BSD WEST TUALATIN VIEW – ADA LIFT

PORTLAND, OR

STRUCTURAL CALCULATIONS

DESIGN CRITERIA: DC1
LIFT ANCHORAGE: L1-L24

(26 PAGES TOTAL INCLUDING COVER SHEET)

July 6, 2020

PROJECT NUMBER: 20Y090.01

CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS
LANDSCAPE

15895 SW 72ND AVE
SUITE 200
PORTLAND, OR 97224
PHONE: 503.226.1285
FAX: 503.226.1670
INFO@CIDAINC.COM
WWW.CIDAINC.COM

Exposure B

BSD WTVE Lift

8800 SW Leahy Rd, Portland, OR 97225, USA

Latitude, Longitude: 45.5153961, -122.7672469

Date	6/29/2020, 12:00:56 PM
Design Code Reference Document	ASCE7-16
Risk Category	IV
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	0.898	MCE_R ground motion. (for 0.2 second period)
S_1	0.408	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.078	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.718	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.406	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.487	Site modified peak ground acceleration
T_L	16	Long-period transition period in seconds
SsRT	0.898	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.008	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.408	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.469	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)

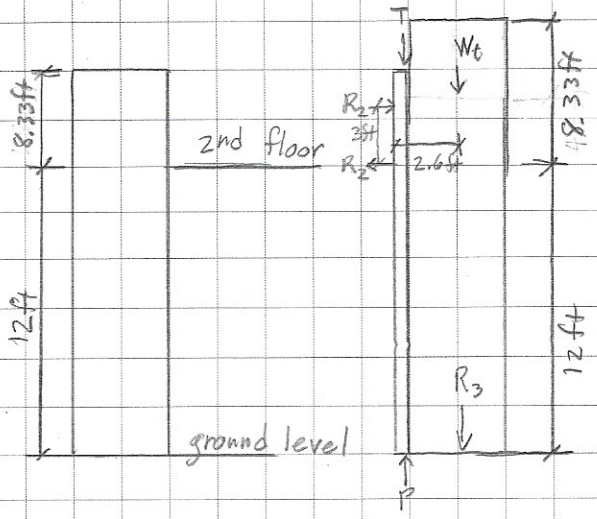
CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD WTVE Lift | PROJ. NO. 20Y090.01 | SHEET L1

TITLE: | BY: RNH | DATE: 6/30/20

Lift



$W_t = 500\,lb + 750\,lb = 1{,}250\,lb$

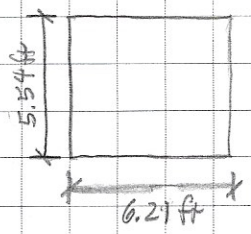
$T_M = 1{,}000\,lb$ max weight

$T_p = 3{,}075\,lb$ prestige weight

$R_2 = (472\,lb)(2) = 944\,lb$ total (each support)

$R_3 = 3{,}200\,lb$ including inpact

$P = 5{,}325\,lb$ with posts



$W_{t.con} = (150\,pcf)(5.54\,ft)(6.21\,ft)(\frac{1}{2}) = 2{,}580.26\,lb$

CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD WTVE Lift | PROJ. NO. 20Y090.01 | SHEET L2
TITLE: | BY: RNH | DATE: 6/29/20

Seismic

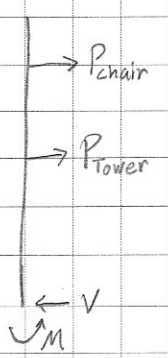
$S_{DS} = 0.718$ $I = 1.5$ $a = 1.0$ $R = 2.5$ elevator components

$F = \frac{0.4 a I S_{DS}}{R}\left(1 + \frac{2(8.925\text{ft})}{12\text{ft}}\right) W_t = 0.429 W_t$ $F_{min} = 0.3 I S_{DS} W_t = 0.323 W_t$

CAP CAR car capacity

$P_{chair} = 0.429(7501b + 5001b - 3301b) = 0.429(9201b) = 395\text{ lb}$ (1.0E)

$P_{Tower} = 0.429(10001b) = 429\text{ lb}$ (1.0E)



$V = P_{chair} + P_{Tower} = 824\text{ lb}$ (1.0E)

$M_{OT} = P_{chair}(14.83\text{ft}) + P_{Tower}(8.925\text{ft}) = 9,687\text{ lb·ft}$

$M_{res} = (920\text{ lb})\left(\frac{29.5}{12}\right) + (2,580.26\text{lb})(1.895\text{ft}) = 9,687\text{ lb·ft}$

$= 2,261.7\text{ lb·ft} + 4,786.4\text{ lb·ft} = 7,048.1\text{ lb·ft}$

$0.7 M_{OT} - 0.6 M_{res} = 2,552\text{ lb·ft} > 0$ overturning

Brace at 2nd floor

CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD WTVE Lift | PROJ. NO. 20Y090.01 | SHEET L3

TITLE: | BY: RNH | DATE: 6/29/20

Wind

Exposure B $V = 110$ mph $K_d = 0.85$ $K_h = 0.7$

$$q = 0.00256(0.85)(0.7)(110)^2 = 18.43 \text{ psf}$$

$$w = q\left(\frac{58.375}{12}\right) = 89.66 \text{ plf (1.0W)}$$

$$V = w(20.33 \text{ ft}) = 1,823 \text{ lb (1.0W)}$$

$$M_{OT\_W} = \frac{w(20.33\text{ft})^2}{2} = 18,535 \text{ lb·ft (1.0W)}$$

$M_{res} = 7,048.1$ lb·ft

$0.6M_{OT} - 0.6M_{res} = 6,892$ lb·ft > 1 overturning

$P = 5,031$ lb (1.0D)

Support lift shaft at 2nd floor

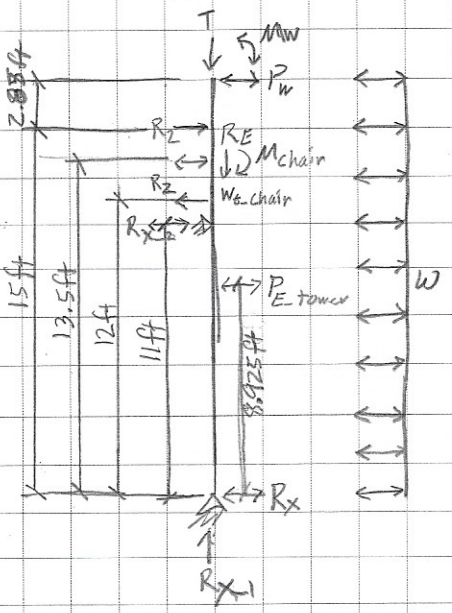
CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD WTVE Lift | PROJ. NO. 20Y090.01 | SHEET L4

TITLE: | BY: RNH | DATE: 6/30/20

HSS Support



T = 3075 lb prestige weight

R_2 = 472 lb

$M_{chair\_D} = (500lb + 750lb - 330lb)\left(\frac{29.5}{12}\right) = 2262\ lb \cdot ft$

$M_{chair\_L} = (330lb)\left(\frac{29.5}{12}\right) = 811.25\ lb \cdot ft$

w = 44.83 plf (1.0W) $P_w = (1.4ft)\,w = 62.76$ lb (1.0W)

$M_w = \frac{w(1.4ft)^2}{2} = 43.933\ lb \cdot ft$

R_E = 395 lb (1.0E) chair

P_{E_tower} = 429 lb (1.0E) tower

	D	L	Total
$W_{t\ chair}$ =	920 lb	330 lb	1,250 lb

Column

Bending/Axial stress ratio = 27.78%

Shear stress ratio = 0.2%

R_x = 50 lb

	D	L	Total
R_y =	2.14 k	3.41 k	5.55 k

$\Delta = 0.136in < \frac{L}{240} = 0.55in$

Beam

Bending stress ratio = 23.2%

Shear stress ratio = 1.9%

	D	L	W	E
R_{x1} =	-77 lb	-74 lb	108 lb	-9 lb
R_{x2} =	77 lb	74 lb	755 lb	833 lb

V = 472 lb

M = 2.49 k·ft

$\Delta_L = 0.242in < \frac{L}{360} = 0.367in$

$\Delta_T = 0.584in < \frac{L}{240} = 0.55in$

Total Bending/Axial stress ratio = 49.68%

HSS4x4x¼ is adequate

see next 4 pages →

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

DESCRIPTION: HSS Support - column

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-10

General Information

Steel Section Name : **HSS4x4x1/4**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 46.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 17.850 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 12 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 17.850 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 217.427 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 17.850 ft, Xecc = 2.0 in, D = 1.0, L = 3.075 k
Wt: Axial Load at 14.833 ft, Xecc = 2.0 in, D = 0.920, L = 0.330 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.2778** : 1
Load Combination +D+L
Location of max.above base 14.735 ft
At maximum location values are . . .
Pa : Axial 5.542 k
Pn / Omega : Allowable 25.507 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 10.765 k-ft
Ma-y : Applied -0.7326 k-ft
Mn-y / Omega : Allowable 10.765 k-ft

PASS Maximum Shear Stress Ratio = **0.001956** : 1
Load Combination +D+L
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.04972 k
Vn / Omega : Allowable 25.423 k

Maximum Load Reactions . .
Top along X-X 0.04972 k
Bottom along X-X 0.04972 k
Top along Y-Y 0.0 k
Bottom along Y-Y 0.0 k

