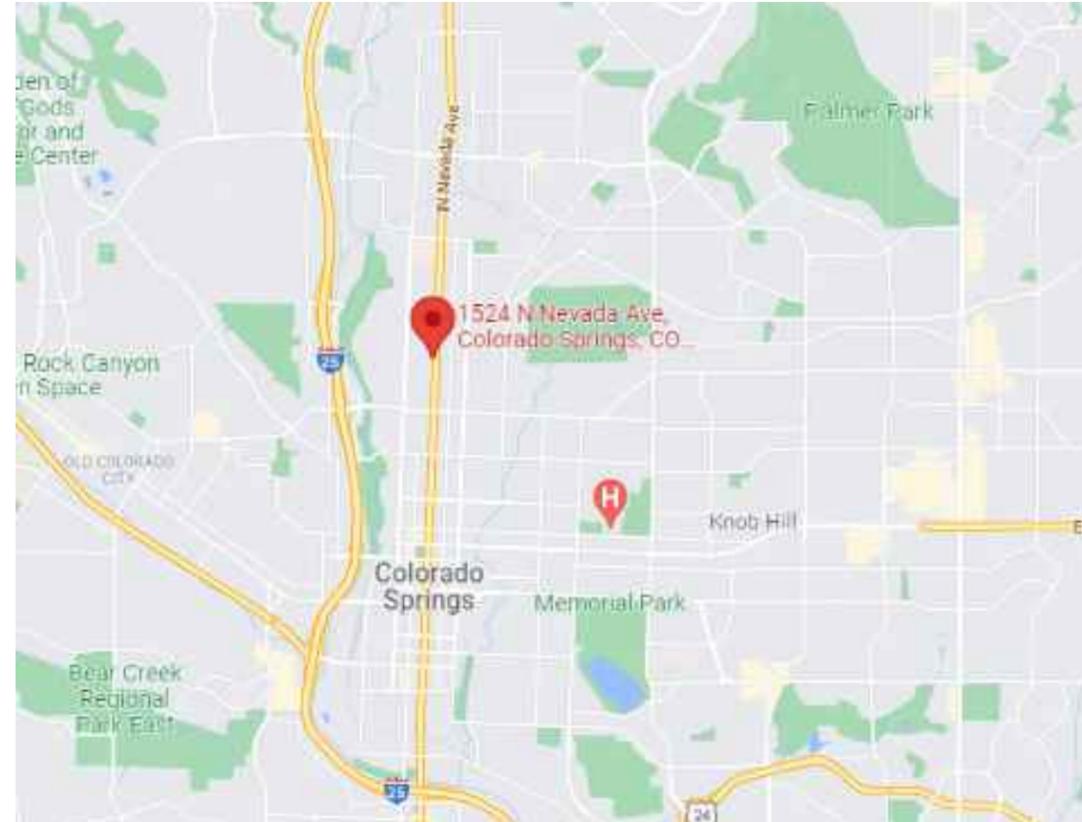


# PROJ-2183 CRANE PV PROJECT - 5.7kWdc



1 PROPERTY ASSESSOR MAP - PROJECT LOCATION NTS



2 AERIAL MAP - PROJECT LOCATION NTS

**Contractor Info**  
 Photon Brothers  
 4921 N. Elizabeth  
 Pueblo, CO 81008  
 ----

**Project Type - Photovoltaic**

**Project Location:**  
 CRANE RESIDENCE  
 1524 N Nevada Ave,  
 Colorado Springs, CO 80907  
 (719) 505-6490  
 Dogdoc500@hotmail.com  
  
 Parcel Number: 6406423007  
 Assessor Phone # (719) 327-2880

**PV SYSTEM SPECIFICATIONS**  
 1. PV MODULE: 15 x SIL-380 BK Elite; 5.7kWdc  
 2. INVERTER: IQ7A-72-2-US  
 3. RACKING: Unirac Lite\_RT Mini  
 4. ROOF TYPE:SHINGLE  
 5. AZIMUTH:183°, 273°  
 6. ROOF SLOPE:45°

**File Name:**  
 01\_CRANE\_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	----	11/4/21

**Design**

Godwin Engineering and Design, LLC  
 8378 Foxtail Loop  
 Pensacola, FL 32526  
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**SCOPE OF WORK**

