Historic Preservation Services
Community Development & Neighborhood Services
281 North College Avenue
P.O. Box 580
Fort Collins, CO 80522.0580

970.416.4250
preservation@fcgov.com
fcgov.com/historicpreservation

REPORT OF ALTERATIONS TO DESIGNATED RESOURCE
Site Number/Address: 318 E. Myrtle Street
Laurel School National Register Historic District
ISSUED: May 18, 2020

Steven and Heidi Lovaas
318 E. Myrtle St.
Fort Collins, CO 80524

Dear Mr. and Mrs Lovaas:

This report is to document proposed alterations to the property at 318 E. Myrtle Street, pursuant to Fort Collins Municipal Code Chapter 14, Article IV. A copy of this report may be forwarded to the Colorado Office of Archaeology and Historic Preservation.

The alterations include:

- Installation of rooftop solar on non-historic, c.2006, accessory dwelling unit at rear (north) of property.

Our staff review of the proposed work finds the alterations do meet the SOI Standards for Treatment of Historic Properties. A summary is provided below:

Applicable Code Standard	Summary of Code Requirement and Analysis (Rehabilitation)	Standard Met (Y/N)
SOI #1	*A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships;*	**Y**
SOI #2	*The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.* **The primary historic property at 318 E. Myrtle is a modest, gable-ell cottage. The non-historic (c.2006) accessory dwelling unit at the rear of the lot is generally not visible from Myrtle Street, so the solar panels will be well-screened from public rights-of-way.**	**Y**
SOI #3	*Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.*	**N/A**

SOI #4	*Changes to a property that have acquired historic significance in their own right will be retained and preserved.*	**N/A**
SOI #5	*Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.*	**N/A**
SOI #6	*Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.*	**N/A**
SOI #7	*Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.*	**N/A**
SOI #8	*Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.*	**N/A**
SOI #9	*New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.* **The solar panels are being installed on a non-historic building at the rear of the lot with minimal visibility from public rights-of-way. Panels will be flush-mounted to further reduce visibility and alteration to the property's overall historic design characteristics.**	**Y**
SOI #10	*New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.* **Typical of rooftop solar installations, the panels can be removed at a later date if necessary.**	**Y**

This project is not expected to negatively affect the historic status of the property. It is expected to remain a contributing property in the Laurel School Historic District.

If you have any questions regarding this review, please contact me. I may be reached at jbertolini@fcgov.com, or at (970) 416-4250.

Sincerely,

Jim Bertolini
Historic Preservation Planner

GODWIN ENGINEERING AND DESIGN, LLC

8378 Foxtail Loop, Pensacola, FL 32526 | (850)712-4219 | chad@godwineng.com

May 13, 2020

To: City of Ft. Collins Building Division
281 N College
Ft. Collins, CO 80524

Re: Lovaas - Residential Roof Mount PV Installation
318 E Myrtle Street
Fort Collins, CO 80524

Plans Examiner,

This letter is regarding the installation of a new roof mounted Solar PV system on the existing residential structure at the address above. I have analyzed/reviewed the attached plans and have determined that the roof mounted PV system is in compliance with the applicable sections of the following Codes as amended and adopted by the City:

2018 International Building Code, IBC
2018 International Residential Code, IRC
ASCE/SEI 7-16 Min. Design Loads for Buildings & Other Structures
2017 National Electrical Code

Per 2018 IBC, the Roof Mounted PV system will be subject to the following design criteria:
Design Wind Speed(V_{ult}) - 140mph 3sec gust, Ground Snow load(P_g) – 30psf, Exposure Category – C

The PV System consist of PV modules, railing, and connection hardware. The system will add a dead load of approximately 3 psf to the roof.

The existing roof structure consist of 2” x 4” roof trusses 24” O.C. The existing structure will be adequate for supporting the additional PV dead load, snow and wind loads.

The securement method of the PV system is to be flush mounted to the asphalt shingle roof with Ironridge railing and the Roof-Tech RT mini mount. The attachments can be attached up to 48” apart and should be staggered, where possible, to allow distribution of the design loads evenly to the structure. The mounts shall be installed with a min. 2 x 5.0 x 60mm wood screws with minimum 2-5/16” thread length directly to roof truss.

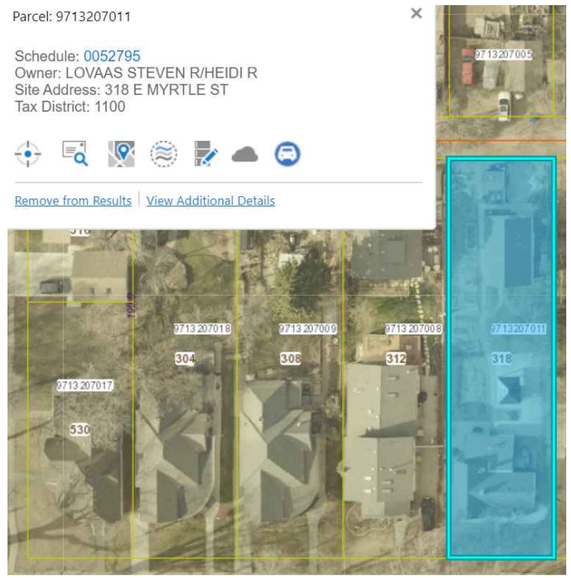
Please note that only a portion of the roof structure was reviewed. The engineer of Responsible Charge shall not be responsible for any existing flaws and/or defects that may currently exist or may be caused by the proposed installation.

Please contact me if you have any questions.

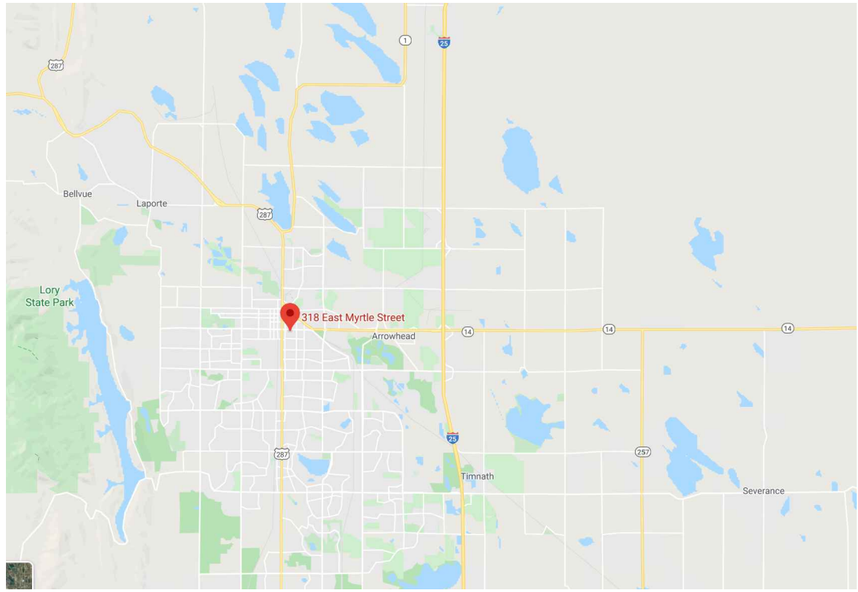
Sincerely,

D. Chad Godwin, PE 52767
Exp. 10/31/2021

LOVAAS PV PROJECT-7.92kWdc



1 PROPERTY ASSESOR MAP - PROJECT LOCATION
NTS



2 AERIAL MAP - PROJECT LOCATION
NTS

SCOPE OF WORK

THESE PLANS ARE FOR THE INSTALLATION OF A ROOF MOUNTED PHOTOVOLTAIC (PV) SYSTEM. THE PV SYSTEM WILL BE INTERCONNECTED WITH THE Fort Collins UTILITY GRID THROUGH EXISTING ELECTRICAL EQUIPMENT AND WILL OPERATE IN PARALLEL VIA SUPPLY (LST) SIDE CONNECTION WITH NET ENERGY METER.

GOVERNING BUILDING CODES

1. 2018INTERNATIONAL BUILDING CODE, IBC
2. 2018 INTERNATIONAL RESIDENTIAL CODE, IRC
3. 2018 INTERNATIONAL FIRE CODE, IFC
4. 2017 NATIONAL ELECTRICAL CODE, NEC
5. IEEE 1547
6. ASCE 7-10 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES
7. UL STANDARDS
   - 7.1. RACKING - UL 2703
   - 7.2. PV MODULE - UL 1703
   - 7.3. INVERTER - UL 1741

DESIGN SPECIFICATIONS

1. AHJ - City of Fort Collins Building Division
2. UTILITY - Fort Collins
3. BUILDING RISK CATEGORY II
4. DESIGN WIND SPEED (ULT) - 140MPH
5. DESIGN SNOW LOAD - 30 PSF
6. EXPOSURE CATEGORY - C
7. MEAN ROOF HEIGHT - 30
8. ROOF SLOPE - 42°

PV SYSTEM SPECIFICATIONS

1. PV MODULE: 21 x Silfab 320 Black ; 6.72kWdc
2. INVERTER: SE7600H-US
3. RACKING: UNIRAC w/RT MINI
4. ROOF TYPE:SHINGLE
5. AZIMUTH:95° 275°

PV INSTALLATION OVERVIEW

ELECTRICAL

a. POINT OF CONNECTION: Supply (LST)
b. MAX INV OUTPUT CURRENT: 32A
c. PV AC DEDICATED OCP DEVICE RATING: 32A * 125% = 40A, 40A OCP
d. UTILITY AC DISCONNECT REQ'D: YES

STRUCTURAL

a. MAX ALLOWABLE SPACING BETWEEN ATTACH POINTS: 4FT
b. MIN. NUMBER OF ATTACHMENT POINTS: 72
c. WEIGHT PER ATTACHMENT POINT: 16.4LBS/ATTACH
d. PV DEAD LOAD: 3.08 PSF
e. LENGTH OF RAIL REQUIRED: 238FT

