	1.0625	1	65.0	156.29	0.0	OK
O	W27X84	0.460	4.21	1.34375	4	1.0625	1	65.0	135.12	0.0	OK
363B4-R	W30X90	0.470	4.21	1.34375	4	1.0625	1	65.0	138.06	0.0	OK
P	W18X40	0.315	1.73	2.1875	4	0.8125	0.75	65.0	31.88	0.0	OK
Q	W18X35	0.300	2.59	1.53125	5	0.8125	0.75	65.0	45.45	0.0	OK
0	0	#N/A	0	-0.0625	0	0.0625	0	58.0	#N/A	0.0	#N/A
0	0	#N/A	0	-0.0625	0	0.0625	0	58.0	#N/A	0.0	#N/A
0	0	#N/A	0	-0.0625	0	0.0625	0	58.0	#N/A	0.0	#N/A
0	0	#N/A	0	-0.0625	0	0.0625	0	58.0	#N/A	0.0	#N/A

Check Flexural Rupture **Ω= 2.00**

Mn/Ω or ØMn, Mn = Fu*Snet

Piece Mark	Beam Size	tp (in)	Plate Depth (in)	Fu_plate (ksi)	# of Bolts/line	Hole Diam. (in)	Bolt Diam. (in)	Znet (in^3)	Mn/Ω (kips)	Ma (kip-in)	Check
N	W18X35	0.375	14.50	58	5	0.8125	0.75	15.55	450.88	0.0	OK
357B2	W27X84	0.625	21.50	58	7	1.0625	1	44.82	1299.88	0.0	OK
O	W27X84	0.625	12.50	58	4	1.0625	1	14.53	421.41	0.0	OK
363B4-R	W30X90	0.625	12.50	58	4	1.0625	1	14.53	421.41	0.0	OK
P	W18X40	0.375	11.50	58	4	0.8125	0.75	9.84	285.47	0.0	OK
Q	W18X35	0.375	14.50	58	5	0.8125	0.75	15.55	450.88	0.0	OK
0	0	0.000	0.00	58	0	0.0625	0	0.00	0.00	NA	NG
0	0	0.000	0.00	58	0	0.0625	0	0.00	0.00	NA	NG
0	0	0.000	0.00	58	0	0.0625	0	0.00	0.00	NA	NG
0	0	0.000	0.00	58	0	0.0625	0	0.00	0.00	NA	NG

Check If Stabilizer Plates Are Required **Ω= 1.67**

Rn/Ω or ØRn, Rn = (1500*π*L*tp^3)/(a^2)

Piece Mark	Beam Size	tp (in)	L (in)	a (in)	Rn/Ω (kips)	Va (kips)	Check
N	W18X35	0.375	14.5	6.5	51.1	0	Stabilizer Plates NOT Required
357B2	W27X84	0.625	21.5	5.125	563.9	0	Stabilizer Plates NOT Required
O	W27X84	0.625	12.5	4.125	506.1	0	Stabilizer Plates NOT Required
363B4-R	W30X90	0.625	12.5	4.125	506.1	0	Stabilizer Plates NOT Required
P	W18X40	0.375	11.5	6	47.5	0	Stabilizer Plates NOT Required
Q	W18X35	0.375	14.5	6	59.9	0	Stabilizer Plates NOT Required
0	0	0.000	0	0	#DIV/0!	0	#DIV/0!
0	0	0.000	0	0	#DIV/0!	0	#DIV/0!
0	0	0.000	0	0	#DIV/0!	0	#DIV/0!
0	0	0.000	0	0	#DIV/0!	0	#DIV/0!