Maximum Load Deflections . . .
Along Y-Y 0.0 in at 0.0 ft above base
for load combination :
Along X-X -0.1356 in at 10.303 ft above base
for load combination : +D+L

Steel Section Properties : HSS4x4x1/4

Depth	=	4.000	in	I xx	=	7.80	in^4	J	=	12.800	in^4
Design Thick	=	0.233	in	S xx	=	3.90	in^3				
Width	=	4.000	in	R xx	=	1.520	in				
Wall Thick	=	0.250	in	Zx	=	4.690	in^3				
Area	=	3.370	in^2	I yy	=	7.800	in^4	C	=	6.560	in^3
Weight	=	12.181	plf	S yy	=	3.900	in^3				
				R yy	=	1.520	in				
Ycg	=	0.000	in								

Project Title:
Engineer:
Project ID:
Project Descr:

L6

Steel Column

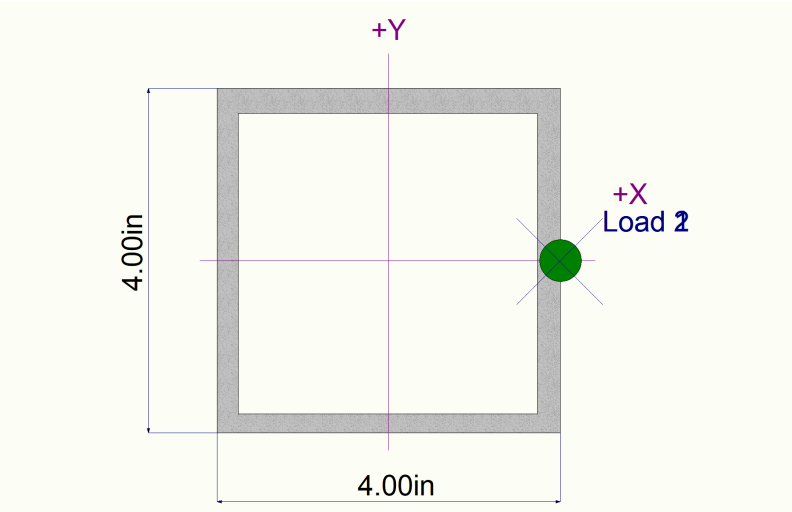
File: BSD WTVE Lift.ec6

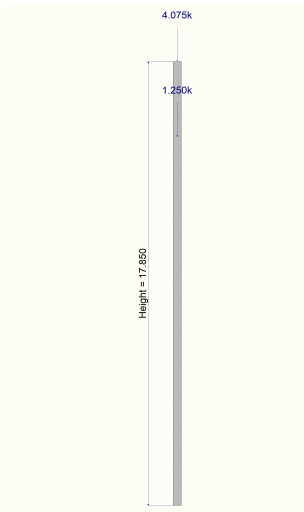
Lic. # : KW-06006865

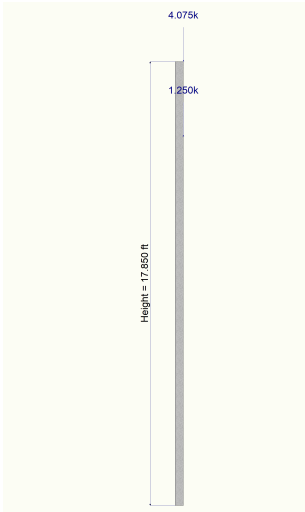
CIDA INC.

DESCRIPTION: HSS Support - column

Sketches







Project Title:
Engineer:
Project ID:
Project Descr:

L7

Steel Beam

File: BSD WTVE Lift.ec6

Lic. # : KW-06006865 CIDA INC.

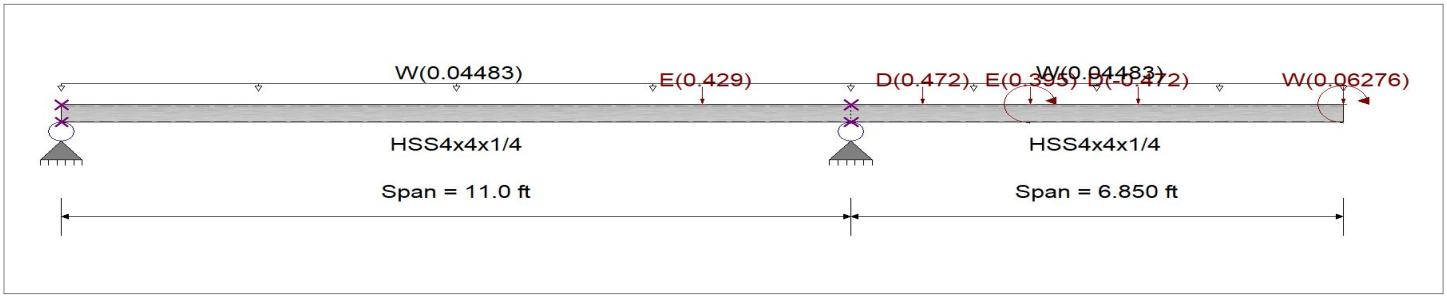
DESCRIPTION: HSS support - Beam

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	46.0 ksi
Beam Bracing :	Completely Unbraced	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Load for Span Number 1
Uniform Load : W = 0.04483 k/ft, Tributary Width = 1.0 ft, (w)

Point Load : E = 0.4290 k @ 8.925 ft, (Pe_tower)

Load(s) for Span Number 2
Point Load : D = -0.4720 k @ 4.0 ft

Moment : D = 2.262, L = 0.8113 k-ft, Loc = 2.50 ft in span, (weight)

Uniform Load : W = 0.04483 k/ft, Tributary Width = 1.0 ft, (W)

Point Load : D = 0.4720 k @ 1.0 ft

Point Load : E = 0.3950 k @ 2.50 ft, (Re_chair)

Moment : W = 0.04393 k-ft, Loc = 6.850 ft in span, (wind_shaft_above)

Point Load : W = 0.06276 k @ 6.850 ft, (wind_shaft_above)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.232 : 1	Maximum Shear Stress Ratio =	0.019 : 1
Section used for this span	HSS4x4x1/4	Section used for this span	HSS4x4x1/4
Ma : Applied	2.494 k-ft	Va : Applied	0.4720 k
Mn / Omega : Allowable	10.765 k-ft	Vn/Omega : Allowable	25.423 k
Load Combination	+D+0.750L+0.450W	Load Combination	D Only
Location of maximum on span	2.493 ft	Location of maximum on span	1.014 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.242 in	Ratio =	678 >=360
Max Upward Transient Deflection	-0.048 in	Ratio =	2,729 >=360
Max Downward Total Deflection	0.581 in	Ratio =	283 >=240.
Max Upward Total Deflection	-0.099 in	Ratio =	1331 >=240.

Steel Beam

DESCRIPTION: HSS support - Beam

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+0.750L+0.450W	-0.0992	6.644
+D+0.750L+0.450W	2	0.5810	6.850		0.0000	6.644

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	-0.151	0.833	
Overall MINimum	-0.009	0.074	
D Only	-0.077	0.077	
+D+L	-0.151	0.151	
+D+0.60W	-0.012	0.530	
+D+0.70E	-0.083	0.660	
+D+0.750L+0.450W	-0.084	0.472	
+D+0.750L+0.5250E	-0.137	0.569	
+0.60D+0.60W	0.019	0.499	
+0.60D+0.70E	-0.052	0.629	
L Only	-0.074	0.074	
W Only	0.108	0.755	
E Only	-0.009	0.833	

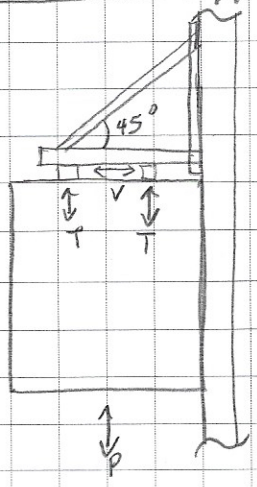
CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

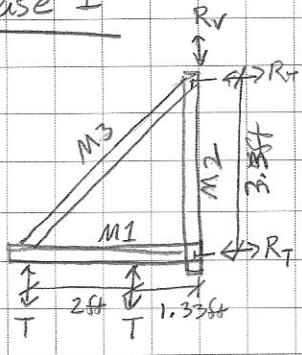
PROJECT NAME: BSD WTVE - ADA Lift PROJ. NO. 20Y090.01 SHEET L9

TITLE: _____ BY: RNH DATE: 7/6/20

Lift - Lateral support



Case 1



$T = (\overset{D}{-77\,lb} / \overset{L}{-74\,lb} / \overset{W}{\pm 408\,lb} / \overset{E}{\pm 9\,lb})$

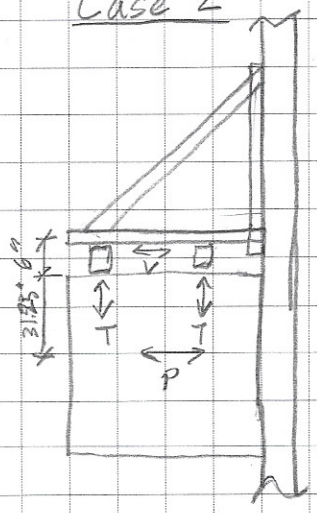
$R_{T\_max\_ASD} = 241\,lb$ LC9

$R_{V\_max\_ASD} = 241\,lb$ LC9

$R_{T\_max\_LRFD} = 384\,lb$ LC29

$R_{V\_max\_LRFD} = 549\,lb$ LC29

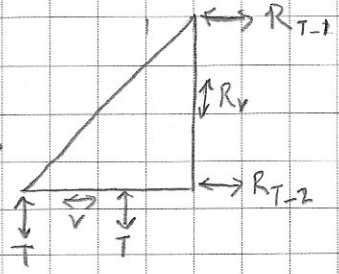
Case 2



$T_{D+L} = (\overset{D}{-77\,lb} / \overset{L}{-74\,lb} / \overset{\text{Total}}{-151\,lb})$