Sheet List Table

Contractor Info
PHOTON BROTHERS
7705 W 108th Ave
Westminster, CO 80021

Project Type - Photovoltaic

Project Location:
LOVAAS RESIDENCE
318 E Myrtle St
Fort Collins, CO 80524
(970) 567-1028
Steven.lovaas@colostate.edu

Parcel Number: (970) 567-1028
Assessor Phone # (970) 416-2740

PV SYSTEM SPECIFICATIONS
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2. INVERTER: SE7600H-US
3. RACKING: UNIRAC w/RT MINI
4. ROOF TYPE:SHINGLE
5. AZIMUTH:95° 275°
6. ROOF SLOPE:42°

File Name:
01_LOVAAS_COVER.DWG

Sheet Number and Title:
PV01 - COVER

Sheet Size:
ANSI full bleed B (17.00 x 11.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	5/13/20

Design
Godwin Engineering and Design, LLC
8378 Foxtail Loop
Pensacola, FL 32526
D. Chad Godwin, PE
Chad@godwineng.com

INSTALLATION NOTES

1. THE EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURES INSTALLATION INSTRUCTIONS.
2. THE ACTUAL LOCATION OF THE ARRAY AND PLACEMENT OF THE MECHANICAL ANCHORS ARE SUBJECT TO VARIANCES DEPENDING ON SITE CONDITIONS AND/OR ROOF OBSTRUCTIONS. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND SPECIFICATIONS BEFORE COMMENCING.
3. ALL OUTDOOR EQUIPMENT SHALL BE RAIN TIGHT WITH MINIMUM NEMA3-R RATING.
4. ALL LOCATIONS ARE APPROXIMATE AND REQUIRE FIELD VERIFICATION.
5. ALL WORK SHALL COMPLY WITH THE BUILDING CODES SET FORTH BY THE GOVERNING JURISDICTION.
6. ALL EQUIPMENT SHALL MEET MINIMUM SETBACKS AS REQUIRED BY THE NATIONAL FIRE CODE, NFC AND THE NATIONAL ELECTRICAL CODE, NEC.

GENERAL PV SITE NOTES

1. PV ARRAY NOT TO DISRUPT ATTIC VENTS OR PLUMBING VENTS. ARRAY TO SPAN OR EXTEND TERMINATION PLUMBING VENTS WITHOUT ANY IMPACT ON THEIR FUNCTIONALITY.
2. PANELS WILL NOT EXCEED THE OVERALL HEIGHT OR ROOF PITCH OF THE EXISTING STRUCTURE.

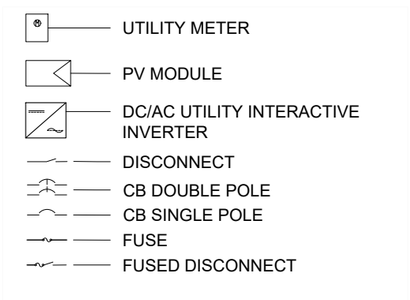
ABBREVIATIONS

(E) - EXISTING
(N) - NEW
TYP - TYPICAL
NTS - NOT TO SCALE
MIN - MINIMUM
MAX - MAXIMUM
AC - ALTERNATING CURRENT
DC - DIRECT CURRENT
PV - PHOTOVOLTAIC
MOD - PV MODULE
INV - DC/AC PV INVERTER
POC - POINT OF CONNECTION(PV)
RSB - RAPID SHUTDOWN BOX
CB - CIRCUIT BREAKER (EX. 20A/2P CB - 20AMP 2-POLE CIRCUIT BREAKER)
C - CONDUIT
OCP - OVERCURRENT PROTECTION
OCPD- OVERCURRENT PROTECTION DEVICE
MSD - MAIN SERVICE DISCONNECT
DISC - DISCONNECT
MSP - MAIN SERVICE PANEL
SP - SUB PANEL
PLP - PROTECTED LOADS PANEL
MLO - MAIN LUG ONLY
MB - MAIN BREAKER
EGC - EQUIPMENT GROUNDING CONDUCTOR
GEC - GROUNDING ELECTRODE CODUCTOR
GES - GROUNDING ELECTRODE SYSTEM

ELECTRICAL NOTES

1. INSTALLATION TO BE COMPLIANT WITH NFPA 1 & NFPA70 (NATIONAL ELECTRICAL CODE)
2. THE INVERTER HAS INTEGRATED GROUND AND NO DC GEC IS REQUIRED. THE DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENTS OF 690.35 (UNGROUNDED PHOTOVOLTAIC POWER SYSTEMS)
3. THE EXACT LOCATION OF NEW ELECTRICAL EQUIPMENT AND CONDUIT RUN RELATING TO THIS PROJECT IS SUBJECT TO CHANGE AND WILL BE DETERMINED ON SITE BY THE CONTRACTOR
4. THE PV SYSTEM IS EQUIPPED WITH A RAPID SHUTDOWN SYSTEM AND SATISFIES THE REQUIREMENTS OF THE NEC SEC. 690.12
5. ALL EQUIPMENT TO BE LISTED OR LABELED FOR ITS APPLICATION(UL OR OTHER APPROVED LISTINGS)
   - 5.1. PV MODULE - UL1703
   - 5.2. INVERTER - UL1741
   - 5.3. RACKING SYSTEM - UL2703
6. GROUNDING
   - 6.1. ALL EQUIPMENT SHALL BE PROPERLY GROUNDED PER THE REQUIREMENTS OF NEC ARTICLES 250 & 690
   - 6.2. MODULE BONDING METHOD SHALL BE INTEGRATED GROUNDING MID CLAPS. REFER TO MANUFACTURES SPECIFIC INSTRUCTIONS FOR PROPER BONDING TECHNIQUES.
   - 6.3. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES SHALL BE RATED FOR DIRECT BURIAL
   - 6.4. EGC SHALL BE SIZED IN ACCORDACE WITH 250.122 AND ARRAY EGC'S SMALLER THAN 6AWG SHALL COMPLY WITH 250.120(C)
7. ALL CONDUCTORS ARE COPPER, UNLESS SPECIFIED OTHERWISE
8. ALL CONDUIT, RACEWAYS, AND JUNCTION BOXES SHALL BE SIZED ACCORDING TO THE APPLICABLE CODE IF THE SIZE IS NOT SPECIFIED.
9. SIGNAGE SHALL BE APPLIED ACCORDING TO GOVERNING BUILDING CODES AND LOCAL JURISDICTIONS SPECIFIC REQUIREMENTS.
10. EQUIPMENT INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC.
11. CALCULATION OF MAXIMUM CIRCUIT CURRENT FOR THE SPECIFIC CIRCUIT SHALL BE CALCULATED IN ACCORDANCE WITH 690.8(A)(1) THROUGH (A)(5). CONDUCTOR AMPACITY SHALL BE SIZED TO NOT CARRY LESS THAN THE LARGER OF 690.(B)(1) OR (2)
12. DC PV SOURCE AND DC OUTPUT CURRENT CIRCUITS ON OR INSIDE A BUILDING SHALL BE CONTAINED IN METAL RACEWAYS, TYPE MC METAL-CLAD CABLE THAT COMPLIES WITH 250.118(10), OR METAL ENCLOSURES FROM THE POINT OF PENETRATION OF THE SURFACE OF THE BUILDING OR STRUCTURE TO THE FIRST READILY ACCESSIBLE DISCONNECTING MEANS.(690.31(G))
13. ACCESS TO BOXES; JUNCTION, PULL, AND OUTLET BOXES LOCATED BEHIND MODULES OR PANELS SHALL BE SO INSTALLED THAT THE WIRING CONTAINED IN THEM CAN BE RENDERED ACCESSIBLE DIRECTLY OR BY DISPLACEMENT OF A MODULE(S) SECURED BY REMOVABLE FASTENERS AND CONNECTED BY FLEXIBLE WIRING SYSTEM.(690.34)
14. PV POINT OF CONNECTION. THE OUTPUT OF AN INTERCONNECTED ELECTRIC POWER SOURCE SHALL BE CONNECTED AS SPECIFIED IN 705.12(A),(B),(C), OR (D).

SYMBOLS



STRUCTURAL NOTES

1. PV SYSTEM CONSIST OF THE PV MODULES, RAILING, AND CONNECTION HARDWARE
2. RACKING SYSTEM & PV ARRAY SHALL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL
3. THE ATTACHMENTS SHOULD BE STAGGERED, WHERE POSSIBLE, TO ALLOW DISTRIBUTION OF THE DESIGN LOADS EVENLY TO THE STRUCTURE.
4. ALL ROOF PENETRATIONS SHALL BE FLASHED AND SEALED BY APPROVED METHOD PER ROOF TYPE MANUFACTURE
5. TYP. ROOF SUPPORT STRUCTURE; 2" X 4", 24"O.C.
6. REFER TO TABLE 1.1 FOR MAX OVERHANG FROM LAST ATTACHMENT.
7. PV ARRAY SHALL BE A MINIMUM 3" ABOVE THE ROOFING MATERIAL.