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

**GOVERNING BUILDING CODES**

- 2015 PIKES PEAK REGIONAL BUILDING DEPARTMENT, PPRBD
- 2020 NATIONAL ELECTRICAL CODE, NEC
- IEEE 1547
- ASCE 7 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES
- UL STANDARDS
  - RACKING - UL 2703
  - PV MODULE - UL 1703
  - INVERTER - UL 1741

**DESIGN SPECIFICATIONS**

- AHJ - Pikes Peak Regional Building Department, PPRBD
- UTILITY - CSU
- BUILDING RISK CATEGORY II
- DESIGN WIND SPEED (ULT) - 130MPH
- DESIGN SNOW LOAD - 30PSF
- EXPOSURE CATEGORY - C
- MEAN ROOF HEIGHT - 20FT
- ROOF SLOPE - 45°

**PV SYSTEM SPECIFICATIONS**

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- INVERTER: IQ7A-72-2-US
- RACKING: Unirac Lite\_RT Mini
- ROOF TYPE:SHINGLE
- AZIMUTH:183°, 273°

**PV INSTALLATION OVERVIEW**

**ELECTRICAL**

- POINT OF CONNECTION: LOAD
- MAX INV OUTPUT CURRENT: 1.45A Ea
- PV AC DEDICATED OCP DEVICE RATING:  $15 * 1.45A * 125\% = 27.1875A$ , 30A OCP
- UTILITY AC DISCONNECT REQ'D: YES

**STRUCTURAL**

- MAX ALLOWABLE SPACING BETWEEN ATTACH POINTS: 4FT
- MIN. NUMBER OF ATTACHMENT POINTS: 43
- WEIGHT PER ATTACHMENT POINT: 19.0LBS/ATTACH
- PV DEAD LOAD: 2.78PSF
- LENGTH OF RAIL REQUIRED: 128FT

**Sheet List Table**

Sheet Number	Sheet Title
PV01	COVER
PV02	NOTES
PV03	E_PV SITE PLAN
PV04	PV LABELING
PV05	LINE DIAGRAM
PV06	S_PV SITE LAYOUT
PV07	PV ATTACH PLAN
R01	MODULE DATASHEET
R02	INVERTER DATASHEET
R03	RACKING DATASHEET
R04	RACKING DATASHEET
R05	RACKING DATASHEET

**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.

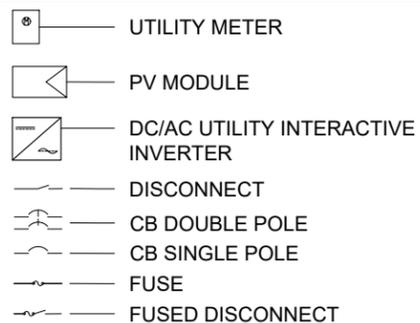
**ABBREVIATIONS**

- (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 (UNGROUNDING 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: 43
3. WEIGHT PER ATTACHMENT POINT: 19.0LBS/ATTACH
4. PV DEAD LOAD: 2.78PSF
5. DESIGN SNOW LOAD
  - 5.1. GROUND SNOW LOAD - 30PSF
6. ALLOWABLE DESIGN LOADS FOR PV MODULE:
  - 6.1. WIND = 62PSF
  - 6.2. SNOW = 125PSF

**Contractor Info**

Photon Brothers  
4921 N. Elizabeth  
Pueblo, CO 81008  
----

**Project Type - Photovoltaic**

**Project Location:**

CRANE RESIDENCE  
1524 N Nevada Ave,  
Colorado Springs, CO 80907  
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Dogdoc500@hotmail.com

Parcel Number: 6406423007  
Assessor Phone # (719) 327-2880

**PV SYSTEM SPECIFICATIONS**

1. PV MODULE: 15 x SIL-380 BK Elite; 5.7kWdc
2. INVERTER: IQ7A-72-2-US
3. RACKING: Unirac Lite\_RT Mini
4. ROOF TYPE:SHINGLE
5. AZIMUTH:183°, 273°
6. ROOF SLOPE:45°

**File Name:**

02\_CRANE\_NOTES.DWG

**Sheet Number and Title:**

PV02 - NOTES

**Sheet Size:**

ANSI full bleed B (17.00 x 11.00 Inches)

**Drawing history**

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**Design**

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**Contractor Info**  
 Photon Brothers  
 4921 N. Elizabeth  
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  4. ROOF TYPE: SHINGLE
  5. AZIMUTH: 183°, 273°
  6. ROOF SLOPE: 45°