$V = P = (\overset{W}{\pm 206\,lb} / \overset{E}{\pm 18\,lb})$

$T_{W/E} = \frac{P(36.25")}{24"} = (\overset{W}{\pm 282\,lb} / \overset{E}{241\,lb})$



$R_{V\_max\_ASD} = 302\,lb$ LC3

$R_{T\_1max\_ASD} = 249\,lb$ LC8

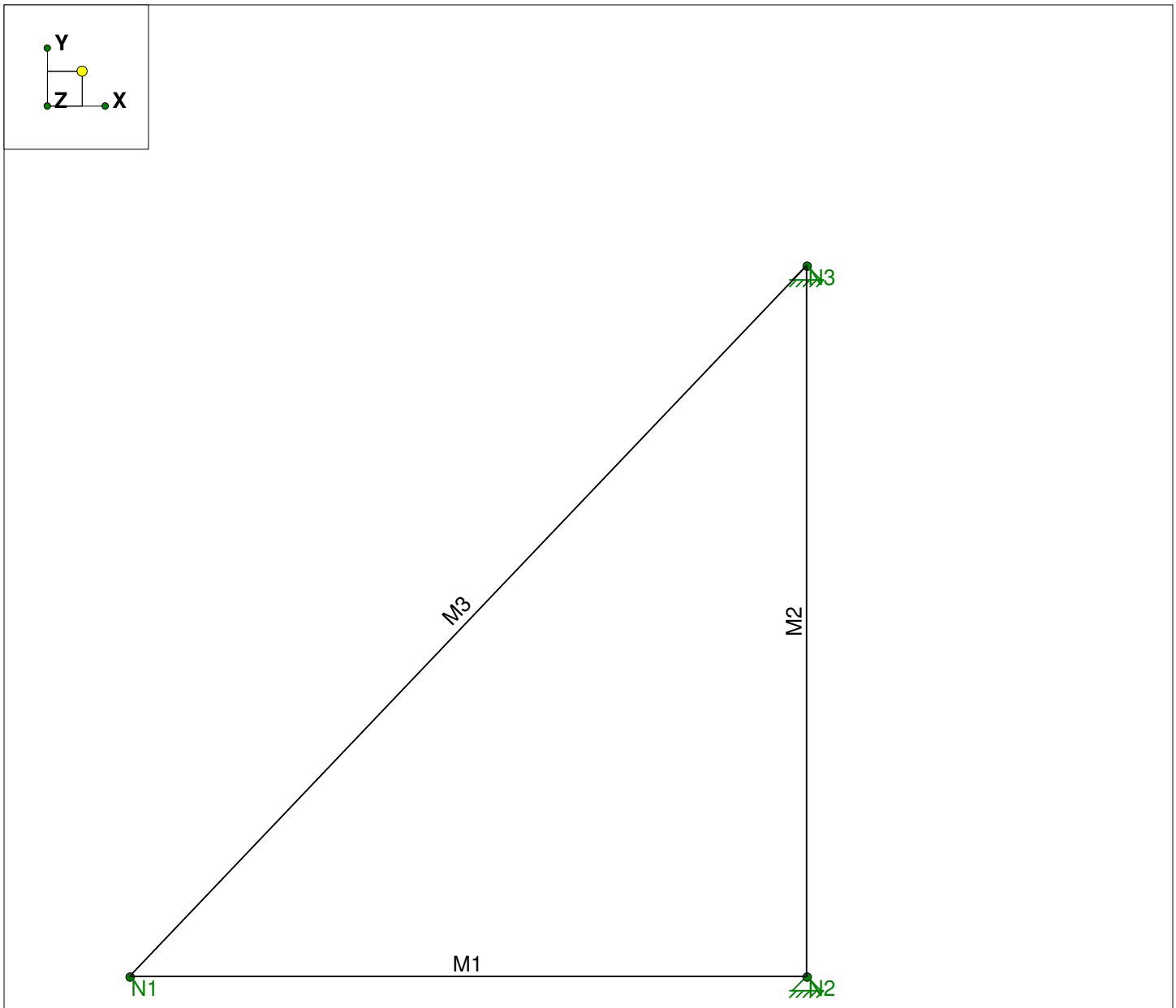
$R_{T-2max\_ASD} = -346\,lb$ LC8

$R_{V\_max\_LRFD} = 422\,lb$ LC19

$R_{T\_1max\_LRFD} = 383\,lb$ LC28

$R_{T-2max\_LRFD} = 599\,lb$ LC28

See print outs on next 8 pages



Envelope Only Solution

CIDA	Lift - Lateral Support	SK - 1
RNH		July 6, 2020 at 7:47 AM
20Y090.01		Lateral Support.r2d

Company : CIDA
Designer : RNH
Job Number : 20Y090.01
Model Name : Lift - Lateral Support

Load Combinations

	Description	So..	P...	SR...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..
1	ASD																							
2	IBC 16-8	Yes	Y		DL	1																		
3	IBC 16-9	Yes	Y		DL	1	LL	1	LLS	1														
4	IBC 16-12 (a) (a)	Yes	Y		DL	1	WL	.6																
5	IBC 16-12 (a) (b)	Yes	Y		DL	1	WL	-.6																
6	IBC 16-12 (b) (a)	Yes	Y		DL	1	EL	.7																
7	IBC 16-12 (b) (b)	Yes	Y		DL	1	EL	-.7																
8	IBC 16-13 (a) (a)	Yes	Y		DL	1	WL	.45	LL	.75	LLS	.75	RLL	.75										
9	IBC 16-13 (a) (b)	Yes	Y		DL	1	WL	-.45	LL	.75	LLS	.75	RLL	.75										
10	IBC 16-14 (a) (a)	Yes	Y		DL	1	EL	.525	LL	.75	LLS	.75	RLL	.75										
11	IBC 16-14 (a) (b)	Yes	Y		DL	1	EL	-.525	LL	.75	LLS	.75	RLL	.75										
12	IBC 16-15 (a)	Yes	Y		DL	.6	WL	.6																
13	IBC 16-15 (b)	Yes	Y		DL	.6	WL	-.6																
14	IBC 16-16 (a)	Yes	Y		DL	.6	EL	.7																
15	IBC 16-16 (b)	Yes	Y		DL	.6	EL	-.7																
16																								
17	LRFD																							
18	IBC 16-1		Y		DL	1.4																		
19	IBC 16-2 (a)		Y		DL	1.2	LL	1.6	LLS	1.6	RLL	.5												
20	IBC 16-4 (b) (a)		Y		DL	1.2	WL	1	LL	.5	LLS	1	SL	.5	SLN	.5								
21	IBC 16-4 (b) (b)		Y		DL	1.2	WL	-1	LL	.5	LLS	1	SL	.5	SLN	.5								
22	IBC 16-5 (a)		Y		DL	1.2	EL	1	LL	.5	LLS	1	SL	.2	SLN	.7								
23	IBC 16-5 (b)		Y		DL	1.2	EL	-1	LL	.5	LLS	1	SL	.2	SLN	.7								
24	IBC 16-6 (a)		Y		DL	.9	WL	1																
25	IBC 16-6 (b)		Y		DL	.9	WL	-1																
26	IBC 16-7 (a)		Y		DL	.9	EL	1																
27	IBC 16-7 (b)		Y		DL	.9	EL	-1																
28	1.2D+W+L (concret...		Y		DL	1.2	WL	1	LL	1														
29	1.2D-W+L (concret...		Y		DL	1.2	WL	-1	LL	1														

Joint Coordinates and Temperatures ASD

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	3.3333	0	0
3	N3	3.3333	3.3333	0

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lb-out[ft]	Lb-in[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	K-out	K-in	Cb	Function
1	M1	M1	3.333			Lb out						Lateral
2	M2	M2	3.333			Lb out						Lateral
3	M3	M3	4.714			Lb out						Lateral

Joint Loads and Enforced Displacements (BLC 1 : Dead)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1	L	Y	-.077

Joint Loads and Enforced Displacements (BLC 2 : Live)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1	L	Y	-.074

Joint Loads and Enforced Displacements (BLC 3 : Wind)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1	L	Y	.108

Joint Loads and Enforced Displacements (BLC 4 : Seismic)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1	L	Y	.009

Member Distributed Loads

Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
No Data to Print ...					