LOAD INFORMATION

1. THE COMBINED LOADS WITH THE PV ROOF EQUIPMENT INSTALLED ARE NOT LARGER THAN THE COMBINED LOADS AS REQUIRED BY THE BUILDING CODE FOR THE ROOF WITHOUT PANELS.
2. NUMBER OF ATTACHMENT POINTS: 72
3. WEIGHT PER ATTACHMENT POINT: 16.4LBS/ATTACH
4. PV DEAD LOAD: 3.08 PSF
5. DESIGN SNOW LOAD
   - 5.1. GROUND SNOW LOAD - 30 PSF
6. ALLOWABLE DESIGN LOADS FOR PV MODULE:
   - 6.1. WIND = 62PSF
   - 6.2. SNOW = 125PSF

Contractor Info

PHOTON BROTHERS
7705 W 108th Ave
Westminster, CO 80021

Project Type - Photovoltaic

Project Location:

LOVAAS RESIDENCE
318 E Myrtle St
Fort Collins, CO 80524
(970) 567-1028
Steven.lovaas@colostate.edu

Parcel Number: (970) 567-1028
Assessor Phone # (970) 416-2740

PV SYSTEM SPECIFICATIONS

1. PV MODULE: 21 x Silfab 320 Black ; 6.72kWdc
2. INVERTER: SE7600H-US
3. RACKING: UNIRAC w/RT MINI
4. ROOF TYPE:SHINGLE
5. AZIMUTH:95° 275°
6. ROOF SLOPE:42°

File Name:
02_LOVAAS_NOTES.DWG

Sheet Number and Title:
PV02 - NOTES

Sheet Size:
ANSI full bleed B (17.00 x 11.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	5/13/20

Design

Godwin Engineering and Design, LLC
8378 Foxtail Loop
Pensacola, FL 32526
D. Chad Godwin, PE
Chad@godwineng.com

PV02

NEC LABEL NOTES:

1. THE WARNING SIGN(S) OR LABEL(S) SHALL COMPLY WITH NEC 110.21(B)
2. LABELS SHALL BE SUITABLE FOR THE ENVIRONMENT WHERE THEY ARE INSTALLED.
3. LABELS TO BE A MIN LETTER HEIGHT OF 3/8" AND PERMANENTLY AFFIXED.
4. LABELS SHALL ALSO COMPLY WITH THE SPECIFIC REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.

UTILITY PHOTOVOLTAIC DISCONNECT

UTILITY REQUIRED LABEL
APPLY TO PV AC DISCONNECT

PHOTOVOLTAIC SYSTEM CONNECTED

UTILITY REQUIRED LABEL
APPLY TO UTILITY METER

WARNING
ELECTRIC SHOCK HAZARD

TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL 1 - NEC 690.13(B)
APPLY TO DISCONNECTS

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL 2 - NEC 690.31(G)(4)
APPLY TO EXPOSED RACEWAYS, CABLE TRAYS, OTHER WIRING METHODS, COVERS, ENCLOSURES OF PULL BOXES, AND J-BOXES. SPACING BETWEEN LABELS OR MARKINGS SHALL NOT BE MORE THAN 10FT APART.

PHOTOVOLTAIC SYSTEM DC DISCONNECT

MAX SYSTEM VOLTAGE: 480VDC
MAX CIRCUIT CURRENT: 20A

LABEL 3 - 690.53
APPLY TO DC DISCONNECT/INVERTER

PHOTOVOLTAIC SYSTEM
AC DISCONNECT
RATED AC OUTPUT CURRENT: 32A
NOMINAL OPERATING VOLTAGE: 240VAC

LABEL 4 - NEC 690.54
APPLY TO MAIN PV AC DISCONNECT

WARNING:
DUAL POWER SUPPLY
SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

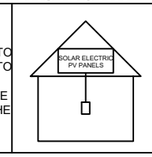
LABEL 5 - NEC 705.12(B)(3)
APPLY TO MSP

WARNING:
POWER SOURCE OUTPUT CONNECTION: DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL 6 - NEC 705.12(B)(2)(3)(b)
APPLY TO BACK-FED BREAKER, IF APPLICABLE

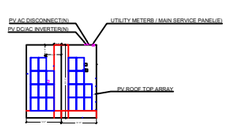
SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY.

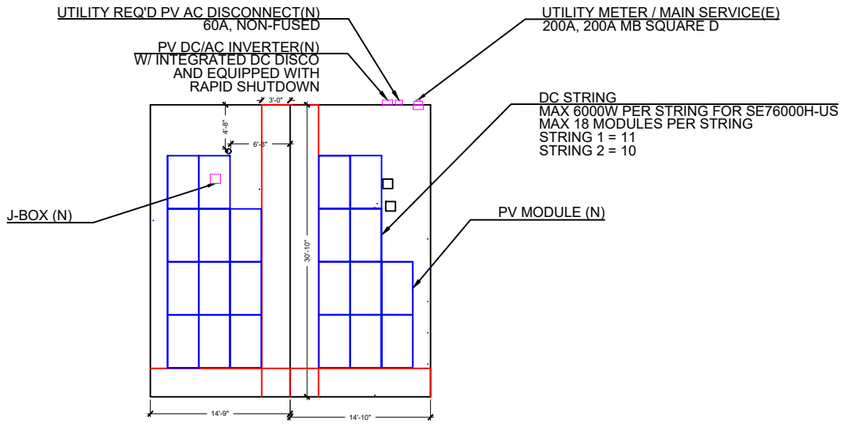


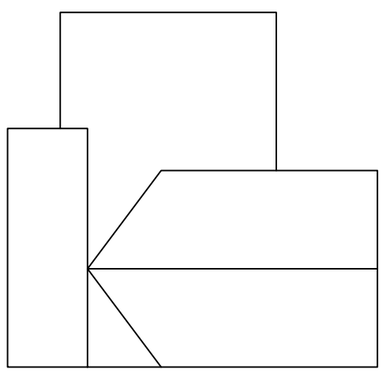
LABEL 7 - NEC 690.56(C)(1)(a)
APPLY TO LABEL ON OR NO MORE THAN 3FT FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATION OF ALL IDENTIFIED RAPID SHUTDOWN SWITCHES IF NOT AT THE SAME LOCATION

CAUTION
POWER TO THIS BUILDING IS ALSO SUPPLIED FROM ROOF MOUNTED PV ARRAY WITH SAFETY DISCONNECTS AS SHOWN:
PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN



LABEL 10 - NEC 705.10 DIRECTORY OR PLAQUE
APPLY TO LOCATION APPROVED BY AHJ.
DIRECTORY OR PLAQUE PROVIDING LOCATION OF MSD AND PV DISCONNECT





4 PV SITE PLAN W/ MODULE LAYOUT
Scale: 1/16" = 1'-0"

Contractor Info
PHOTON BROTHERS
7705 W 108th Ave
Westminster, CO 80021

Project Type - Photovoltaic

Project Location:
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2. INVERTER: SE7600H-US
3. RACKING: UNIRAC w/RT MINI
4. ROOF TYPE:SHINGLE
5. AZIMUTH:95° 275°
6. ROOF SLOPE:42°

File Name:
03_2017NEC_E_PV SITE LAYOUT.DWG

Sheet Number and Title:
PV03 - E_PV SITE PLAN

Sheet Size:
ANSI full bleed B (17.00 x 11.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	5/13/20

Design
Godwin Engineering and Design, LLC
8378 Foxtail Loop
Pensacola, FL 32526
D. Chad Godwin, PE
Chad@godwineng.com

PV03

Project Details				PV Module Data			SolarEdge Inverter Data			Optimizer Data			PV Source Circuit Calculations				
Project Name	LOVAAS PV			Model Number	SIL-320 NL		Model Number	SE7600H-US		Optimizer	P400		# of strings	2	Inverter 1		
Project Location	FORT COLINS CO			Nominal Output @ STC, Pmp	320	Wdc	Max DC Power(STC)	11800	Wdc	DC input Power	400	Wdc	String #	1	2	Max # of Modules/String	17
Module - 21	Silfab	SIL-320 NL		Open Circuit Voltage, Voc	40.1	Vdc	DC Max Voltage	480	Vdc	Max Input Voltage	80	Vdc	Modules per string	11	10	Maximum System Power (W)	6,720
Inverter - 1	SolarEdge	SE7600H-US		Max Power Point, Vmp	32.88	Vdc	DC Max input Current	20	A	MPPT Range	8-80	Vdc	Watts/String	3520	3200	Voltage Correction Factor, Low	1.1372
Utility - 240	Vac			Short Circuit Current, Isc	10.32	A	AC Max Output Power	7600	Wac	Max DC input Current	12.5	A	Operating Current	8.8	8.0	Voltage Correction Factor, High	0.9692
DC Rating 6.72	kW			Max Power Point Current, Imp	9.74	A	Nominal Output Voltage (Vac)	240	Vac	Max Output Current	15	A	# of strings			SolarEdge Fixed String Voltage	400
AC Rating 5.7	kW			VOC Temp Coeff	-0.28	%/°C	AC Max Output Current	32	A	Max Output Voltage	60	Vdc	String #	1	2	Maximum System Voltage	480
Min. Ambient Temp, °C	-24	-11.2 °F		Dimensions, LxWxH (in)	66.93 x 39.37 x 1.5		CEC Weighted Efficiency	99	%	Min. # of Opt's/String	8		Modules per string			Source Circuit Current	15
Max. Ambient Temp, °C	36	96.8 °F		Weight	41	lbs	Dimensions, LxWxH (in)	17.7x14.6x6.8		Max # of Opt's/String	25		Watts/String			Max Source Circuit Current	19
							Weight	26.2	lbs	Max Watts/String	5700		Operating Current				

PV INVERTER (N)
SOLAREDGE SE7600H-US
32A MAX AC OUTPUT
W/ INTEGRATED DC DISCONNECT
AND EQUIPPED WITH
RAPID SHUTDOWN

UTILITY REQ'D PV AC DISCONNECT(N)
60A, NON-FUSED,240Vac
GENERAL DUTY, NEMA 3R,
MANUAL, LOCKABLE, LOAD-BREAK
DISCONNECT SWITCH

UTILITY PHOTOVOLTAIC DISCONNECT

SERVICE UTILITY METER (E)
200A, 120/240Vac,1ϕ,3W

PHOTOVOLTAIC SYSTEM CONNECTED

METER/ MAIN COMBO PANEL(E)
200A, 200 MB,120/240Vac, SQUARE D
ADD 40/2 C.B. FOR PV

POINT OF CONNECTION (POC)
LOAD SIDE CONNECTION
DEDICATED BREAKER
705.12(B)(2)(3)(b)
200A BUSBAR
200A * 120% = 240A
PV 32A * 125% = 40A
200A(MB) + 40A(PV) = 240A <= 240A

GROUNDING ELECTRODE (E)

ROOF
BLDG. EXTERIOR WALL

PV MODULE (N)

SOLAREDGE OPTIMIZER (N)
P400

J-BOX (N)
SOLADECK TYP.