File Name:  
 03\_2017NEC\_E\_PV SITE LAYOUT.DWG

Sheet Number and Title:  
 PV03 - E\_PV SITE PLAN

Sheet Size:  
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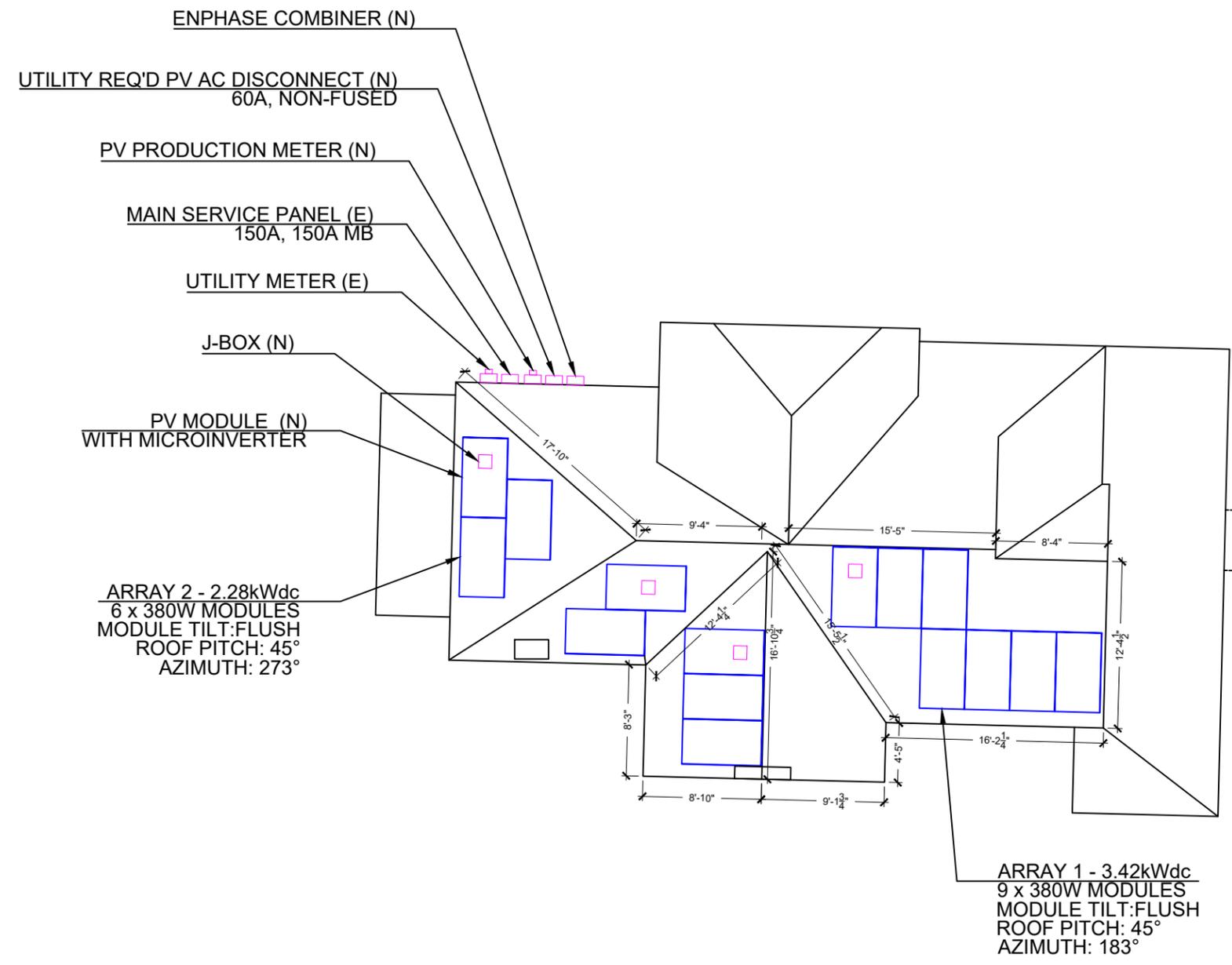
**Drawing history**

no.	drawn by	revision	date
01	DCG	---	11/4/21

**Design**  
 Godwin Engineering and Design, LLC  
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 D. Chad Godwin, PE  
 Chad@godwineng.com