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Moment [k-ft]	LC
1	N3	max	.254	9	.24	9	0	2
2		min	-.026	12	-.025	12	0	2
3	N2	max	.026	12	.122	9	0	2
4		min	-.254	9	-.013	12	0	2
5	Totals:	max	0	9	.362	9		
6		min	0	8	-.037	12		

Envelope Story Drift - X-Direction, Service ASD

	Story (Elevation)		Story Drift[in]	Loc (Z,X)	LC	Drift Ratio (%)	Loc (Z,X)	LC	2nd/1st Ratio	Loc (Z,X)	LC
1	N1 (0 ft)	max	0	0, 0	9	NC			1	0, 0	2
2		min	0	0, 0	12	NC			1	0, 0	2

Envelope AISC 14th(360-10): ASD Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear ...	Loc[ft]	LC	Pnc/om [k]	Pnt/om [k]	Mn/om [k...	Cb	Eqn
1	M1	HSS4x4x4	.011	1.979	9	.005	2.014	9	88.609	92.826	10.765	1.535	H1-1b
2	M2	L5x3x4	.014	0	9	.001	0	9	30.648	41.82	4.082	1.93	H2-1
3	M3	L3x3x4	.019	0	9	.001	0	9	25.486	31.042	1.532	2.255	H2-1

Hot Rolled Steel Section Sets *LRFD*

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [i...	I (0,180) [in4]
1	M1	HSS4x4x4	Beam	SquareTube	A500 Gr.B Rect	Typical	3.37	7.8	7.8
2	M2	L5x3x4	Beam	Single Angle	A36 Gr.36	Typical	1.94	1.41	5.09
3	M3	L3x3x4	HBrace	Single Angle	A36 Gr.36	Typical	1.44	1.23	1.23

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Moment [k-ft]	LC
1	N3	max	.384	29	.364	29	0	2
2		min	-.054	24	-.051	24	0	2
3	N2	max	.054	24	.184	29	0	2
4		min	-.384	29	-.026	24	0	2
5	Totals:	max	0	19	.549	29		
6		min	0	18	-.077	24		

Envelope Story Drift - X-Direction, Strength

	Story (Elevation)		Story Drift[in]	Loc (Z,X)	LC	Drift Ratio (%)	Loc (Z,X)	LC	2nd/1st Ratio	Loc (Z,X)	LC
1	N1 (0 ft)	max	0	0, 0	29	NC			1	0, 0	18
2		min	0	0, 0	24	NC			1	0, 0	18

Envelope AISC 14th(360-10): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear ...	Loc[ft]	LC	phi*Pnc [k]	phi*Pnt [k]	phi*Mn [k...	Cb	Eqn
1	M1	HSS4x4x4	.011	1.979	29	.005	2.014	29	133.179	139.518	16.181	1.535	H1-1b
2	M2	L5x3x4	.014	0	29	.001	0	29	46.064	62.856	6.135	1.93	H2-1
3	M3	L3x3x4	.019	0	29	.001	0	29	38.305	46.656	2.302	2.255	H2-1

Joint Coordinates and Temperatures ASD

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	3.3333	0	0
3	N3	3.3333	3.5	0

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lb-out[ft]	Lb-in[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torqu...	K-out	K-in	Cb	Function
1	M1	M1	3.333			Lb out						Lateral
2	M2	M2	3.5			Lb out						Lateral
3	M3	M3	4.833			Lb out						Lateral

Joint Loads and Enforced Displacements (BLC 1 : Dead)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1	L	Y	-.077

Joint Loads and Enforced Displacements (BLC 2 : Live)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1	L	Y	-.074

Joint Loads and Enforced Displacements (BLC 3 : Wind)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1	L	Y	-.282

Joint Loads and Enforced Displacements (BLC 4 : Seismic)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	N1	L	Y	-.024

Member Point Loads (BLC 1 : Dead)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.077	2

Member Point Loads (BLC 2 : Live)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.074	2

Member Point Loads (BLC 3 : Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	.282	2
2	M1	X	.216	2

Member Point Loads (BLC 4 : Seismic)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	.024	2
2	M1	X	.018	2

Envelope Joint Reactions ASD

	Joint		X [k]	LC	Y [k]	LC	Moment [k-ft]	LC
1	N3	max	.249	8	.258	8	0	2
2		min	-.035	13	-.047	13	0	2
3	N2	max	.165	13	.17	9	0	2
4		min	-.346	8	-.077	12	0	2
5	Totals:	max	.13	13	.302	3		
6		min	-.13	4	.092	12		

Envelope Story Drift - X-Direction, Service

	Story (Elevation)		Story Drift[in]	Loc (Z,X)	LC	Drift Ratio (%)	Loc (Z,X)	LC	2nd/1st Ratio	Loc (Z,X)	LC
1	N1 (0 ft)	max	0	0, 0	8	NC			1	0, 0	2
2		min	0	0, 0	13	NC			1	0, 0	2

Envelope AISC 14th(360-10): ASD Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear ...	Loc[ft]	LC	Pnc/om [k]	Pnt/om [k]	Mn/om [k...	Cb	Eqn
1	M1	HSS4x4x4	.015	1.979	9	.007	2.014	9	88.609	92.826	10.765	1.511	H1-1b
2	M2	L5x3x4	.016	0	9	.001	0	9	30.356	41.82	4.082	1.934	H2-1
3	M3	L3x3x4	.016	0	9	.001	0	9	25.229	31.042	1.532	2.219	H2-1

Hot Rolled Steel Section Sets LRFD

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [i...	I (0,180) [in4]
1	M1	HSS4x4x4	Beam	SquareTube	A500 Gr.B Rect	Typical	3.37	7.8	7.8
2	M2	L5x3x4	Beam	Single Angle	A36 Gr.36	Typical	1.94	1.41	5.09
3	M3	L3x3x4	HBrace	Single Angle	A36 Gr.36	Typical	1.44	1.23	1.23

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Moment [k-ft]	LC
1	N3	max	.383	28	.402	28	0	2
2		min	-.069	25	-.088	25	0	2
3	N2	max	.285	25	.292	29	0	2
4		min	-.599	28	-.134	24	0	2
5	Totals:	max	.216	25	.422	19		
6		min	-.216	24	.092	12		

Envelope Story Drift - X-Direction, Strength

	Story (Elevation)		Story Drift[in]	Loc (Z,X)	LC	Drift Ratio (%)	Loc (Z,X)	LC	2nd/1st Ratio	Loc (Z,X)	LC
1	N1 (0 ft)	max	0	0, 0	28	NC			1	0, 0	18
2		min	0	0, 0	25	NC			1	0, 0	18

Envelope AISC 14th(360-10): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear ...	Loc[ft]	LC	phi*Pnc [k]	phi*Pnt [k]	phi*Mn [k...	Cb	Eqn
1	M1	HSS4x4x4	.018	2.014	29	.008	2.014	29	133.179	139.518	16.181	1.507	H1-1b
2	M2	L5x3x4	.018	0	29	.002	0	29	45.626	62.856	6.135	1.935	H2-1
3	M3	L3x3x4	.017	0	28	.001	0	29	37.92	46.656	2.302	1.965	H2-1

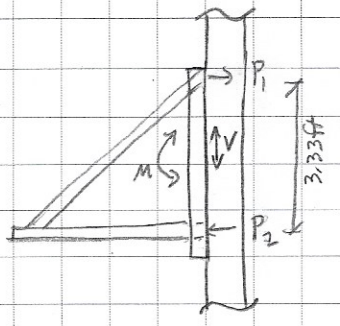
CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD WTVE -ADA | PROJ. NO. 20Y090.01 | SHEET L18

TITLE: | BY: RNH | DATE: 7/6/20

Lift Attachment to Concrete Beam



$V = 422\ lb$ (1.2D+1.6L)

$P_1 = 383\ lb$ (1.2D+1.0W+1.0L)

$P_2 = 599\ lb$ (1.2D+1.0W+1.0L)

3/8" x 3" embed Simpson AT-XP epoxy anchor at 12" o.c.

See print out on next 6 pages →

SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 2.9.7376.32

Company:	CIDA	Date:	6/30/2020
Engineer:	Rebekah Huschka	Page:	1/6
Project:			
Address:	15895 SW 72 Ave		
Phone:	(503) 226-1285		
E-mail:	rebekahh@cidainc.com		

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-11
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.375
Effective Embedment depth, h_{ef} (inch): 3.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 4.25
c_{ac} (inch): 4.58
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 10.00
State: Cracked
Compressive strength, f'_c (psi): 3000
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 3/8"Ø F1554 Gr. 36
Code Report: IAPMO UES ER-263

SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 2.9.7376.32

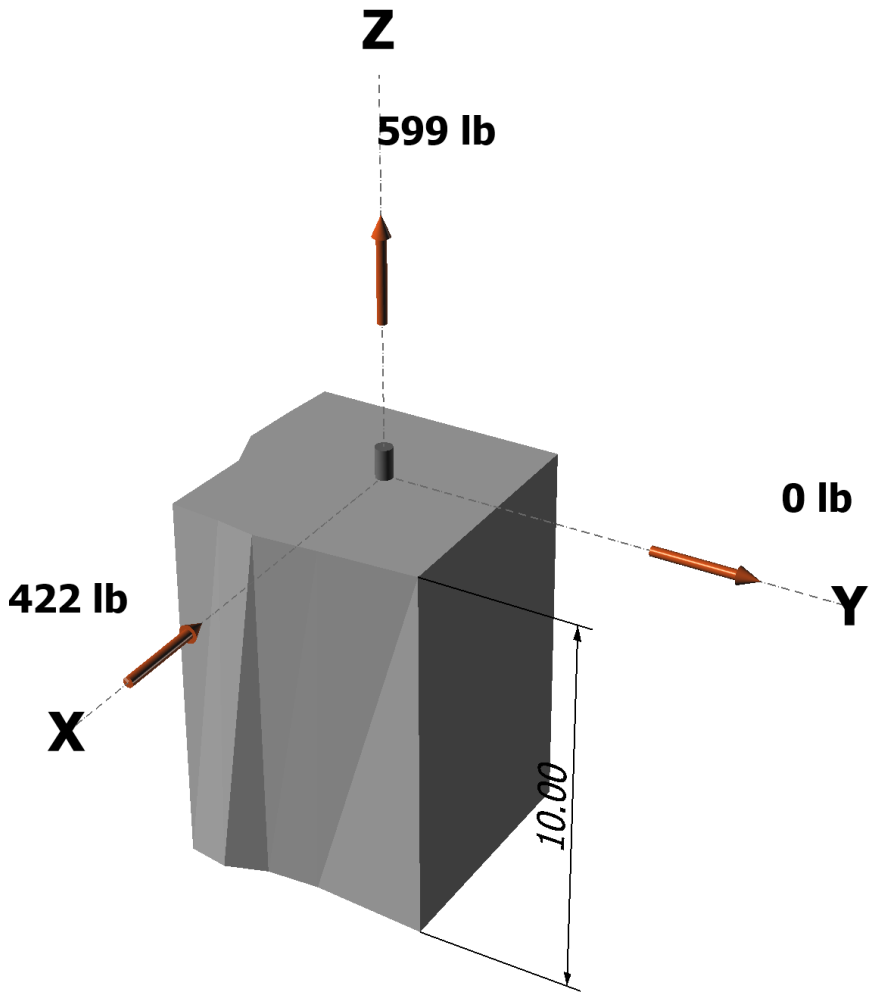
Company:	CIDA	Date:	6/30/2020
Engineer:	Rebekah Huschka	Page:	2/6
Project:			
Address:	15895 SW 72 Ave		
Phone:	(503) 226-1285		
E-mail:	rebekahh@cidainc.com		

Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: No
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

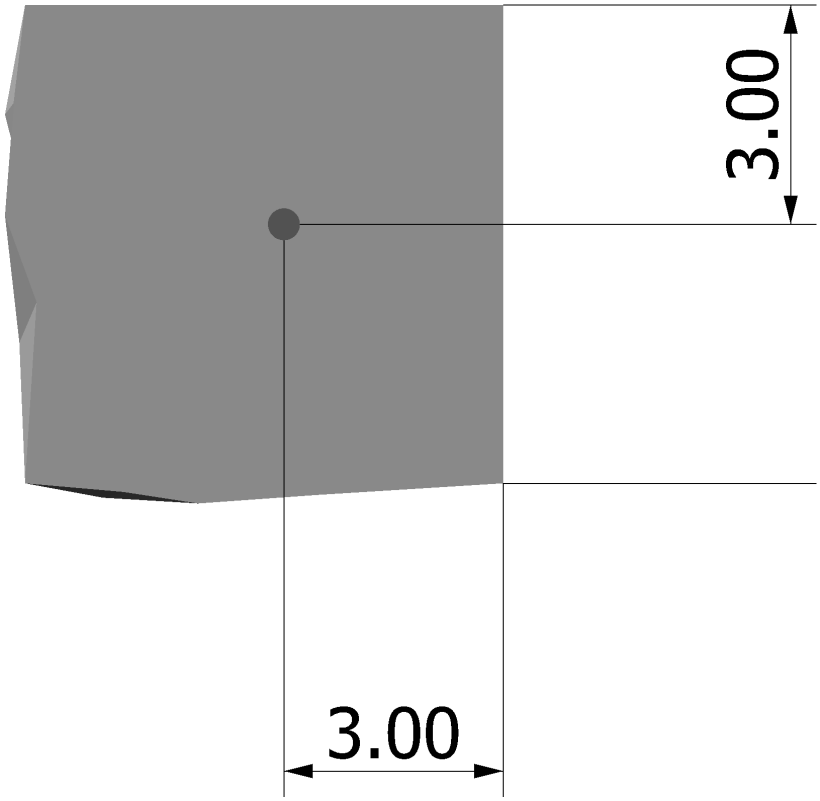
N_{ua} [lb]: 599
V_{uax} [lb]: -422
V_{uay} [lb]: 0

<Figure 1>



Company:	CIDA	Date:	6/30/2020
Engineer:	Rebekah Huschka	Page:	3/6
Project:			
Address:	15895 SW 72 Ave		
Phone:	(503) 226-1285		
E-mail:	rebekahh@cidainc.com		

<Figure 2>



SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 2.9.7376.32

Company:	CIDA	Date:	6/30/2020
Engineer:	Rebekah Huschka	Page:	4/6
Project:			
Address:	15895 SW 72 Ave		
Phone:	(503) 226-1285		
E-mail:	rebekahh@cidainc.com		

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	599.0	-422.0	0.0	422.0
Sum	599.0	-422.0	0.0	422.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 599
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. D.5.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
4525	0.75	3394

5. Concrete Breakout Strength of Anchor in Tension (Sec. D.5.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. D-6)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	3000	3.000	4838

$\phi N_{cb} = \phi \, (A_{Nc} / A_{Nco}) \, \Psi_{ed,N} \, \Psi_{c,N} \, \Psi_{cp,N} N_b$ (Sec. D.4.1 & Eq. D-3)

A_{Nc} (in²)	A_{Nco} (in²)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
56.25	81.00	3.00	0.900	1.00	1.000	4838	0.65	1966

6. Adhesive Strength of Anchor in Tension (Sec. D.5.5)

$\tau_{k,cr} = \tau_{k,cr} f_{short\text{-}term} K_{sat}$

$\tau_{k,cr}$ (psi)	$f_{short\text{-}term}$	K_{sat}	$\tau_{k,cr}$ (psi)
1085	1.00	1.00	1085

$N_{ba} = \lambda_a \tau_{cr} \pi d_a h_{ef}$ (Eq. D-22)

λ_a	τ_{cr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	1085	0.38	3.000	3835

$\phi N_a = \phi \, (A_{Na} / A_{Na0}) \, \Psi_{ed,Na} \, \Psi_{cp,Na} N_{ba}$ (Sec. D.4.1 & Eq. D-18)

A_{Na} (in²)	A_{Na0} (in²)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	ϕ	ϕN_a (lb)
52.06	71.08	4.22	3.00	0.914	1.000	3835	0.65	1668

SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 2.9.7376.32

Company:	CIDA	Date:	6/30/2020
Engineer:	Rebekah Huschka	Page:	5/6
Project:			
Address:	15895 SW 72 Ave		
Phone:	(503) 226-1285		
E-mail:	rebekahh@cidainc.com		

8. Steel Strength of Anchor in Shear (Sec. D.6.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
2260	1.0	0.65	1469

9. Concrete Breakout Strength of Anchor in Shear (Sec. D.6.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = \min\left|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}\right|$ (Eq. D-33 & Eq. D-34)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
3.00	0.375	1.00	3000	3.00	1849

$\phi V_{cbx} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}\,V_{bx}$ (Sec. D.4.1 & Eq. D-30)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbx} (lb)
33.75	40.50	0.900	1.000	1.000	1849	0.70	971

Shear parallel to edge in x-direction:

$V_{by} = \min\left|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}\right|$ (Eq. D-33 & Eq. D-34)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
3.00	0.375	1.00	3000	3.00	1849

$\phi V_{cbx} = \phi\,(2)(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}\,V_{by}$ (Sec. D.4.1 & Eq. D-30)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbx} (lb)
33.75	40.50	1.000	1.000	1.000	1849	0.70	2157

10. Concrete Pryout Strength of Anchor in Shear (Sec. D.6.3)

$\phi V_{cp} = \phi \min\left|k_{cp}N_a\ ;\ k_{cp}N_{cb}\right| = \phi \min\left|k_{cp}(A_{Na} / A_{Na0})\,\Psi_{ed,Na}\,\Psi_{cp,Na}N_{ba}\ ;\ k_{cp}(A_{Nc} / A_{Nco})\,\Psi_{ed,N}\,\Psi_{c,N}\,\Psi_{cp,N}N_b\right|$ (Sec. D.4.1 & Eq. D-40)

k_{cp}	A_{Na} (in²)	A_{Na0} (in²)	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	N_a (lb)
2.0	52.06	71.08	0.914	1.000	3835	2566

A_{Nc} (in²)	A_{Nco} (in²)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ	ϕV_{cp} (lb)
56.25	81.00	0.900	1.000	1.000	4838	3024	0.70	3592

11. Results

Interaction of Tensile and Shear Forces (Sec. D.7.)

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	599	3394	0.18	Pass
Concrete breakout	599	1966	0.30	Pass
Adhesive	**599**	**1668**	**0.36**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	422	1469	0.29	Pass
T Concrete breakout x-	**422**	**971**	**0.43**	**Pass (Governs)**
|| Concrete breakout y+	**422**	**2157**	**0.20**	**Pass (Governs)**
Pryout	422	3592	0.12	Pass

SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 2.9.7376.32

Company:	CIDA	Date:	6/30/2020
Engineer:	Rebekah Huschka	Page:	6/6
Project:			
Address:	15895 SW 72 Ave		
Phone:	(503) 226-1285		
E-mail:	rebekahh@cidainc.com		

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7..2	0.00	0.43	43.5%	1.0	Pass

AT-XP w/ 3/8"Ø F1554 Gr. 36 with hef = 3.000 inch meets the selected design criteria.