A
B
C

Conduit and Conductor Schedule						
Tag	**Description and Conductor Type**	**Min. Conductor Gauge**	**Number of Conductors**	**Typical Conduit Type**	**Min. Conduit Size**	**Max one way length (ft)**
A	Mods to j-box, PV Wire	12AWG	2 x (+,-)	FREE AIR	MFG CABLE	20
B	J-box to Inv., THWN-2	12AWG	2 x (+,-)(G)	12/4 MC	*MC CABLE	10
C	inv to POC, THWN-2	8AWG	L_1, L_2, N, (G)	PVC, EMT, or FMC	3/4"	10
Notes: *MC Cable can be EMT or FMC (G) can be #8AWG THWN-2 For Conduit sizing refer to Chapter 9 Tables, NEC					NEC 690.45-46, Table 250.66, Table 250.122	

PV Source Ckt			Inverter Out Ckt		
Distance above roof	1/2 in.-3 1/2 in.	310.15(B)c	PV Disconnect (AC)		
Amb. Temp. Adder for Rooftops (°F)	40		Design temperature (°F)	94	
Design temperature (°F)	136.8		Max Ambient Temp. Range (°F)	87-95	310.15(B)(2)(a)
Adjusted Temp. Range for Roof	132-140	310.15(B)(2)(a)	Temp. Rating of Conductor	75°C	
Temp. Rating of Conductor	90°C		No. of Current Carrying Cond.	<4	310.15(B)(3)(a)
No. of Current Carrying Cond.	<4	0.15(B)(3)(a)	AC Max Output Current	32.0	690.8(A)(3)
Max Source Circuit Current	15	690.8(A)(5)	AC Max Output Current * 125%	40.0	690.8(B)
Max Source Circuit Current * 125%	18.8	690.8(B)(1)	Overcurrent Protection (A)	40	
Amb. Temp Correction Factor	0.71	310.15(B)(2)(a)	Amb. Temp Correction Factor	0.94	310.15(B)(2)(a)
Raceway Fill Adjustment Factor	100%	310.15(B)(3)(a)	Raceway Fill Adjustment Factor	100%	310.15(B)(3)(a)
Cond. Gauge (AWG)	12	310.15(B)(16)	Cond. Gauge (AWG)	8	310.15(B)(16)
Cond. Allowable Ampacity (Amps)	30		Cond. Allowable Ampacity (Amps)	50	
Cond. Adjusted Ampacity (Amps)	21		Cond. Adjusted Ampacity (Amps)	47	

Contractor Info
PHOTON BROTHERS
7705 W 108th Ave
Westminster, CO 80021

Project Type - Photovoltaic

Project Location:
LOVAAS RESIDENCE
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Fort Collins, CO 80524
(970) 567-1028
Steven.lovaas@colostate.edu

Parcel Number: (970) 567-1028
Assessor Phone # (970) 416-2740

PV SYSTEM SPECIFICATIONS
1. PV MODULE: 21 x Silfab 320 Black ; 6.72kWdc
2. INVERTER: SE7600H-US
3. RACKING: UNIRAC w/RT MINI
4. ROOF TYPE:SHINGLE
5. AZIMUTH:95° 275°
6. ROOF SLOPE:42°

File Name:
04_LOVAAS_LINE DIAGRAM.DWG

Sheet Number and Title:
PV04 - LINE DIAGRAM

Sheet Size:
ANSI full bleed B (17.00 x 11.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	----

Design
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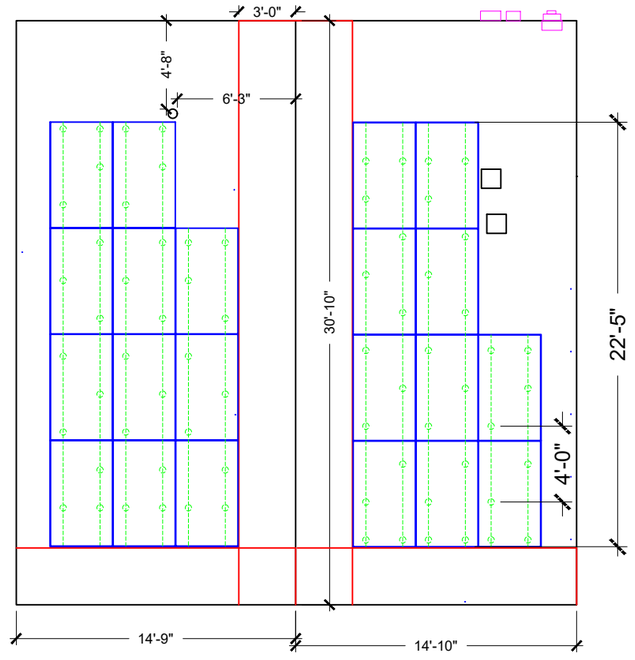
PV04



4 PV SITE PLAN W/ MODULE LAYOUT

Scale: 1/8" - 1'-0"

Contractor Info
PHOTON BROTHERS
7705 W 108th Ave
Westminster, CO 80021

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6. ROOF SLOPE:42°

File Name:
05_LOVAAS_S_PV SITE LAYOUT.DWG

Sheet Number and Title:
PV05 - E_PV SITE PLAN

Sheet Size:
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Drawing history

no.	drawn by	revision	date
01	DCG	----	5/13/20

Design
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Pensacola, FL 32526
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PV Dead Load				Module and Racking Specs		
# of Modules		21		Module Model Number	SIL-320 NL	
Module	W_{mod}	41	lbs	Dimensions, LxWxH (in)	66.93 x 39.37 x 1.5	
Array	W_{mods}	861	lbs	Width	39.37	in
Micro/optimizer	W_{mic}	84	lbs	Height	66.93	in
PV Rail	$W_{PV\ rail}$	238	lbs	Module Area	18.30	ft^2
Total Weight	W_{total}	1183	lbs	PV Racking	Unirac w/RT MINI	
Total Area	A_T	384.28	ft^2	Rail, Clamps, Mounts	1	plf
Dead Load	D_{PV}	3.08	psf	Total Rail Length, L	238	ft
				Micro/opt, W	4	lbs per

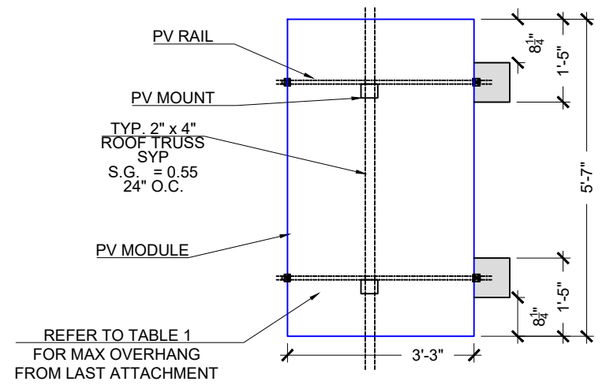
PV Attachment Summary		
Max Allowable Spacing	4	ft
# of attachment points	72	
Weight/attachment	16.4	lbs

ASCE 7-16 CHAPTER 29 WIND LOADS - Rooftop Solar Panels Minimum Design Loads - Part 1: Enclosed(gable, h<60ft, 27°<θ<45°)

					Load Types	Load, PSf
Risk Category		II		Table 1.5-1	Dead Load, D	3
Basic Wind Speed (Ult)		140	mph	Figure 26.5-1B	Weight of Ice, D_i	0
Wind Speed (asd)		108	mph	IBC 1609.3.1	Earthquake, E	0
Roof Angle		42	°		Fluid, F	n/a
Effective Wind Area		10.00	ft^2	26.20	Flood Load, F_a	n/a
Wind Load Parameters					Lateral Earth psi, H	n/a
Wind Directionality	K_d	0.85		Table 26.6-1	Live Load, L	n/a
Exposure Cat.	B,C, or D	C		Section 26.7	Roof Live, L_r	n/a
Topographic factor	K_{zt}	1.00		26.8 or 26.8.2	Rain, R	n/a
Ground Elevation Factor	K_e	0.86		Table 26.9-1	Snow, S	30
Velocity Exposure Coefficient	K_z	0.85		Table 26.10-1	Self-Straining, T	n/a
Array Edge Factor	γ_E	1.50		29.4.4	Wind, W	see calc
Solar Panel Equalization Factor	γ_a	0.80		Fig. 29.4-8	Wind-on-Ice, Wi	n/a
Velocity Pressure	q_p	18.66	psf	$q_h=0.00256\,K_z K_{zt} K_d K_e V^2$		
Mean Roof Height	h	20.00	ft			
0.4h		8.00	ft			
least horizontal dim		360	in			
10% of least horizontal dim		3.00	ft			
Roof Zone Set Back	a	3.00	ft			

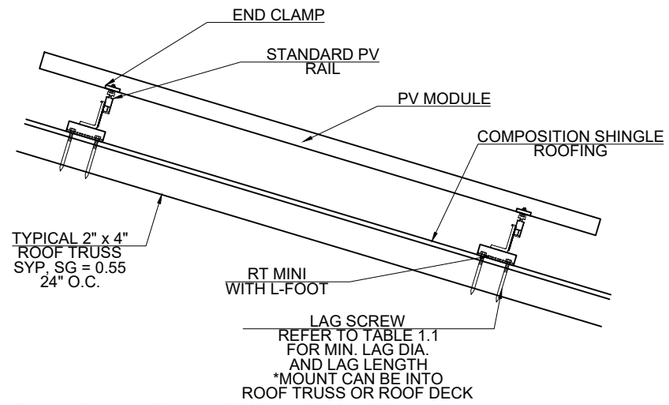
Figure 30.3-2C(Gable roof, h<60ft, 27°<θ<45°)

