

BARUN CORP

November 24, 2021

RE:

CERTIFICATION LETTER

Project Address:

Randy Fields
20 Southwest Persels Road
Lees Summit, MO 64081

Design Criteria:

- Applicable Codes = 2018 IEBC/IBC, 2018 IRC, ASCE 7-16, and 2018 NDS
- Risk Category = II
- Wind Speed = 115 mph, Exposure Category B, Partially/Fully Enclosed Method
- Ground Snow Load = 20 psf
- Roof DL = 7 psf, Roof LL/SL = 20 psf (Non-PV), Roof LL/SL = 20 psf (PV)

To Whom It May Concern,

A jobsite survey of the existing framing system of the address indicated above was provided . All structural evaluation is based on the site inspection observations and the design criteria listed above.

Existing roof structural framing has been reviewed for additional loading due to installation of PV Solar System on the roof. The structural review applies to the sections of roof that is directly supporting the solar PV system.

Based on this evaluation, I certify that the alteration to the existing structure by installation of the PV system meets the requirements of the applicable existing building and/or new building provisions adopted/referenced above.

Additionally, the PV module assembly including attachment hardware has been reviewed to be in accordance with the manufacturer's specifications and to meet and/or exceed the requirements set forth by the referenced codes.

Sincerely,

XiaoJian Xie, P.E.

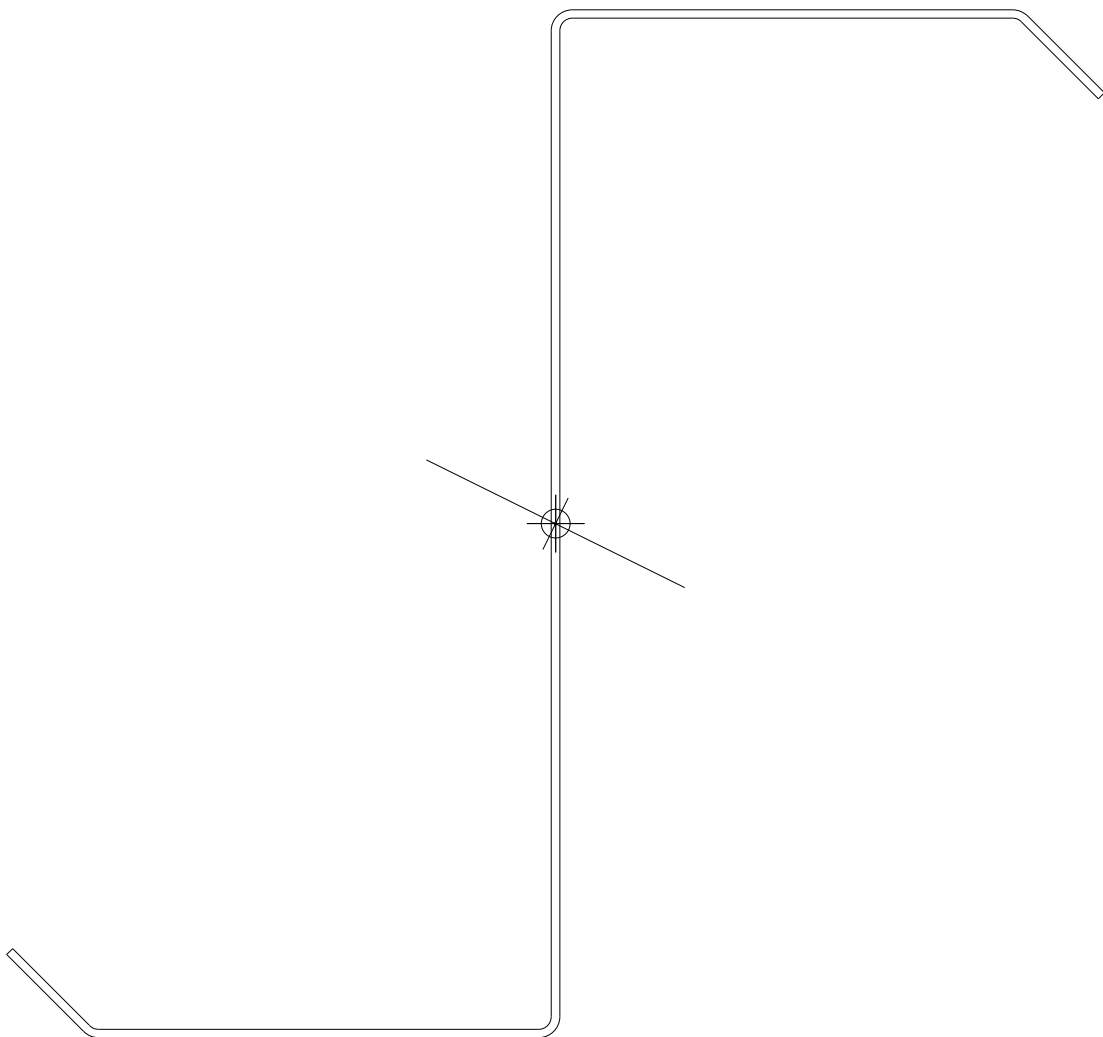
Structural Components Only



Rev. Date: 24-11-2021 5.24.50 PM

By:

Printed: 24-11-2021 5.25.50 PM



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Section Inputs

Material: A653 SS Grade 33

No cold work of forming strength increase.

No inelastic reserve strength increase.

Modulus of Elasticity, E 29500 ksi

Yield Strength, Fy 33 ksi

Tensile Strength, Fu 45 ksi

Torsion Constant Override, J 0 in⁴Warping Constant Override, Cw 0 in⁶

Stiffened Zee, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

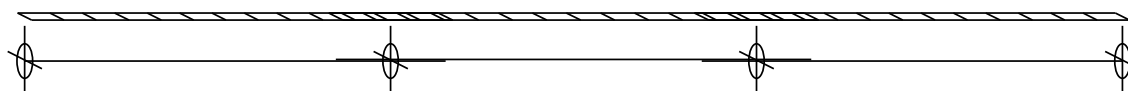
X to center of gravity 0 in

Y to center of gravity 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.0000	-45.000	0.10690	None	0.000	0.0000	0.5000
2	4.0000	0.000	0.10690	Single	0.000	0.0000	2.0000
3	8.7500	90.000	0.10690	Zee	0.000	0.0000	4.3750
4	4.0000	0.000	0.10690	Single	0.000	0.0000	2.0000
5	1.0000	-45.000	0.10690	None	0.000	0.0000	0.5000

Rev. Date: 24-11-2021 5.25.18 PM
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Analysis Inputs

General

Member Orientation: Horizontal
 Calculate global buckling using specification equations
 Do not include torsion in member checks

Members

Section File	Revision Date and Time
1 Section 1.cfss	24-11-2021 5.24.50 PM
2 Section 1.cfss	24-11-2021 5.24.50 PM
3 Section 1.cfss	24-11-2021 5.24.50 PM

Material	Area (in ²)	Length (ft)	Weight (k)
1 A653 SS Grade 33	1.3129	23.000	0.10267
2 A653 SS Grade 33	1.3129	26.000	0.11606
3 A653 SS Grade 33	1.3129	23.000	0.10267
Total		72.000	0.32140

	Start Loc. (ft)	End Loc. (ft)	Braced Flange	R	kφ (k)	Lm (ft)	ex (in)	ey (in)
1	0.000	23.000	Top	0.0000	0.0000	20.000	0.000	0.000
2	17.000	43.000	Top	0.0000	0.0000	20.000	0.000	0.000
3	37.000	60.000	Top	0.0000	0.0000	20.000	0.000	0.000

Supports

Type	Location (ft)	Bearing (in)	Fastened	K
1 XYT	0.000	2.00	No	1.0000
2 XYT	20.000	2.00	No	1.0000
3 XYT	40.000	2.00	No	1.0000
4 XYT	60.000	2.00	No	1.0000

Loading: Dead Load

Type	Angle (deg)	Start Loc. (ft)	End Loc. (ft)	Start Magnitude	End Magnitude
1 Distributed	90.000	0.000	60.000	-0.03500	-0.03500 k/ft

Loading: Product Load

Type	Angle (deg)	Start Loc. (ft)	End Loc. (ft)	Start Magnitude	End Magnitude
1 Distributed	90.000	0.000	60.000	-0.01500	-0.01500 k/ft

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Loading: Roof Live Load

Type	Angle (deg)	Start Loc. (ft)	End Loc. (ft)	Start Magnitude	End Magnitude
1 Distributed	90.000	0.000	60.000	-0.10000	-0.10000 k/ft

Loading: Snow Load

Type	Angle (deg)	Start Loc. (ft)	End Loc. (ft)	Start Magnitude	End Magnitude
1 Distributed	90.000	0.000	60.000	-0.10000	-0.10000 k/ft