BSD ALOHA HIGHSCHOOL – ADA LIFT

BEAVERTON, OR

STRUCTURAL CALCULATIONS

DESIGN CRITERIA: DC1
LIFT ANCHORAGE: L1-L13

(15 PAGES TOTAL INCLUDING COVER SHEET)

July 6, 2020

PROJECT NUMBER: 20Y091.01

CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS
LANDSCAPE

15895 SW 72ND AVE
SUITE 200
PORTLAND, OR 97224
PHONE: 503.226.1285
FAX: 503.226.1670
INFO@CIDAINC.COM
WWW.CIDAINC.COM

DC1

ALOHA HIGH SCHOOL ADA LIFT

18550 SW Kinnaman Rd, Beaverton, OR 97007, USA

Latitude, Longitude: 45.4845388, -122.8677503

Date	6/30/2020, 7:31:31 PM
Design Code Reference Document	ASCE7-16
Risk Category	IV
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	0.875	MCE_R ground motion. (for 0.2 second period)
S_1	0.41	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.05	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.7	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

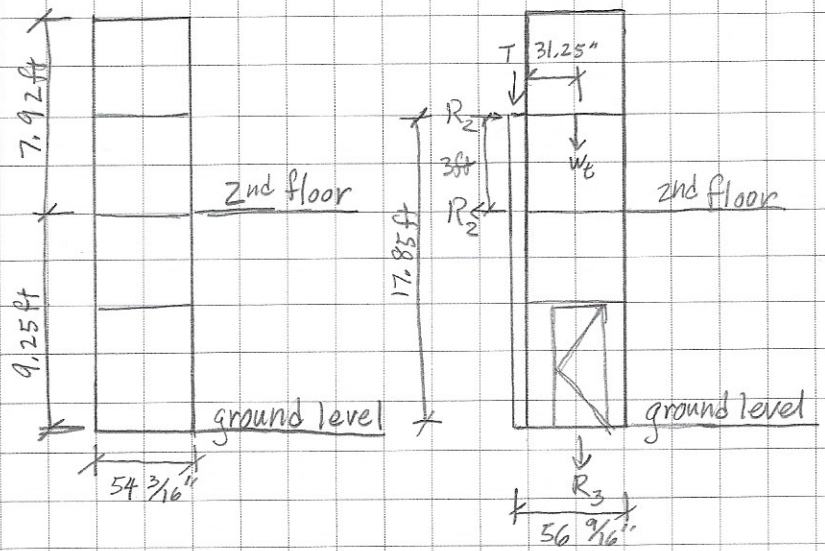
Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.401	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.482	Site modified peak ground acceleration
T_L	16	Long-period transition period in seconds
SsRT	0.875	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.992	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.41	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.473	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.631	Factored deterministic acceleration value. (1.0 second)
PGAd	0.515	Factored deterministic acceleration value. (Peak Ground Acceleration)

CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD ALOHA ADA Lift PROJ. NO. 20Y091.01 SHEET L1

TITLE: BY: RNH DATE: 6/30/20



T_m = 1000 lb max weight

T_p = 3,075 lb prestige weight

CAR CAP

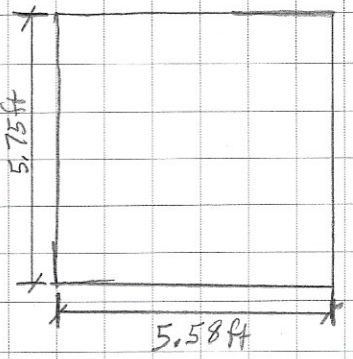
W_t = 500 lb + 750 lb = 1,250 lb

mounting point

R_2 = (472 lb)(2) = 944 lb per support

R_3 = 3,200 lb including impact

P = 5,325 lb without posts



$W_{c\,con} = (150\,pcf)\left[(5.75\,ft)(5.58\,ft)\left(\frac{1}{2}\,ft\right) + (1\,ft)\left(\frac{10}{12}\right)(2)(5.75 + 4.75)\right]$

$= 5{,}031$ lb (1.0D)

CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD Alpha-ADA Lift PROJ. NO. 20Y091.01 SHEET 12

TITLE: BY: RNH DATE: 6/30/20

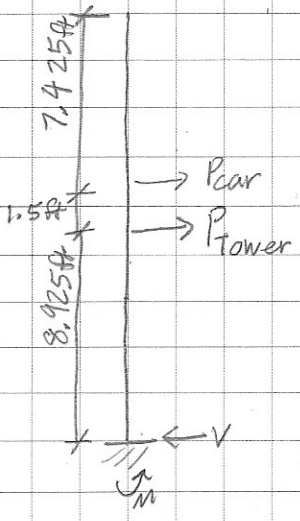
Seismic

$S_{DS} = 0.7$ $I = 1.5$ $a = 1.0$ $R = 2.5$ elevator components

$$F = \frac{0.4(1.5)(0.7)}{2.5}\left(1+\frac{28.925\text{ft}}{9.25\text{ft}}\right) = 0.492\,W_t$$

$$P_{chair} = 0.492(\underset{\text{CAP}}{750\text{lb}} + \underset{\text{CAR}}{500} - \underset{\text{car capacity}}{3301\text{b}}) = 0.492(920\text{lb}) = 453\text{lb} \quad (1.0E)$$

$$P_{Tower} = 0.492(1000\text{lb}) = 492\text{lb} \quad (1.0E)$$



$$V = P_{car} + P_{Tower} = 945\text{lb} \quad (1.0E)$$

$$M_{OT} = P_{car}(10.425\text{ft}) + P_{Tower}(8.925\text{ft}) = 9113.63\text{lb}\cdot\text{ft} \quad (1.0E)$$

$$M_{res} = (920\text{lb})\left(\frac{31.25}{12}\right) + (2406\text{lb})\left(\frac{5.52\text{ft}}{2} - \frac{1}{2}\right) = 7,906\text{lb}\cdot\text{ft} \quad (1.0D)$$

$$P = \underset{W_t}{920\text{lb}} + \underset{W_{t\text{-con}}}{2406\text{lb}} + \underset{T}{1000\text{lb}} = 4326\text{lb} \quad (1.0D)$$

$0.7M_{OT} - 0.6M_{res} = 1635.94\text{lb}\cdot\text{ft} > 0$, overturning

Brace Lift shaft at 2nd floor

CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD Aloha -ADA Lift PROJ. NO. 20Y091.01 SHEET L3

TITLE: _____ BY: RNH DATE: 6/30/20

Wind

Exposure C $V = 110$ mph $K_d = 0.85$ $K_h = 0.9$

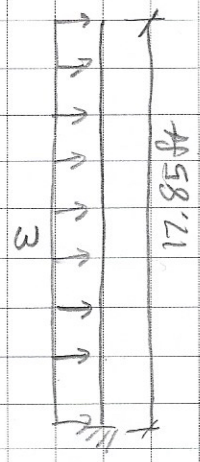
$q = 0.00256(0.85)(0.9)(110)^2 = 23.7$ psf

$w = q\left(\frac{56.5625}{12}\right) = 111.71$ plf (1.0W)

$V = w(17.85\text{ ft}) = 1994$ lb (1.0W)

$M_{@1} = \frac{w(17.85)^2}{2} = 17,797$ lb·ft (1.0W)

$M_{res} = 7,906$ lb·ft (1.0D)



Brace lift at second floor

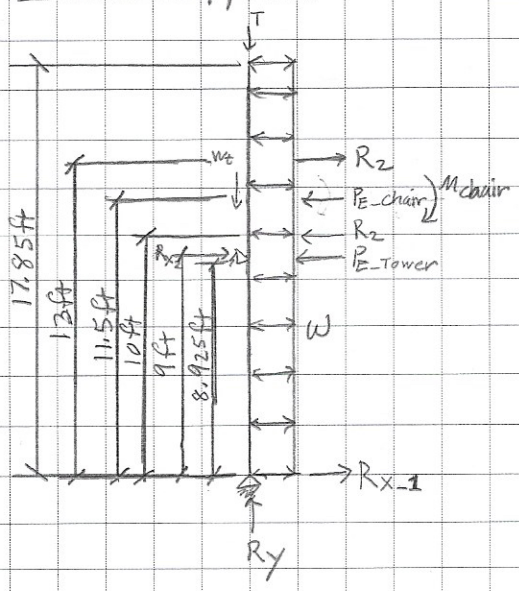
CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD Aloha - ADA Lift PROJ. NO. 20Y091.01 SHEET L4

TITLE: BY: RNH DATE: 7/1/20

HSS Support



$T = 3075\,lb$ prestige weight

$R_2 = 2(472\,lb) = 944\,lb$ (D+L)

$M_{chair\_D} = (500\,lb + 750\,lb - 330\,lb)\left(\frac{31.5}{12}\right) = 2262\,lb\cdot ft$ (1.0D)

$M_{chair\_L} = (330\,lb)\left(\frac{31.5}{12}\right) = 866\,lb\cdot ft$ (1.0L)

$P_{E\_chair} = 453\,lb$ (1.0E)

$P_{E\_Tower} = 492\,lb$ (1.0E)

$W_E = (\underset{D}{920\,lb} / \underset{L}{330\,lb} / \underset{Total}{1250\,lb})$

$w = 55.86\,psf$ (1.0W)

Column

Bending/Axial stress ratio = 27.78%

Shear stress ratio = 0.2%

$R_x = (\underset{D}{18\,lb} / \underset{L}{32\,lb} / \underset{Total}{50\,lb})$

$R_y = (\underset{D}{2.14\,K} / \underset{L}{3.91\,K} / \underset{Total}{5.55\,K})$

$\Delta = 0.136\,in < \frac{L}{240} = 0.55\,in$

Beam

Bending stress ratio = 19.3%

Shear stress ratio = 4.7%

$R_{x1} = (\underset{D}{63\,lb} / \underset{L}{-901\,lb} / \underset{W}{81\,lb} / \underset{E}{-122\,lb})$

$R_{x2} = (-63\,lb / 901\,lb / 989\,lb / 1,067\,lb)$

$V = 1.21\,K$

$M = 2.08\,K\cdot ft$

$\Delta_L = 0.393\,in < \frac{L}{360} = 0.59\,in$

$\Delta_T = 0.316\,in < \frac{L}{240} = 0.885\,in$

Total Bending/Axial stress ratio = 47.08%

HSS 4x4x1/4 is adequate see next 4 pages →

Project Title:
Engineer:
Project ID:
Project Descr:

L5

Steel Column

File: BSD ALOHA.ec6

Lic. # : KW-06006865
CIDA INC.