		Zone							
		1	2e	2n	2r	3e	3r		
GC_p		-1.80	-1.80	-2.00	-1.80	-2.00	-3.20		uplift
GC_p		0.90	0.90	0.90	0.90	0.90	0.90		downward
$p = q_h(GC_p)(\gamma_E)(\gamma_a)$		-40.31	-40.31	-44.79	-40.31	-44.79	-71.66	psf	uplift
$p = q_h(GC_p)(\gamma_E)(\gamma_a)$		20.16	20.16	20.16	20.16	20.16	20.16	psf	downward
downward case 1		23.16	23.16	23.16	23.16	23.16	23.16	psf	D + (0.6W OR 0.7E)
downward case 2		34.57	34.57	34.57	34.57	34.57	34.57	psf	D + 0.75L +0.75(0.6W) + 0.75(L, or S or R)
downward case 3		13.89	13.89	13.89	13.89	13.89	13.89	psf	0.6D + 0.6W
uplift case 1		-21.19	-21.19	-23.87	-21.19	-23.87	-40.00	psf	D + (0.6W OR 0.7E)
uplift case 2		-15.14	-15.14	-17.16	-15.14	-17.16	-29.25	psf	D + 0.75L +0.75(0.6W) + 0.75(L, or S or R)
uplift case 3		-22.39	-22.39	-25.07	-22.39	-25.07	-41.20	psf	0.6D + 0.6W
uplift case 4		-37.31	-37.31	-41.79	-37.31	-41.79	-68.66	psf	D + W
Width of Module	B	5.30						ft	
Total Design Load (Uplift)	P_{design}	-37.31	-37.31	-41.79	-37.31	-41.79	-68.66	psf	
Total Design Load (Downforce)	P_{design}	34.57	34.57	34.57	34.57	34.57	34.57	psf	
Distributed Load (Uplift)	$P_{dist.\ Up}$	-98.87	-98.87	-110.74	-98.87	-110.74	-181.96	plf	$P_{dist\ up}$ * B/2
Distributed Load (Down)	$P_{dist.\ Down}$	91.61	91.61	91.61	91.61	91.61	91.61	plf	$P_{dist\ down}$ * B/2
Railspan Between Anchor Points	L	4	4	4	4	4	2	ft	
Point Load (Uplift)	R	-395.49	-395.49	-442.96	-395.49	-442.96	-363.91	lbs	
Point Load (Down)	R	183.22	183.22	183.22	183.22	183.22	91.61	lbs	
Specific Gravity	G	0.55	0.55	0.55	0.55	0.55	0.55		Table 11.2A, NDS 2005, page 68 (SYP)
Diameter of Lag Screw	D	0.25	0.25	0.25	0.25	0.25	0.25	In	
Pullout Value of	W	259.5802	259.5802	259.5802	259.5802	259.5802	259.5802	lbs/in	$W=1800\,G^{3/2}\,D^{3/4}$
# of Lag screws		2	2	2	2	2	2		
Thread Length	T_d	1.5	1.5	1.5	1.5	1.5	1.5	In	Table L2, NDS 2005
Design Pullout Value per Mount	W_t	778.7406	778.7406	778.7406	778.7406	778.7406	778.7406		$W_t = W * \#\ of\ Lags * T_d$
SAFTEY FACTOR	SF	**1.97**	**1.97**	**1.76**	**1.97**	**1.76**	**2.14**		**Calculation**: $SF=W_t/R$ (Uplift)



A ALLOW. CLAMPING AREA - TOP DOWN

Scale: 3/8" = 1'-0"



B CONNECTION DETAIL - SIDE VIEW

Scale: 1:16

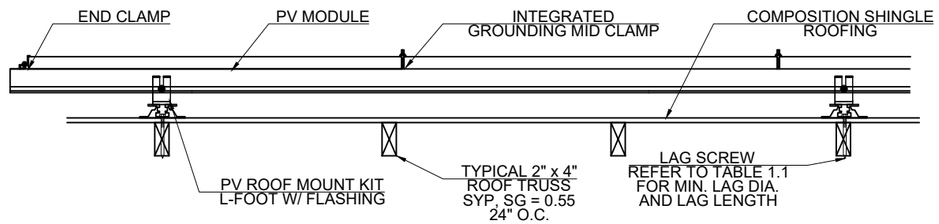
Table 1.1

Maximum Rail Span Allowance per Roof Zone

	RT MINI Mount - Truss/Rafter				RT MINI Mount - Roof Deck		
Zone	Span(ft)	# of lags	Min. Lag Dia.(in)	Min. Lag length(in)	Span(ft)	# of lags	Min. Lag Dia.
1	4	2	5/16	4	4	5	1/4
2	4	2	5/16	4	4	5	1/4
3	2	2	5/16	4	4	5	1/4

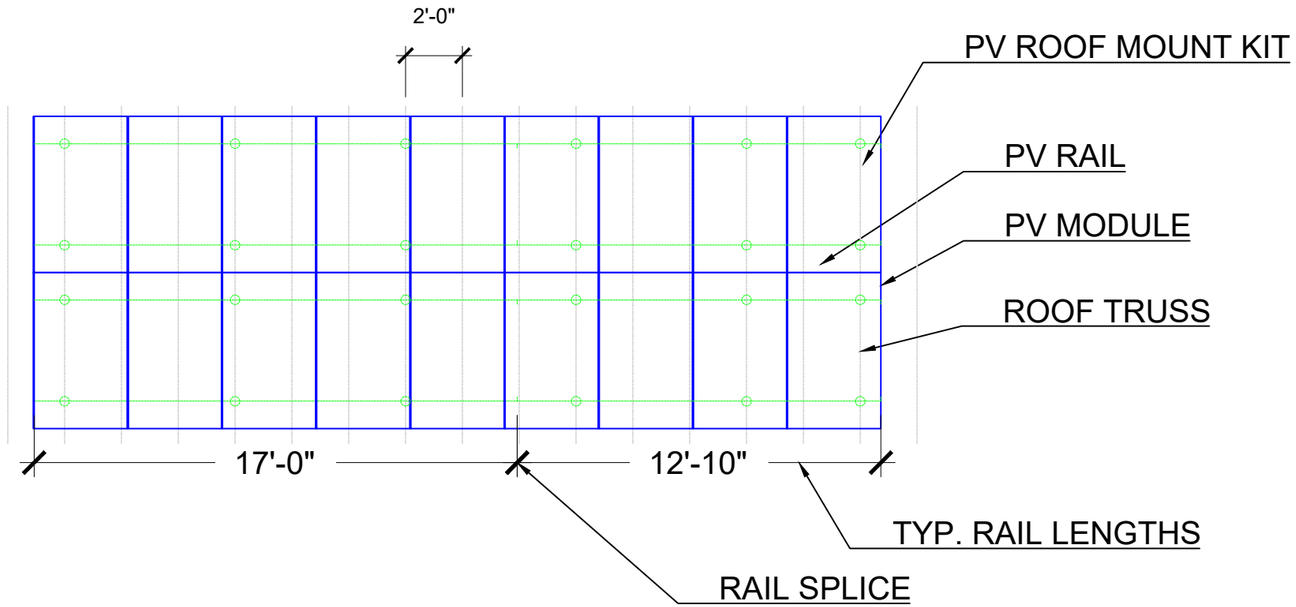
Maximum Rail Overhang from last attachment

Zone	Max overhang - Truss (in)	Max overhang - Roof Deck (in)
1	16	16
2	16	16
3	8	16



C CONNECTION DETAIL - FRONT VIEW

Scale: 3/4" = 1'



D MODULE ATTACHMENT PLAN W/ RAIL LENGTHS

Scale: 3/16" = 1'-0"

Contractor Info
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7705 W 108th Ave
Westminster, CO 80021

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1. PV MODULE: 21 x Silfab 320 Black ; 6.72kWdc
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4. ROOF TYPE:SHINGLE
5. AZIMUTH:95° 275°
6. ROOF SLOPE:42°

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06_LOVAAS_SHINGLE_SILFAB 320_RT MINI.DWG

Sheet Number and Title:
PV06 - PV ATTACH PLAN

Sheet Size:
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Drawing history

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Design
Godwin Engineering and Design, LLC
8378 Foxtail Loop
Pensacola, FL 32526
D. Chad Godwin, PE

PV06

SIL-320 NL

Silfab SOLAR

BAA ARRA · 25 YEAR PRODUCT WARRANTY · AUTOMATED MANUFACTURING · JUST-IN-TIME · 3PVEL DNV·GL TOP PERFORMER · TIER 1 BANKABLE $$$ · HIGH EFFICIENCY

60 Cell
Monocrystalline PV Module

INDUSTRY LEADING WARRANTY
All our products include an industry leading 25-year product workmanship and 30-year performance warranty.

35+ YEARS OF SOLAR INNOVATION
Leveraging over 35+ years of worldwide experience in the solar industry, Silfab is dedicated to superior manufacturing processes and innovations such as Bifacial and Back Contact technologies, to ensure our partners have the latest in solar innovation.

NORTH AMERICAN QUALITY
Silfab is the leading automated solar module manufacturer in North America. Utilizing premium quality materials and strict quality control management to deliver the highest efficiency, premium quality PV modules 100% made in North America.

CE · ETL Intertek · ETL Intertek · IEC · Fraunhofer ISE · CEC LISTED

CHUBB
* Chubb provides error and omission insurance to Silfab Solar Inc.

BAA / ARRA COMPLIANT
Silfab panels are designed and manufactured to meet Buy American Act Compliance. The US State Department, US Military and FAA have all utilized Silfab panels in their solar installations.

LIGHT AND DURABLE
Engineered to accommodate low load bearing structures up to 5400Pa. The light-weight frame is exclusively designed for wide-ranging racking compatibility and durability.

LOWEST DEFECT RATE
Total automation ensures strict quality controls during the entire manufacturing process at our ISO certified facilities. 48.18 ppm as per December 2018.

DOMESTIC PRODUCTION
Silfab Solar manufactures our PV modules in two automated locations within North America. Our 300+ North American team is ready to help our partners win the hearts and minds of customers, providing customer service and product delivery that is direct, efficient and local.

AESTHETICALLY PLEASING
All black sleek design, ideal for high-profile residential or commercial applications.

PID RESISTANT
PID Resistant due to advanced cell technology and material selection. In accordance to IEC 62804-1.