Load Combination: D

Specification: AISI S100-16/S1-18, US, ASD

Inflection Point Bracing: No

Loading	Factor
1 Beam Self Weight	1.000
2 Dead Load	1.000

Load Combination: D+Lr

Specification: AISI S100-16/S1-18, US, ASD

Inflection Point Bracing: No

Loading	Factor
1 Beam Self Weight	1.000
2 Dead Load	1.000
3 Roof Live Load	1.000

Load Combination: D+S

Specification: AISI S100-16/S1-18, US, ASD

Inflection Point Bracing: No

Loading	Factor
1 Beam Self Weight	1.000
2 Dead Load	1.000
3 Snow Load	1.000

Load Combination: D+0.75(L+Lr)

Specification: AISI S100-16/S1-18, US, ASD

Inflection Point Bracing: No

Loading	Factor
1 Beam Self Weight	1.000
2 Dead Load	1.000
3 Live Load	0.750
4 Product Load	0.750
5 Roof Live Load	0.750

Load Combination: D+0.75(L+S)

Specification: AISI S100-16/S1-18, US, ASD

Inflection Point Bracing: No

Loading	Factor
1 Beam Self Weight	1.000
2 Dead Load	1.000
3 Live Load	0.750
4 Product Load	0.750
5 Snow Load	0.750

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Member Check - AISI S100-16/S1-18, US, ASD

Load Combination: D+0.75(L+S)
 Design Parameters at 7.738 ft:

Lx	20.000 ft	Ly	20.000 ft	Lt	20.000 ft
Kx	1.0000	Ky	1.0000	Kt	1.0000

Section: Section 1.cfss

Material Type: A653 SS Grade 33, Fy=33 ksi

Cbx	1.8174	Cby	1.0000	ex	0.0000 in
Cmx	1.0000	Cmy	1.0000	ey	0.0000 in
Braced Flange: Top		kφ	0 k		
Red. Factor, R:	0	Lm	20.000 ft		

Loads:	P (k)	Mx (k-in)	Vy (k)	My (k-in)	Vx (k)
Total	0.000	45.162	0.000	0.000	0.000
Applied	0.000	45.162	0.000	0.000	0.000
Strength	11.531	52.064	3.843	16.928	6.614

Interaction Equations

Eq. H1.2-1 (P, Mx, My) $0.000 + 0.867 + 0.000 = 0.867 \leq 1.0$
 Eq. H2-1 (Mx, Vy) $\text{Sqrt}(0.516 + 0.000) = 0.718 \leq 1.0$
 Eq. H2-1 (My, Vx) $\text{Sqrt}(0.000 + 0.000) = 0.000 \leq 1.0$

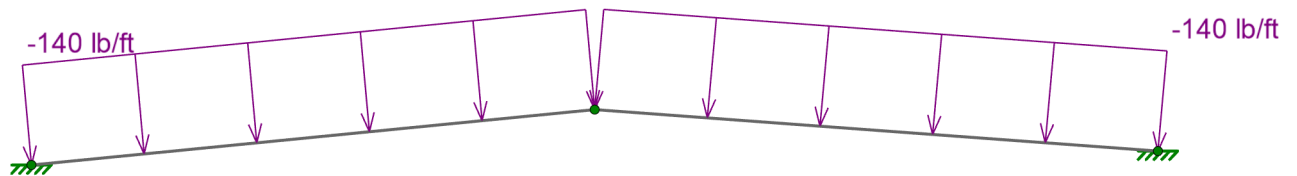
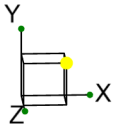
Design Loads

Dead Load =	7	psf
Roof Live Load =	20	psf
Pg, Ground Snow Load =	20	psf
Ce, Exposure Factor =	1	ASCE7 Table 7-2
Ct, Thermal Factor =	1	ASCE7 Table 7-3
Risk Category =	II	
I, Snow =	1	
Pf = 0.7*Ce*Ct*Is*Pg =	14	psf
Pm =	20	psf
Total, DL + SL =	27.00	psf
5%	1.35	psf

PV Dead Load, flat roof = 3.00 psf

Member	Span (ft)	Spacing (ft)	SW (plf)	DL (plf)	PV DL (plf)	Roof LL (plf)	Flat Roof SL (plf)	Total Load (plf)	Stress ratio
19" Deep Steel Beam	68.00	20.00		140.00	60.00	400.00	400.00	600.00	Refer Risa Output