DESCRIPTION: HSS Support - column

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-10

General Information

Steel Section Name : **HSS4x4x1/4**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 46.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 17.850 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 12 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 17.850 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 217.427 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 17.850 ft, Xecc = 2.0 in, D = 1.0, L = 3.075 k
Wt: Axial Load at 14.833 ft, Xecc = 2.0 in, D = 0.920, L = 0.330 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.2778** : 1
Load Combination +D+L
Location of max.above base 14.735 ft
At maximum location values are . . .
Pa : Axial 5.542 k
Pn / Omega : Allowable 25.507 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 10.765 k-ft
Ma-y : Applied -0.7326 k-ft
Mn-y / Omega : Allowable 10.765 k-ft

PASS Maximum Shear Stress Ratio = **0.001956** : 1
Load Combination +D+L
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.04972 k
Vn / Omega : Allowable 25.423 k

Maximum Load Reactions . .
Top along X-X 0.04972 k
Bottom along X-X 0.04972 k
Top along Y-Y 0.0 k
Bottom along Y-Y 0.0 k

Maximum Load Deflections . . .
Along Y-Y 0.0 in at 0.0 ft above base
for load combination :
Along X-X -0.1356 in at 10.303 ft above base
for load combination : +D+L

Steel Section Properties : HSS4x4x1/4

Depth	=	4.000	in	I xx	=	7.80	in^4	J	=	12.800	in^4
Design Thick	=	0.233	in	S xx	=	3.90	in^3				
Width	=	4.000	in	R xx	=	1.520	in				
Wall Thick	=	0.250	in	Zx	=	4.690	in^3				
Area	=	3.370	in^2	I yy	=	7.800	in^4	C	=	6.560	in^3
Weight	=	12.181	plf	S yy	=	3.900	in^3				
				R yy	=	1.520	in				
Ycg	=	0.000	in								

Project Title:
Engineer:
Project ID:
Project Descr:

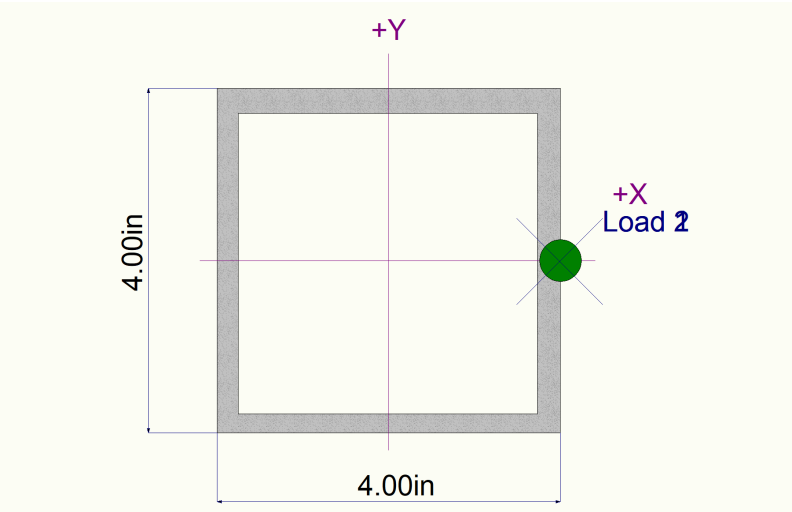
Steel Column

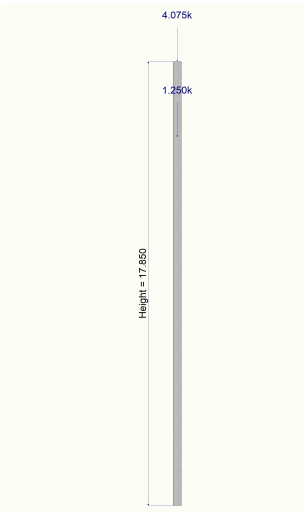
Lic. # : KW-06006865

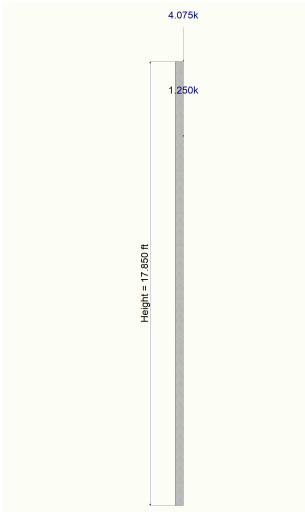
CIDA INC.

DESCRIPTION: HSS Support - column

Sketches







Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Lic. # : KW-06006865 CIDA INC.

DESCRIPTION: HSS support - beam

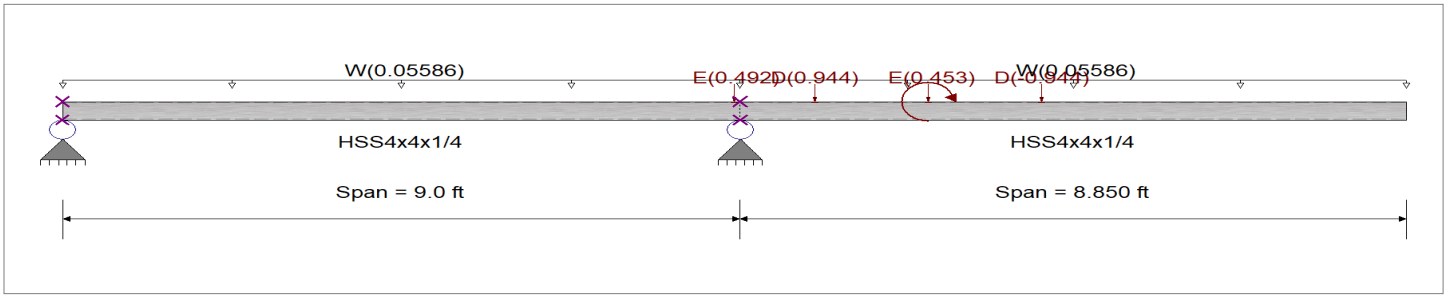
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending

Fy : Steel Yield : 46.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Load for Span Number 1
Uniform Load : W = 0.05586 k/ft, Tributary Width = 1.0 ft, (w)

Point Load : E = 0.4920 k @ 8.925 ft, (Pe_tower)

Load(s) for Span Number 2
Point Load : D = -0.9440 k @ 4.0 ft

Moment : D = 2.262, L = 0.8113 k-ft, Loc = 2.50 ft in span, (weight)

Uniform Load : W = 0.05586 k/ft, Tributary Width = 1.0 ft, (W)

Point Load : D = 0.9440 k @ 1.0 ft

Point Load : E = 0.4530 k @ 2.50 ft, (Re_chair)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.193 : 1	Maximum Shear Stress Ratio =	0.047 : 1
Section used for this span	HSS4x4x1/4	Section used for this span	HSS4x4x1/4
Ma : Applied	2.076 k-ft	Va : Applied	1.206 k
Mn / Omega : Allowable	10.765 k-ft	Vn/Omega : Allowable	25.423 k
Load Combination	+D-0.60W	Load Combination	+D-0.60W
Location of maximum on span	2.513 ft	Location of maximum on span	1.027 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.393 in	Ratio =	540 >=360
Max Upward Transient Deflection	-0.032 in	Ratio =	3,336 >=360
Max Downward Total Deflection	0.316 in	Ratio =	673 >=240.
Max Upward Total Deflection	-0.191 in	Ratio =	1115 >=240.