Electrical Specifications		SIL-320 NL mono PERC	
Test Conditions		STC	NOCT
Module Power (Pmax)	Wp	320	242
Maximum power voltage (Vpmax)	V	32.88	29.59
Maximum power current (Ipmax)	A	9.74	8.18
Open circuit voltage (Voc)	V	40.10	37.09
Short circuit current (Isc)	A	10.32	8.46
Module efficiency	%	18.8	17.8
Maximum system voltage (VDC)	V	1000	
Series fuse rating	A	20	
Power Tolerance	Wp	0 to +10	

Measurement conditions: STC 1000 W/m2 • AM 1.5 • Temperature 25 °C • NOCT 800 W/m² • AM 1.5 • Measurement uncertainty ≤ 3%
• Sun simulator calibration reference modules from Fraunhofer Institute. Electrical characteristics may vary by ±5% and power by 0 to +10W.

Temperature Ratings	SIL-320 NL mono PERC
Temperature Coefficient Isc	0.064 %/°C
Temperature Coefficient Voc	-0.28 %/°C
Temperature Coefficient Pmax	-0.36 %/°C
NOCT (± 2°C)	45 °C
Operating temperature	-40/+85 °C

Mechanical Properties and Components	SIL-320 NL mono PERC	
	Metric	Imperial
Module weight	18.6 kg ±0.2 kg	41 ±0.4 lbs
Dimensions (H x L x D)	1700 mm x 1000 mm x 38 mm	66.9 in x 39.4 in x 1.5 in
Maximum surface load (wind/snow)*	4000 Pa rear load / 5400 Pa front load N/m²	83.5/112.8 lb/ft^2
Hail impact resistance	ø 25 mm at 83 km/h	ø 1 in @ 51.6 mph
Cells	60 - Si mono PERC - 5 busbar 158.75 x 158.75 mm	60 - Si mono PERC - 5 busbar 6.25 x 6.25 Inch
Glass	3.2 mm high transmittance, tempered, DSM anti-reflective coating	0.126 high transmittance, tempered, DSM anti-reflective coating
Cables and connectors (refer to installation manual)	1200 mm, ø 5.7 mm, MC4 compatible	47.2 in, ø 0.22 in, MC4 compatible
Backsheet	High durability, superior hydrolysis resistance, multi-layer dielectric film	
Frame	Anodized Aluminum (Black)	
Bypass diodes	3 diodes-30SQ045T (45V max DC blocking voltage, 30A max forward rectified current)	
Junction Box	UL 3730 Certified, IP67 rated	

Warranties	SIL-320 NL mono PERC			
Module product workmanship warranty	25 years**			
Linear power performance guarantee	30 years			
	≥ 97% end 1st year	≥ 90% end 12th year	≥ 82% end 25th year	≥ 80% end 30th year

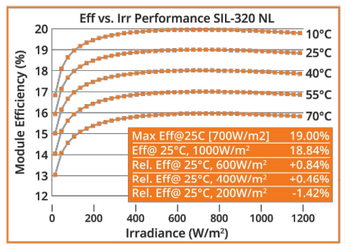
Certifications	SIL-320 NL mono PERC
Product	ULC ORD C1703, UL 1703, CEC listed, IEC 62716 Ammonia Corrosion; IEC61701:2011 Salt Mist Corrosion Certifed, UL Fire Rating: Type 2
Factory	ISO9001:2015

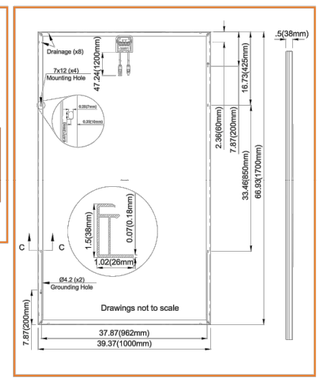
- Modules Per Pallet: 26
- Pallets Per Truck: 36
- Modules Per Truck: 936

*⚠ Warning. Read the Safety and Installation Manual for mounting specifications and before handling, installing and operating modules.

**12 year extendable to 25 years subject to registration and conditions outlined under "Warranty" at www.silfabsolar.com.

Third-party generated pan files from Fraunhofer-Institute for Solar Energy Systems ISE are available for download at: www.silfabsolar.com/downloads





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2019 TOP PERFORMER 3PVEL DNV·GL PV MODULE RELIABILITY SCORECARD

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R01 - MODULE DATASHEET

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Drawing history

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Design
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R01

Single Phase Inverter with HD-Wave Technology

for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

INVERTERS

12-25 YEAR WARRANTY

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

solaredge.com

solaredge

Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/
SE7600H-US / SE10000H-US / SE11400H-US

	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
OUTPUT								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5[1]							Hz
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
INPUT								
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @208V	-	5100	-	7750	-	-	15500	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380				400			Vdc
Maximum Input Current @240V[2]	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Maximum Input Current @208V[2]	-	9	-	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600kΩ Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%
Nighttime Power Consumption	< 2.5							W
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)							
Revenue Grade Data, ANSI C12.20	Optional[3]							
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect							
STANDARD COMPLIANCE								
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07							
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)							
Emissions	FCC Part 15 Class B							
INSTALLATION SPECIFICATIONS								
AC Output Conduit Size / AWG Range	1" Maximum / 14-6 AWG					1" Maximum /14-4 AWG		
DC Input Conduit Size / # of Strings / AWG Range	1" Maximum / 1-2 strings / 14-6 AWG					1" Maximum / 1-3 strings / 14-6 AWG		
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174					21.3 x 14.6 x 7.3 / 540 x 370 x 185		in / mm
Weight with Safety Switch	22 / 10		25.1 / 11.4	26.2 / 11.9		38.8 / 17.6		lb / kg
Noise	< 25				<50			dBA
Cooling	Natural Convection							
Operating Temperature Range	-13 to +140 / -25 to +60[4] (-40°F / -40°C option)[5]							°F / °C
Protection Rating	NEMA 4X (Inverter with Safety Switch)							

(1) For other regional settings please contact SolarEdge support
(2) A higher current source may be used; the inverter will limit its input current to the values stated
(3) Revenue grade inverter P/N: SExxxxH-US000NNC2
(4) For power de-rating information refer to: https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf
(5) -40 version P/N: SExxxxH-US000NNU4

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RoHS

Contractor Info
PHOTON BROTHERS
7705 W 108th Ave
Westminster, CO 80021

Project Type - Photovoltaic

Project Location:
LOVAAS RESIDENCE
318 E Myrtle St
Fort Collins, CO 80524
(970) 567-1028
Steven.lovaas@colostate.edu

Parcel Number: (970) 567-1028
Assessor Phone # (970) 416-2740

PV SYSTEM SPECIFICATIONS
1. PV MODULE: 21 x Silfab 320 Black ; 6.72kWdc
2. INVERTER: SE7600H-US
3. RACKING: UNIRAC w/RT MINI
4. ROOF TYPE:SHINGLE
5. AZIMUTH:95° 275°
6. ROOF SLOPE:42°

File Name:
R02_INVERTER_SE-H.DWG

Sheet Number and Title:
R02 - INVERTER DATASHEET

Sheet Size:
ANSI full bleed B (17.00 x 11.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	----

Design
Godwin Engineering and Design, LLC
8378 Foxtail Loop
Pensacola, FL 32526
D. Chad Godwin, PE

R02

Power Optimizer

For North America

P320 / P340 / P370 / P400 / P405 / P505

POWEROPTIMIZER

PV power optimization at the module-level

- Specifically designed to work with SolarEdge inverters
- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Fast installation with a single bolt
- Next generation maintenance with module-level monitoring
- Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRSS)
- Module-level voltage shutdown for installer and firefighter safety

solaredge.com

solaredge

Power Optimizer

For North America

P320 / P340 / P370 / P400 / P405 / P505

Optimizer model (typical module compatibility)	P320 (for 60-cell modules)	P340 (for high-power 60-cell modules)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for thin film modules)	P505 (for higher current modules)	
INPUT							
Rated Input DC Power[1]	320	340	370	400	405	505	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48		60	80	125[2]	83[2]	Vdc
MPPT Operating Range	8 - 48		8 - 60	8 - 80	12.5 - 105	12.5 - 83	Vdc
Maximum Short Circuit Current (Isc)	11			10.1		14	Adc
Maximum DC Input Current	13.75			12.5		17.5	Adc
Maximum Efficiency	99.5						%
Weighted Efficiency	98.8					98.6	%
Overvoltage Category	II						
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)							
Maximum Output Current	15						Adc
Maximum Output Voltage	60				85		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)							
Safety Output Voltage per Power Optimizer	1 ± 0.1						Vdc
STANDARD COMPLIANCE							
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3						
Safety	IEC62109-1 (class II safety), UL1741						
Material	UL94 V-0 , UV Resistant						
RoHS	Yes						
INSTALLATION SPECIFICATIONS							
Maximum Allowed System Voltage	1000						Vdc
Compatible inverters	All SolarEdge Single Phase and Three Phase inverters						
Dimensions (W x L x H)	129 x 153 x 27.5 / 5.1 x 6 x 1.1		129 x 153 x 33.5 / 5.1 x 6 x 1.3	129 x 159 x 49.5 / 5.1 x 6.3 x 1.9		129 x 162 x 59 / 5.1 x 6.4 x 2.3	mm / in
Weight (including cables)	630 / 1.4		750 / 1.7	845 / 1.9		1064 / 2.3	gr / lb
Input Connector	MC4[3]				Single or dual MC4[3][4]	MC4[3]	
Input Wire Length	0.16 / 0.52						m / ft
Output Wire Type / Connector	Double Insulated / MC4						
Output Wire Length	0.9 / 2.95		1.2 / 3.9				m / ft
Operating Temperature Range[5]	-40 - +85 / -40 - +185						°C / °F
Protection Rating	IP68 / NEMA6P						
Relative Humidity	0 - 100						%

[1] Rated power of the module at STC will not exceed the optimizer "Rated Input DC Power". Modules with up to +5% power tolerance are allowed
[2] NEC 2017 requires max input voltage be not more than 80V
[3] For other connector types please contact SolarEdge
[4] For dual version for parallel connection of two modules use the P405. In the case of an odd number of PV modules in one string, installing one P405 dual version power optimizer
[5] For ambient temperature above +85°C / +185°F power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details.