ASSUMPTION:
FLANGE AND WEB THICKNESS ASSUMED AS 0.5in



Loads: BLC 1, DL
Envelope Only Solution

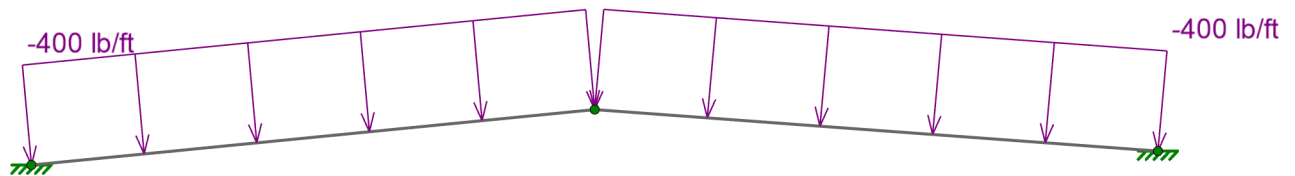
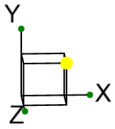
Barun Crop

Gopi

SK-1

Nov 24, 2021

Steel Frame.r3d



Loads: BLC 2, SL
Envelope Only Solution

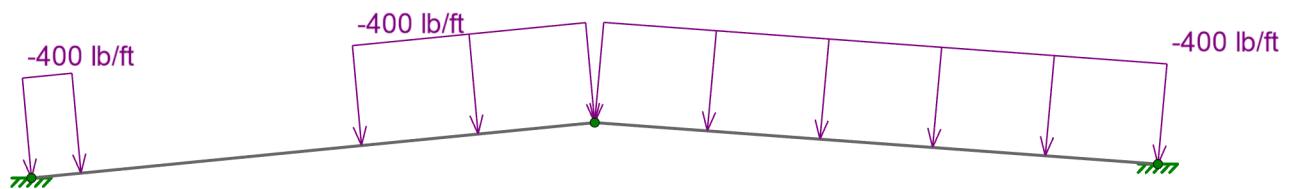
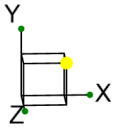
Barun Crop

Gopi

SK-2

Nov 24, 2021

Steel Frame.r3d



Loads: BLC 3, LL
Envelope Only Solution

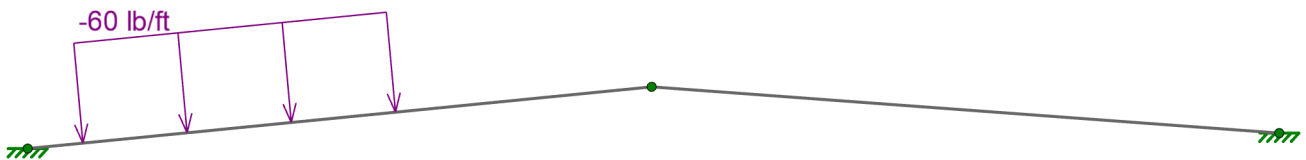
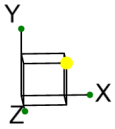
Barun Crop

Gopi

SK-3

Nov 24, 2021

Steel Frame.r3d



Loads: BLC 4, PV DL
Envelope Only Solution

Barun Crop

Gopi

SK-4

Nov 24, 2021

Steel Frame.r3d

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e° F ⁻¹]	Density [k/ft ³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	0.3	0.65	0.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	0.3	0.65	0.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	0.3	0.65	0.49	35	1.6	60	1.2
7	A1085	29000	11154	0.3	0.65	0.49	50	1.25	65	1.15
8	A913 Gr.65	29000	11154	0.3	0.65	0.49	65	1.1	80	1.1

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in ²]	Iyy [in ⁴]	Izz [in ⁴]	J [in ⁴]
1	Beam	19X7X0.5	Beam	Wide Flange	A992	Typical	16	28.771	842.083	1.353

Basic Load Cases

	BLC Description	Category	Y Gravity	Distributed
1	DL	DL	-1	2
2	SL	SL		2
3	LL	RLL		3
4	PV DL	DL		1

Load Combinations

	Description	Solve	PDelta	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	1	1		
2	1.2DL+1.6SL	Yes	Y	DL	1.2	SL	1.6
3	1.2DL+1.6RLL	Yes	Y	DL	1.2	RLL	1.6

Envelope AISC 15th (360-16): LRFD Steel Code Checks

Member	Shape	Code Check	Loc[ft]	LC	Shear	Check	Loc[ft]	Dir	LC	phi*Pnc [k]	phi*Pnt [k]	phi*Mn y-y [k-ft]	phi*Mn z-z [k-ft]	Cb	Eqn
1	M1	19X7X0.5	1.048	0	2	0.073	0	y	2	571.864	720	49.321	184.832	2.514	H1-1a
2	M2	19X7X0.5	1.031	0	3	0.07	0	y	3	570.315	720	49.321	177.788	2.435	H1-1b

105%Stress Acceptable