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	L Only	-0.0324	5.220
+0.60W	2	0.3932	8.850		0.0000	5.220

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	-0.122	1.067	

Steel Beam

DESCRIPTION: HSS support - beam

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

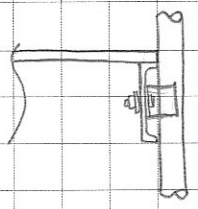
Load Combination	Support 1	Support 2	Support 3
Overall MINimum	-0.001	0.027	
D Only	0.063	-0.063	
+D+L	-0.027	0.027	
+D+0.60W	0.068	0.530	
+D+0.70E	-0.022	0.683	
+D+0.750L+0.450W	-0.001	0.449	
+D+0.750L+0.5250E	-0.068	0.564	
+0.60D+0.60W	0.043	0.555	
+0.60D+0.70E	-0.047	0.709	
L Only	-0.090	0.090	
W Only	0.008	0.989	
E Only	-0.122	1.067	

CIDA
ARCHITECTURE
ENGINEERING
PLANNING
INTERIORS

15895 SW 72ND AVENUE, SUITE 200
PORTLAND, OREGON 97224
TEL: 503.226.1285 FAX: 503.226.1670
E-MAIL: info@cidainc.com

PROJECT NAME: BSD Aloha -ADA Lift | PROJ. NO. 20Y091.01 | SHEET L9
TITLE: | BY: RNH | DATE: 7/1/20

Lift to Landing



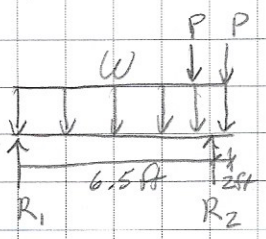
3/8" ϕ is okay for $(36\,ksi)(\frac{3}{8})^2\pi/4 = 3.98\,k$ tension

shear $= (36\,ksi)(\frac{1}{4})(\frac{3}{8}) = 6.75\,k$

	0.6D	0.6W	Total
T_{max} =	(-27 lb	/ 593 lb	/ 566 lb)

Strong Axis Bending

D = 10 psf L = 100 psf



Trib = 4.25 ft

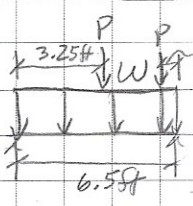
	D	L	Total
w =	(42.5 plf	/ 425 plf	/ 467.5 plf)

P = (801b / 800 lb / 880 lb)

Bending stress ratio = 12.3%

$V_1 = 2.58\,K$
$M = 2.72\,K\cdot ft$
$\Delta_L = 0.013\,in < 0.217\,in$
$\Delta_T = 0.015\,in < 0.325\,in$

Weak axis bending



$w = (23.7\,psf)(8/12) = 15.8\,plf$ (1.0W)

	0.6D	0.6W	Total
P =	(-38 lb	/ 593 lb	/ 555 lb)

Bending stress ratio = 35.6%

$V = 694\,lb$
$M = 1.01\,lb\text{-}ft$
$\Delta_L = 0.204\,in < \frac{L}{360} = 0.217\,in$

Total bending stress = 12.3% + 35.6% = 47.9%

(E) C8×11.5 is adequate

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Lic. # : KW-06006865 CIDA INC.

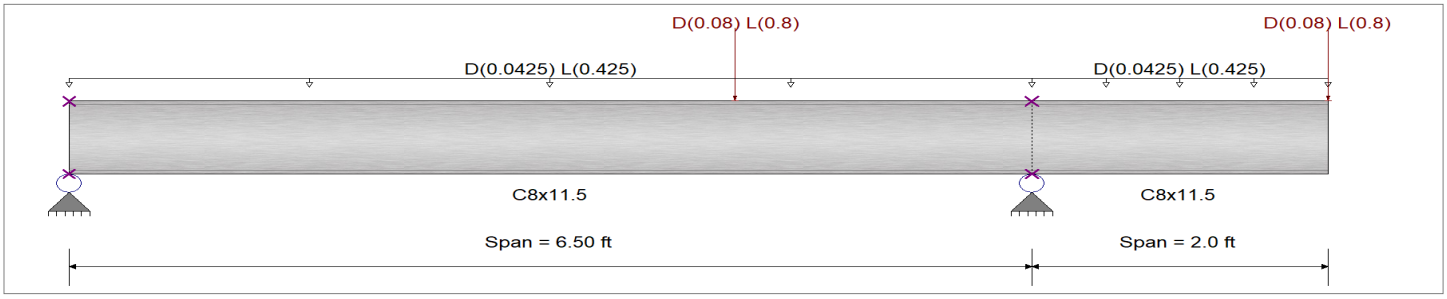
DESCRIPTION: (E) C8X11.5 strong axis

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	46.0 ksi
Beam Bracing :	Completely Unbraced	E: Modulus :	29,000.0 ksi
Bending Axis :	Major Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load for Span Number 1
Uniform Load : D = 0.010, L = 0.10 ksf, Tributary Width = 4.250 ft

Point Load : D = 0.080, L = 0.80 k @ 4.50 ft, (P)

Load for Span Number 2
Uniform Load : D = 0.010, L = 0.10 ksf, Tributary Width = 4.250 ft

Point Load : D = 0.080, L = 0.80 k @ 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.123 : 1	Maximum Shear Stress Ratio =	0.089 : 1
Section used for this span	C8x11.5	Section used for this span	C8x11.5
Ma : Applied	2.718 k-ft	Va : Applied	2.584 k
Mn / Omega : Allowable	22.105 k-ft	Vn/Omega : Allowable	29.087 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	6.500 ft	Location of maximum on span	6.500 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.013 in	Ratio =	5,915 >=360
Max Upward Transient Deflection	-0.001 in	Ratio =	41,556 >=360
Max Downward Total Deflection	0.015 in	Ratio =	5240 >=240.
Max Upward Total Deflection	-0.001 in	Ratio =	34366 >=240.

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.0149	3.042		0.0000	0.000
	2	0.0000	3.042	+D+L+H	-0.0014	0.960

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	1.409	4.422	
Overall MINimum	0.095	0.276	
+D+H	0.159	0.460	
+D+L+H	1.409	4.422	
+D+Lr+H	0.159	0.460	
+D+S+H	0.159	0.460	
+D+0.750Lr+0.750L+H	1.097	3.432	
+D+0.750L+0.750S+H	1.097	3.432	

Project Title:
Engineer:
Project ID:
Project Descr:

L11

Steel Beam

Lic. # : KW-06006865 CIDA INC.

DESCRIPTION: (E) C8X11.5 strong axis

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
+D+0.60W+H	0.159	0.460	
+D+0.70E+H	0.159	0.460	
+D+0.750Lr+0.750L+0.450W+H	1.097	3.432	
+D+0.750L+0.750S+0.450W+H	1.097	3.432	
+D+0.750L+0.750S+0.5250E+H	1.097	3.432	
+0.60D+0.60W+0.60H	0.095	0.276	
+0.60D+0.70E+0.60H	0.095	0.276	
D Only	0.159	0.460	
L Only	1.250	3.962	
H Only			

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Lic. # : KW-06006865 CIDA INC.

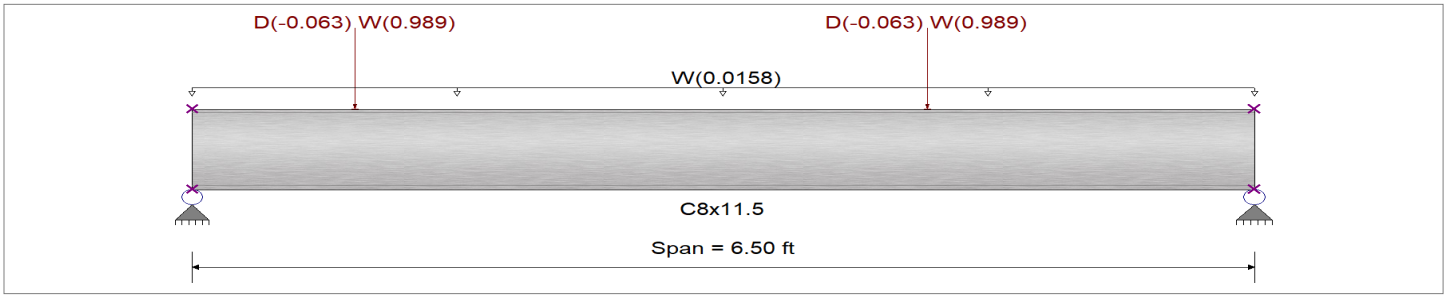
DESCRIPTION: (E) C8X11.5 weak axis

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-10

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	46.0 ksi
Beam Bracing :	Completely Unbraced	E: Modulus :	29,000.0 ksi
Bending Axis :	Minor Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : W = 0.01580 k/ft, Tributary Width = 1.0 ft, (w)

Point Load : D = -0.0630, W = 0.9890 k @ 1.0 ft, (w)

Point Load : D = -0.0630, W = 0.9890 k @ 4.50 ft, (w)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.356 : 1	Maximum Shear Stress Ratio =	0.048 : 1
Section used for this span	C8x11.5	Section used for this span	C8x11.5
Ma : Applied	1.014 k-ft	Va : Applied	0.6943 k
Mn / Omega : Allowable	2.846 k-ft	Vn/Omega : Allowable	14.567 k
Load Combination	+0.60D+0.60W+0.60H	Load Combination	+0.60D+0.60W+0.60H
Location of maximum on span	4.494 ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.204 in	Ratio =	381 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.200 in	Ratio =	391 >=240.
Max Upward Total Deflection	-0.008 in	Ratio =	9223 >=240.

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+0.60W	1	0.2046	3.324		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.193	0.888
Overall MINimum	-0.021	-0.010
+D+H	-0.035	-0.016
+D+L+H	-0.035	-0.016
+D+Lr+H	-0.035	-0.016
+D+S+H	-0.035	-0.016
+D+0.750Lr+0.750L+H	-0.035	-0.016
+D+0.750L+0.750S+H	-0.035	-0.016
+D+0.60W+H	0.680	0.517
+D+0.70E+H	-0.035	-0.016
+D+0.750Lr+0.750L+0.450W+H	0.501	0.384
+D+0.750L+0.750S+0.450W+H	0.501	0.384
+D+0.750L+0.750S+0.5250E+H	-0.035	-0.016
+0.60D+0.60W+0.60H	0.694	0.523

Steel Beam

DESCRIPTION: (E) C8X11.5 weak axis

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
+0.60D+0.70E+0.60H	-0.021	-0.010
D Only	-0.035	-0.016
W Only	1.193	0.888
H Only		