PV System Design Using a SolarEdge Inverter[6][7]		Single Phase HD-Wave	Single phase	Three Phase for 208V grid	Three Phase for 277/480V grid	
Minimum String Length (Power Optimizers)	P320, P340, P370, P400	8		10	18	
	P405 / P505	6		8	14	
Maximum String Length (Power Optimizers)		25		25	50[8]	
Maximum Power per String		5700 (6000 with SE7600-US - SE11400-US)	5250	6000[9]	12750[10]	W
Parallel Strings of Different Lengths or Orientations		Yes				

[6] For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf
[7] It is not allowed to mix P405/P505 with P320/P340/P370/P400 in one string
[8] A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement
[9] For 208V grid: it is allowed to install up to 6,500W per string when the maximum power difference between each string is 1,000W
[10] For 277/480V grid: it is allowed to install up to 17,550W per string when the maximum power difference between each string is 2,000W

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Intertek RoHS

Contractor Info
PHOTON BROTHERS
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Westminster, CO 80021

Project Type - Photovoltaic

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6. ROOF SLOPE:42°

File Name:
R02A OPTIMIZER DATASHEET.DWG

Sheet Number and Title:
R03 - OPTIMIZER DATASHEET

Sheet Size:
ANSI full bleed B (17.00 x 11.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	----

Design
Godwin Engineering and Design, LLC
8378 Foxtail Loop
Pensacola, FL 32526
D. Chad Godwin, PE

R03

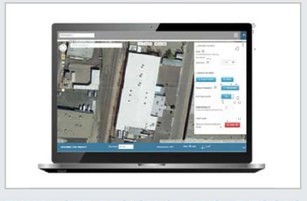
SM SOLARMOUNT

UNIRAC

SOLARMOUNT defined the standard in solar racking. New enhancements are designed to get installers off the roof faster than ever before. Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding straps to reduce costs. Utilize the microinverter mount with a wire management clip for an easier installation.

LOSE ALL OF THE COPPER & LUGS
System grounding through Enphase microinverters and trunk cables

SMALL IS THE NEXT NEW BIG THING
Light Rail is Fully Compatibility with all SM Components



ENHANCED DESIGN & LAYOUT TOOLS
Now Featuring Google Map Capabilities within U-Builder

GET OFF THE ROOF FASTER THAN EVER BEFORE

OPTIMIZED COMPONENTS • VERSATILITY • DESIGN TOOLS • QUALITY PROVIDER

SM SOLARMOUNT

UNIRAC
A HILTI GROUP COMPANY

OPTIMIZED COMPONENTS

INTEGRATED BONDING & PRE-ASSEMBLED PARTS

Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding straps or bonding jumpers to reduce costs. Utilize the microinverter mount with a wire management clip for an easier installation.

VERSATILITY

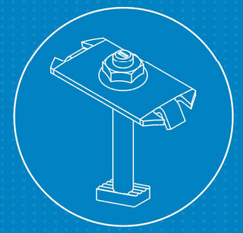
ONE PRODUCT - MANY APPLICATIONS

Quickly set modules flush to the roof or at a desired tilt angle. Change module orientation to portrait or landscape while securing a large variety of framed modules on flat, low sloped or steep pitched roofs. Available in mill, clear and dark anodized finishes to outperform your projects financial and aesthetic aspirations.

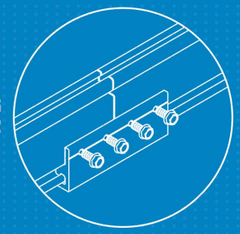
AUTOMATED DESIGN TOOL

DESIGN PLATFORM AT YOUR SERVICE

Creating a bill of materials is just a few clicks away with U-Builder, a powerful online tool that streamlines the process of designing a code compliant solar mounting system. Save time by creating a user profile, and recall preferences and projects automatically when you log in. You will enjoy the ability to share projects with customers: there's no need to print results and send to a distributor, just click and share.

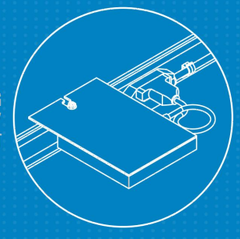


INTEGRATED BONDING
MIDCLAMP



INTEGRATED BONDING
SPLICE BAR

INTEGRATED BONDING
L-FOOT w/ T-BOLT



INTEGRATED BONDING
MICROINVERTER MOUNT w/
WIRE MANAGEMENT

LISTED **UL2703**
BONDING & GROUNDING
MECHANICAL LOADING
SYSTEM FIRE CLASSIFICATION

UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT

UNMATCHED EXPERIENCE | CERTIFIED QUALITY | ENGINEERING EXCELLENCE | BANKABLE WARRANTY | DESIGN TOOLS | PERMIT DOCUMENTATION

TECHNICAL SUPPORT

Unirac's technical support team is dedicated to answering questions & addressing issues in real time. An online library of documents including engineering reports, stamped letters and technical data sheets greatly simplifies your permitting and project planning process.

CERTIFIED QUALITY PROVIDER

Unirac is the only PV mounting vendor with ISO certifications for 9001:2008, 14001:2004 and OHSAS 18001:2007, which means we deliver the highest standards for fit, form, and function. These certifications demonstrate our excellence and commitment to first class business practices.

BANKABLE WARRANTY

As a Hilti Group Company, Unirac has the financial strength to back our products and reduce your risk. Have peace of mind knowing you are receiving products of exceptional quality. SOLARMOUNT is covered by a 10 year limited product warranty and a 5 year limited finish warranty.

PROTECT YOUR REPUTATION WITH QUALITY RACKING SOLUTIONS BACKED BY ENGINEERING EXCELLENCE AND A SUPERIOR SUPPLY CHAIN

PUB 16JAN04 - DIGITAL UPDATES

Contractor Info
PHOTON BROTHERS
7705 W 108th Ave
Westminster, CO 80021

Project Type - Photovoltaic

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4. ROOF TYPE:SHINGLE
5. AZIMUTH:95° 275°
6. ROOF SLOPE:42°

File Name:
R03 UNIRAC DATASHEET.DWG

Sheet Number and Title:
R04 - RACKING DATASHEET

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01	DCG	----	----

Design
Godwin Engineering and Design, LLC
8378 Foxtail Loop
Pensacola, FL 32526
D. Chad Godwin, PE

R04

RT1 — **RT-[E] Mount Mini Rafter Installations (60 Cell PV Panels) Maximum Mount Spacing in Feet**

Portrait Orientation - ASCE 7-10

Snow Load	Exposure Category	Roof Angle	Roof Zone	Basic Wind Speed, V (mph) 110	115	120	130	140	150	160	170	180
21-30 PSF	B	0 to 6	1	8	8	8	8	8	8	7	6	5
		Degrees	2	8	8	7	6	5	4	3	3	3
		7 to 27	1	8	8	8	8	8	8	7	6	6
		Degrees	2	8	7	7	6	5	4	4	3	3
		28 to 45	1	8	8	8	8	8	7	6	5	5
		Degrees	2	8	8	8	8	7	6	5	4	4
	C	0 to 6	1	8	8	8	8	6	5	5	4	4
		Degrees	2	6	5	5	4	3	3	2	2	2
		7 to 27	1	8	8	8	8	7	6	5	4	4
		Degrees	2	6	5	5	4	3	3	2	2	2
		28 to 45	1	8	8	8	7	6	5	4	4	3
		Degrees	2	8	7	6	5	5	4	3	3	3
	D	0 to 6	1	8	8	8	6	5	4	4	3	3
		Degrees	2	5	4	4	3	3	2	2	2	0
		7 to 27	1	8	8	8	7	6	5	4	4	3
		Degrees	2	5	4	4	3	3	2	2	2	0
		28 to 45	1	8	7	7	6	5	4	4	3	3
		Degrees	2	7	6	5	5	4	3	3	2	2
31-40 PSF	B	0 to 6	1	8	8	8	8	8	8	7	6	5
		Degrees	2	8	8	7	6	5	4	3	3	3
		7 to 27	1	8	8	8	8	8	8	7	6	6
		Degrees	2	8	7	7	6	5	4	4	3	3
		28 to 45	1	8	8	8	8	8	7	6	5	5
		Degrees	2	8	8	8	8	7	6	5	4	4
	C	0 to 6	1	8	8	8	8	6	5	5	4	4
		Degrees	2	6	5	5	4	3	3	2	2	2
		7 to 27	1	8	8	8	8	7	6	5	4	4
		Degrees	2	6	5	5	4	3	3	2	2	2
		28 to 45	1	8	8	8	7	6	5	4	4	3
		Degrees	2	8	7	6	5	5	4	3	3	3
	D	0 to 6	1	8	8	8	6	5	4	4	3	3
		Degrees	2	5	4	4	3	3	2	2	2	0
		7 to 27	1	8	8	8	7	6	5	4	4	3
		Degrees	2	5	4	4	3	3	2	2	2	0
		28 to 45	1	8	7	7	6	5	4	4	3	3
		Degrees	2	7	6	5	5	4	3	3	2	2
41-50 PSF	B	0 to 6	1	8	8	8	8	8	8	7	6	5
		Degrees	2	8	8	7	6	5	4	3	3	3
		7 to 27	1	8	8	8	8	8	8	7	6	6
		Degrees	2	8	7	7	6	5	4	4	3	3
		28 to 45	1	8	8	8	8	8	7	6	5	5
		Degrees	2	8	8	8	8	7	6	5	4	4
	C	0 to 6	1	8	8	8	8	6	5	5	4	4
		Degrees	2	6	5	5	4	3	3	2	2	2
		7 to 27	1	8	8	8	8	7	6	5	4	4
		Degrees	2	6	5	5	4	3	3	2	2	2
		28 to 45	1	8	8	8	7	6	5	4	4	3
		Degrees	2	8	7	6	5	5	4	3	3	3
	D	0 to 6	1	8	8	8	6	5	4	4	3	3
		Degrees	2	5	4	4	3	3	2	2	2	0
		7 to 27	1	8	8	8	7	6	5	4	4	3
		Degrees	2	5	4	4	3	3	2	2	2	0
		28 to 45	1	8	7	7	6	5	4	4	3	3
		Degrees	2	7	6	5	5	4	3	3	2	2