**N NEVADA AVE**

**WALKWAY**



**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.

A

PV ARRAY

INVERTER W/ FACTORY LABELING

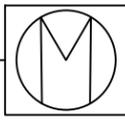
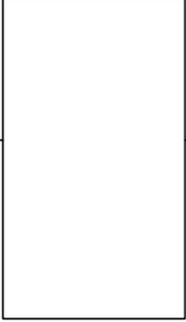
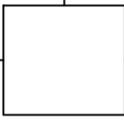
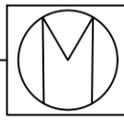
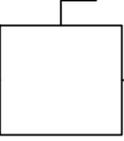
UTILITY REQ'D AC DISCONNECT

PV PRODUCTION METER IF REQ'D

AC DISCONNECT

SERVICE PANEL

UTILITY METER



\*COLOR OPTIONAL  
 MULTIPLE POWER SOURCES PRESENT ON OR IN THIS PREMISES  
 ALL SOURCES MUST BE LISTED

UTILITY PHOTOVOLTAIC DISCONNECT OR (SOLAR SYSTEM UTILITY AC DISCONNECT)

UTILITY REQUIRED LABEL APPLY TO PV AC DISCONNECT

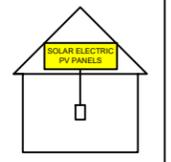
RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM  
 3/8 IN MIN. TEXT

SOLAREEDGE SYSTEM COMMENCES RAPID SHUTDOWN SEQUENCE UPON DISCONNECT FROM AC SOURCE - COMPLIES WITH 2017 NEC 690.12

INITIATION DEVICE SHALL BE LOCATED AT A READILY ACCESSIBLE LOCATION OUTSIDE THE BUILDING

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.



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

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

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

DISCONNECT OF

COLOR OPTIONAL  
 IF USING LINE SIDE TAP (SUPPLY SIDE - 705.12(A)) LABEL PV SERVICE DISCONNECT AS 2 OF 2 AND LABEL UTILITY SERVICE DISCONNECT 1 OF 2. LABELS MUST INDICATE LOCATIONS OF BOTH DISCONNECTS

MULTIPLE POWER SOURCES PRESENT ON OR IN THIS PREMISES

\*COLOR OPTIONAL  
 ALL SOURCES MUST BE LISTED

PHOTOVOLTAIC SYSTEM CONNECTED

UTILITY LABEL - IF REQUIRED APPLY TO UTILITY METER

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.

**Contractor Info**  
 Photon Brothers  
 4921 N. Elizabeth  
 Pueblo, CO 81008  
 ----

Project Type - Photovoltaic

**Project Location:**  
 CRANE RESIDENCE  
 1524 N Nevada Ave,  
 Colorado Springs, CO 80907  
 (719) 505-6490  
 Dogdoc500@hotmail.com  
  
 Parcel Number: 6406423007  
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**PV SYSTEM SPECIFICATIONS**  
 1. PV MODULE: 15 x SIL-380 BK Elite; 5.7kWdc  
 2. INVERTER: IQ7A-72-2-US  
 3. RACKING: Unirac Lite\_RT Mini  
 4. ROOF TYPE: SHINGLE  
 5. AZIMUTH: 183°, 273°  
 6. ROOF SLOPE: 45°

File Name:  
 03A\_CRANE\_2017NEC\_PV LABELING.DWG

Sheet Number and Title:  
 PV04 - PV LABELING

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**Design**  
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D

E

F

G

Electrical Calculations - Photovoltaic System											
Project Details			Microinverter			PV Module			Branch Circuit Summary		
<b>Project Name</b>	CRANE PV		<b>Model Number</b>	IQ7A-72-2-US		<b>Model Number</b>	SIL-380 BK Elite		<b>PV Combiner A</b>		
<b>Project Location</b>	Colorado Springs, CO		<b>Max input PV Power</b>	360	Wdc	<b>Nominal Output @ STC, Pmp</b>	380	Wdc	<b># of Microinverters</b>	15	
<b>Module -</b>	15	Silfab SIL-380 BK Elite	<b>DC Max Voltage</b>	58		<b>Open Circuit Voltage, Voc</b>	45.13	Vdc	<b>Max Continuous Load (A)</b>	27	
<b>Inverter -</b>	15	Enphase IQ7A-72-2-US	<b>Nominal Output Current</b>	1.45	A	<b>Max Power Point, Vmp</b>	38.88	Vdc	<b># of branch Circuits</b>	2	
<b>Utility -</b>	240	Vac	<b>Nominal Voltage</b>	240	Vac	<b>Short Circuit Current, Isc</b>	10.5	A			
<b>DC Rating</b>	5.7	kW	<b>AC Max Output Power</b>	366	Wac	<b>Max Power Point Current, Imp</b>	9.79	A	<b>Busbar Calculation = 150 * 120%</b> 180		
<b>AC Rating</b>	5.49	kW	<b>Max Continuous output Power</b>	349	Wac	<b>VOC Temp Coeff</b>	-0.279	%/°C	<b>Sum of OCP supplying bus</b> 177		
<b>Min. Ambient Temp, °C</b>	-24	-11.2 °F	<b>CEC Weighted Efficiency</b>	97	%	<b>Dimensions, LxWxH (in)</b>	70.67 x 39.98 x 1.5		<b>180A &gt;= 177.1875A; 705.12(B)(2)(3)(b) Satisfied</b>		
<b>Max. Ambient Temp, °C</b>	35	95 °F	<b>Max Units per 20A Branch Circuit</b>	11		<b>Weight</b>	41.9 lbs				

