

Mr. Josh Heinz  
Sunrise Solar Solutions, LLC  
510 North State Road  
Briarcliff Manor, NY 10510

April 17, 2020

**RE: Club Fit – 584 North State Road, Briarcliff Manor, NY 10510  
Project # 20.249**

Mr. Heinz:

We have reviewed the proposed solar array and the structure(s) at the above referenced address.

The array consists of (1,435) Sunpower modules on the structure, mounted on a Unirac racking system, with a system weight of 2.8 psf. Attachments to be 5/16" standard lag bolt, with a minimum of 1-1/2" of embedment into the structural member.

We hereby certify that the existing structure, with the addition of the proposed solar energy devices and racking, are capable of supporting the design loads required by ASCE 7-10, IBC 2015 (and all previous versions), and the 2017 NYS Uniform Code Supplement. Calculations include (in accordance with IBC 2015), Ground Snow Load of 30 psf and Wind Speed of 115 mph (3 second gust).

We have attached the calculation for the critical roof member for the structure – a W10x15 roof beam, checked for bending stress and deflection in accordance with ASCE 7-10.

Please feel free to contact us should you have any comments or questions.

Respectfully yours,

*Matthew J. Boyce, PE*

Matthew J. Boyce, PE





## Calculation Sheet

Project #: 20.249

Date: 4/17/20

Project Name: **Club Fit**

Calc Type: Gravity

### Building Information

Building Length	361 ft
Building Width	120 ft
Building Height	18 ft
Array L	270 ft
Array W	110 ft
Array Unit Weight	2.6 psf
Number of Panels	1435 ea

### Code Information

S <sub>1</sub>	0.072
S <sub>s</sub>	0.27
Occupancy	II
Site Class	D
ASCE 7-10	

Building Construction Type: Metal Frame

Unit Weight 50 psf

### Increased Wind Loads Due to the addition of Solar Panels (AREA ABOVE PARAPET)

Building Wall Area	6498
Solar Area (surface)	270
Area Increase	n/a < 10% Flush mount

Gravity loads are checked for the individual load carrying member - critical case. (see attached)



## Calculation Sheet

Project #: 20.249

Date: 4/17/20

Project Name **Club Fit**

Calc Type: Seismic

### Seismic Weight

Roof DL	10	psf
Roof Weight	433.2	k
Wall Weight	865.8	k
Total Weight	1299.0	k
Solar Weight	77.2	k
W = Solar/Total	5.94%	< 10% OK

### Horizontal Seismic Force

$$F_p = \frac{(0.4 \times a_p \times S_d \times W_p) \times (1 + 2 \times z/h)}{(R_p/I_p)} \quad (13.3-1)$$

$$S_d = 2/3 S_m \quad (11.4-3)$$

$$S_m = F_a \times S_s \quad (11.4-1)$$

$$F_a = 1.37 \quad (\text{from Table 11.4-1})$$

$$S_m = 0.36305$$

$$S_d = 0.242033333$$

$$R_p = 1.5 \quad (\text{Table 13.5-1})$$

$$I_p = 1 \quad (13.1.3)$$

$$a_p = 1 \quad (\text{Table 13.5-1})$$

$$z/h = 1 \quad \text{Difference in height between roof \& solar array}$$

$$W_p = 77220 \quad \text{lbs}$$

$$F_p = 14952 \quad \text{lbs}$$

$$F_p = a \times W_p$$

$$a = 19\%$$

$$\text{For one panel, } F_p = 10 \quad \text{lbs}$$

$$\# \text{ of supports} = 4 \quad \text{ea}$$

$$F_p \text{ (per support)} = 3 \quad \text{lbs}$$

The lateral force resisting elements (ext. shear walls) experience an increase of 14952 lbs total ultimate load for the entire array.

These elements experience an increase of 3 lbs locally and are more than adequate.



## Steel Beam

Lic. #: KW-06012821

File = C:\Users\Owner\DOCUME~1\ENERCA~1\Solar 1.ec6  
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.2.28  
Engineered Solutions

DESCRIPTION: --None--

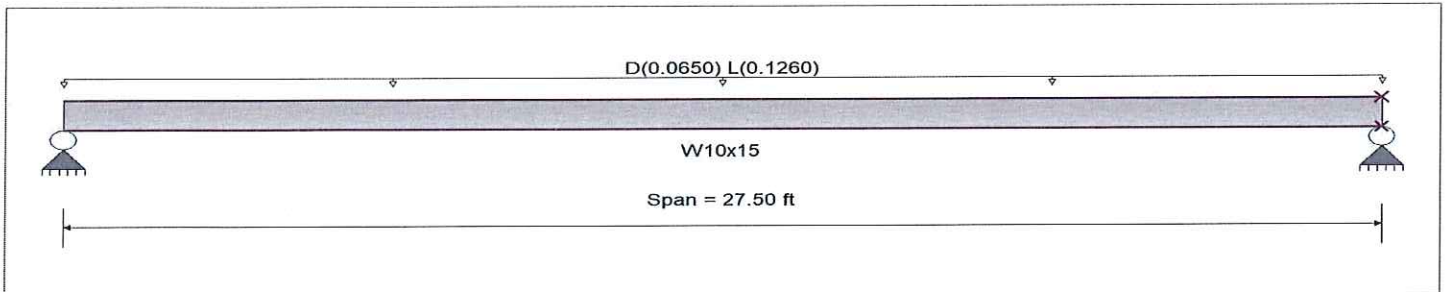
## CODE REFERENCES

Calculations per AISC 360-10, IBC 2015, CBC 2016, ASCE 7-10  
Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Strength Design  
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling  
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 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  
Loads on all spans...

Uniform Load on ALL spans : D = 0.0130, L = 0.02520 ksf, Tributary Width = 5.0 ft

## DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.452 : 1	Maximum Shear Stress Ratio =	0.057 : 1
Section used for this span	W10x15	Section used for this span	W10x15
Ma : Applied	18.055 k-ft	Va : Applied	2.626 k
Mn / Omega : Allowable	39.920 k-ft	Vn/Omega : Allowable	46.0 k
Load Combination	+D+L	Load Combination	+D+L
Location of maximum on span	13.750ft	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	0.815 in	Ratio =	404 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	1.236 in	Ratio =	267 >=180
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only	Dsgn. L = 27.50 ft	1	0.154	0.019	6.14		6.14	66.67	39.92	1.00	1.00	0.89	69.00	46.00
+D+L	Dsgn. L = 27.50 ft	1	0.452	0.057	18.06		18.06	66.67	39.92	1.00	1.00	2.63	69.00	46.00
+D+0.750L	Dsgn. L = 27.50 ft	1	0.378	0.048	15.08		15.08	66.67	39.92	1.00	1.00	2.19	69.00	46.00
+0.60D	Dsgn. L = 27.50 ft	1	0.092	0.012	3.69		3.69	66.67	39.92	1.00	1.00	0.54	69.00	46.00

## Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	1.2357	13.829		0.0000	0.000

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.626	2.626
Overall MINimum	0.536	0.536
D Only	0.894	0.894
+D+L	2.626	2.626
+D+0.750L	2.193	2.193
+0.60D	0.536	0.536
L Only	1.733	1.733