RT3 — **RT-[E] Mount Rail Plywood Only Installations (60 Cell PV Panels) Maximum Mount Spacing in Feet**

Portrait Orientation - ASCE 7-10

Snow Load	Exposure Category	Roof Angle	Roof Zone	Basic Wind Speed, V (mph) 110	115	120	130	140	150	160	170	180
21-30 PSF	B	0 to 6	1	5	5	5	4	4	3	3	2	2
		Degrees	2	3	3	2	2	2	0	0	0	0
		7 to 27	1	4	4	4	4	4	3	3	2	2
		Degrees	2	3	3	3	2	2	0	0	0	0
		28 to 45	1	5	5	5	4	3	3	2	2	2
		Degrees	2	5	4	4	3	3	2	2	2	0
	C	0 to 6	1	4	4	3	3	2	2	2	0	0
		Degrees	2	2	2	2	0	0	0	0	0	0
		7 to 27	1	4	4	4	3	3	2	2	0	0
		Degrees	2	2	2	2	0	0	0	0	0	0
		28 to 45	1	4	3	3	3	2	2	0	0	0
		Degrees	2	3	3	2	2	2	0	0	0	0
	D	0 to 6	1	3	3	3	2	2	0	0	0	0
		Degrees	2	2	0	0	0	0	0	0	0	0
		7 to 27	1	4	3	3	2	2	2	0	0	0
		Degrees	2	2	0	0	0	0	0	0	0	0
		28 to 45	1	3	3	2	2	2	0	0	0	0
		Degrees	2	2	2	2	2	0	0	0	0	0
31-40 PSF	B	0 to 6	1	4	4	4	4	4	3	3	2	2
		Degrees	2	3	3	2	2	2	0	0	0	0
		7 to 27	1	3	3	3	3	3	3	3	2	2
		Degrees	2	3	3	3	2	2	0	0	0	0
		28 to 45	1	4	4	4	4	3	3	2	2	2
		Degrees	2	4	4	4	3	3	2	2	2	0
	C	0 to 6	1	4	4	3	3	2	2	2	0	0
		Degrees	2	2	2	2	0	0	0	0	0	0
		7 to 27	1	3	3	3	3	3	2	2	0	0
		Degrees	2	2	2	2	0	0	0	0	0	0
		28 to 45	1	4	3	3	3	2	2	0	0	0
		Degrees	2	3	3	2	2	2	0	0	0	0
	D	0 to 6	1	3	3	3	2	2	0	0	0	0
		Degrees	2	2	0	0	0	0	0	0	0	0
		7 to 27	1	3	3	3	2	2	2	0	0	0
		Degrees	2	2	0	0	0	0	0	0	0	0
		28 to 45	1	3	3	2	2	2	0	0	0	0
		Degrees	2	2	2	2	2	0	0	0	0	0
41-50 PSF	B	0 to 6	1	3	3	3	3	3	3	3	2	2
		Degrees	2	3	3	2	2	2	0	0	0	0
		7 to 27	1	2	2	2	2	2	2	2	2	2
		Degrees	2	2	2	2	2	2	0	0	0	0
		28 to 45	1	3	3	3	3	3	3	2	2	2
		Degrees	2	3	3	3	3	3	2	2	2	0
	C	0 to 6	1	3	3	3	3	2	2	2	0	0
		Degrees	2	2	2	2	0	0	0	0	0	0
		7 to 27	1	2	2	2	2	2	2	2	0	0
		Degrees	2	2	2	2	0	0	0	0	0	0
		28 to 45	1	3	3	3	3	2	2	0	0	0
		Degrees	2	3	3	2	2	2	0	0	0	0
	D	0 to 6	1	3	3	3	2	2	0	0	0	0
		Degrees	2	2	0	0	0	0	0	0	0	0
		7 to 27	1	2	2	2	2	2	2	0	0	0
		Degrees	2	2	0	0	0	0	0	0	0	0
		28 to 45	1	3	3	2	2	2	0	0	0	0
		Degrees	2	2	2	2	2	0	0	0	0	0

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File Name:
R04_ROOF-TECH_RT MINI.DWG

Sheet Number and Title:
R05 - RACKING DATASHEET

Sheet Size:
ANSI full bleed B (17.00 x 11.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	----

Design
Godwin Engineering and Design, LLC
8378 Foxtail Loop
Pensacola, FL 32526
D. Chad Godwin, PE
Chad@godwineng.com

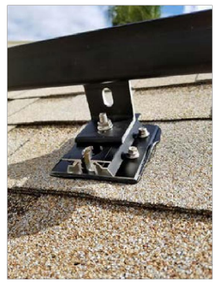
R05

June 5th, 2019

Re: SOLARMOUNT RoofTech RT Mini

To Whom It May Concern,

The interface and hardware between the RoofTech RT-Mini and the Unirac SOLARMOUNT L-foot are compatible and can be used in conjunction with each other as shown in picture below.



Unirac has not analyzed or tested SM racking products in conjunction with this solution. The installer is solely responsible for:

- Complying with all applicable local or national building codes, including code requirements that are more strenuous than the guidelines set forth in the install manuals;
- Ensuring that the products are appropriate for the particular installation and the installation environment;
- Ensuring that the roof, its rafters, its insulation, connections, and any other structural support members can support the array under all code level loading conditions (this total building assembly is referred to as the building structure);
- Ensuring correct and appropriate design parameters are used in determining the design loading used for design of the specific installation. Parameters, such as snow loading, wind speed, exposure, and topographic factor should be confirmed with the local building official or a licensed professional engineer

Please contact Unirac with any questions.

Regards,

Connor Morrison

Connor Morrison
Residential Product Manager

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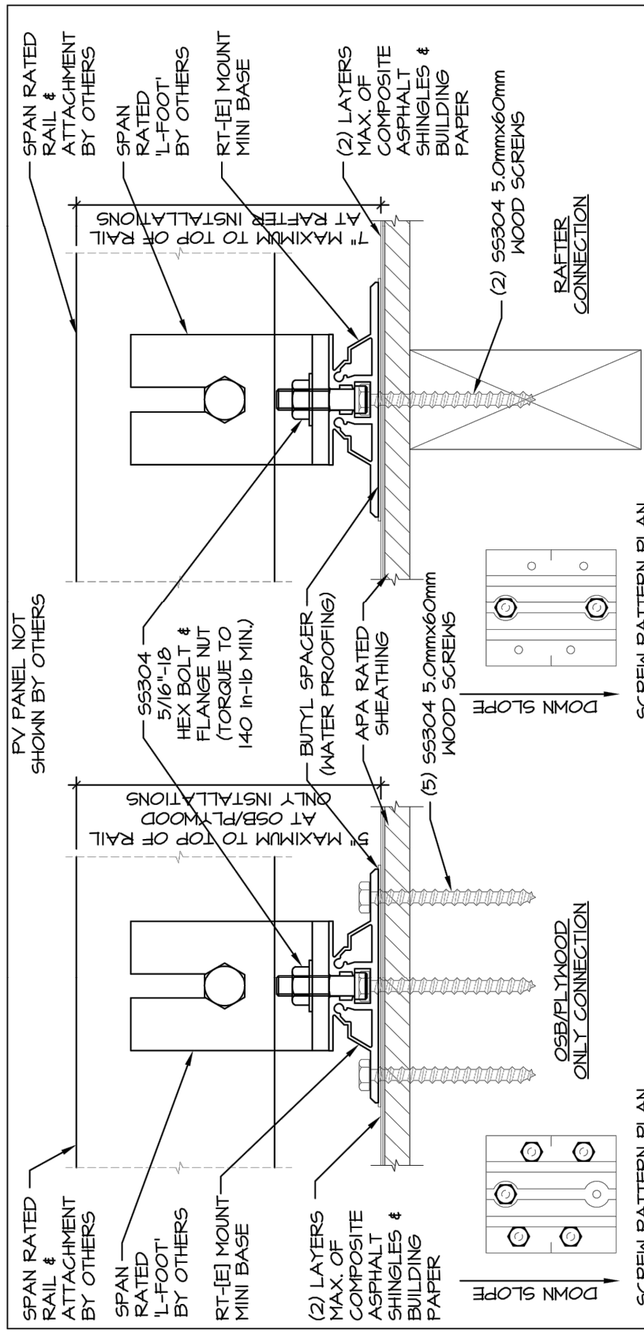

Contractor Info
PHOTON BROTHERS
7705 W 108th Ave
Westminster, CO 80021

Project Type - Photovoltaic

Project Location:
LOVAAS RESIDENCE
318 E Myrtle St
Fort Collins, CO 80524
(970) 567-1028
Steven.lovaas@colostate.edu

Parcel Number: (970) 567-1028
Assessor Phone # (970) 416-2740

PV SYSTEM SPECIFICATIONS
1. PV MODULE: 21 x Silfab 320 Black ; 6.72kWdc
2. INVERTER: SE7600H-US
3. RACKING: UNIRAC w/RT MINI
4. ROOF TYPE:SHINGLE
5. AZIMUTH:95° 275°
6. ROOF SLOPE:42°

File Name:
R04_ROOF-TECH_RT MINI_LETTER.DWG

Sheet Number and Title:
R07 - RACKING DATASHEET

Sheet Size:
ANSI full bleed B (17.00 x 11.00 Inches)

Drawing history

no.	drawn by	revision	date
01	DCG	----	----

Design
Godwin Engineering and Design, LLC
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R07