Branch Circuit Sizing			
Inputs	Branch Circuit Combiner A		
# of Branch Circuits	2		
Individual Branch Circuits	A	B	
Microinverters per Branch Circuit	8	7	
Output current per string (A)	11.60	10.15	
125% of Output for min. OCP (A)	14.50	12.69	
Min. Breaker Size (A)	20	20	

**Contractor Info**  
 Photon Brothers  
 4921 N. Elizabeth  
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 ----

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- PV SYSTEM SPECIFICATIONS**
- PV MODULE: 15 x SIL-380 BK Elite; 5.7kWdc
  - INVERTER: IQ7A-72-2-US
  - RACKING: Unirac Lite\_RT Mini
  - ROOF TYPE: SHINGLE
  - AZIMUTH: 183°, 273°
  - ROOF SLOPE: 45°

**File Name:**  
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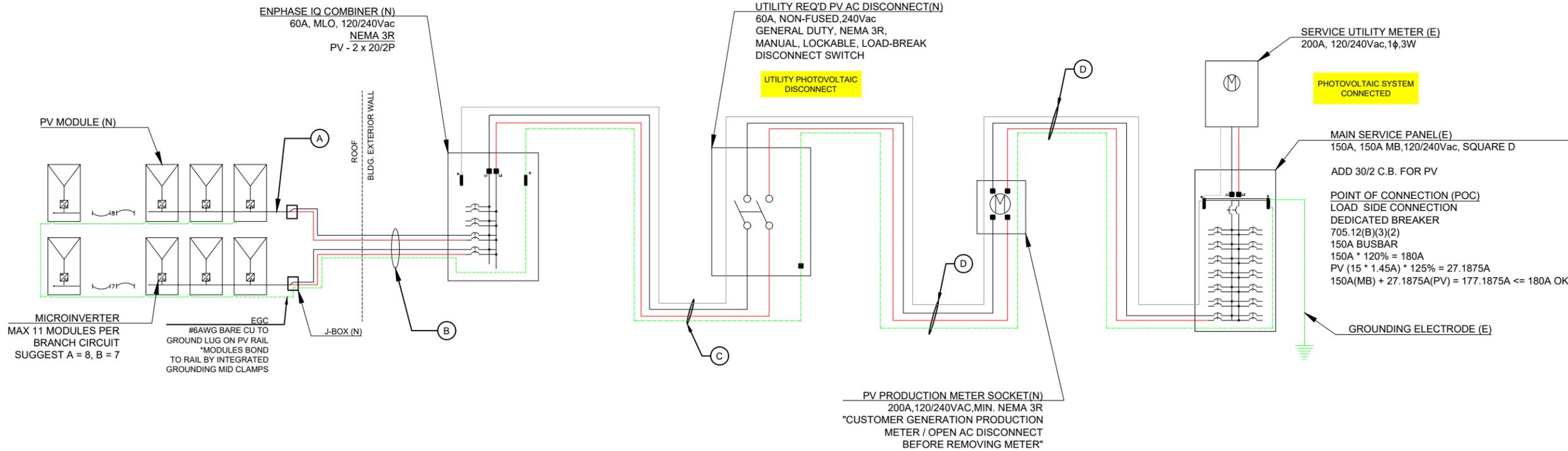
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 PV05 - LINE DIAGRAM

**Sheet Size:**  
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**Design**  
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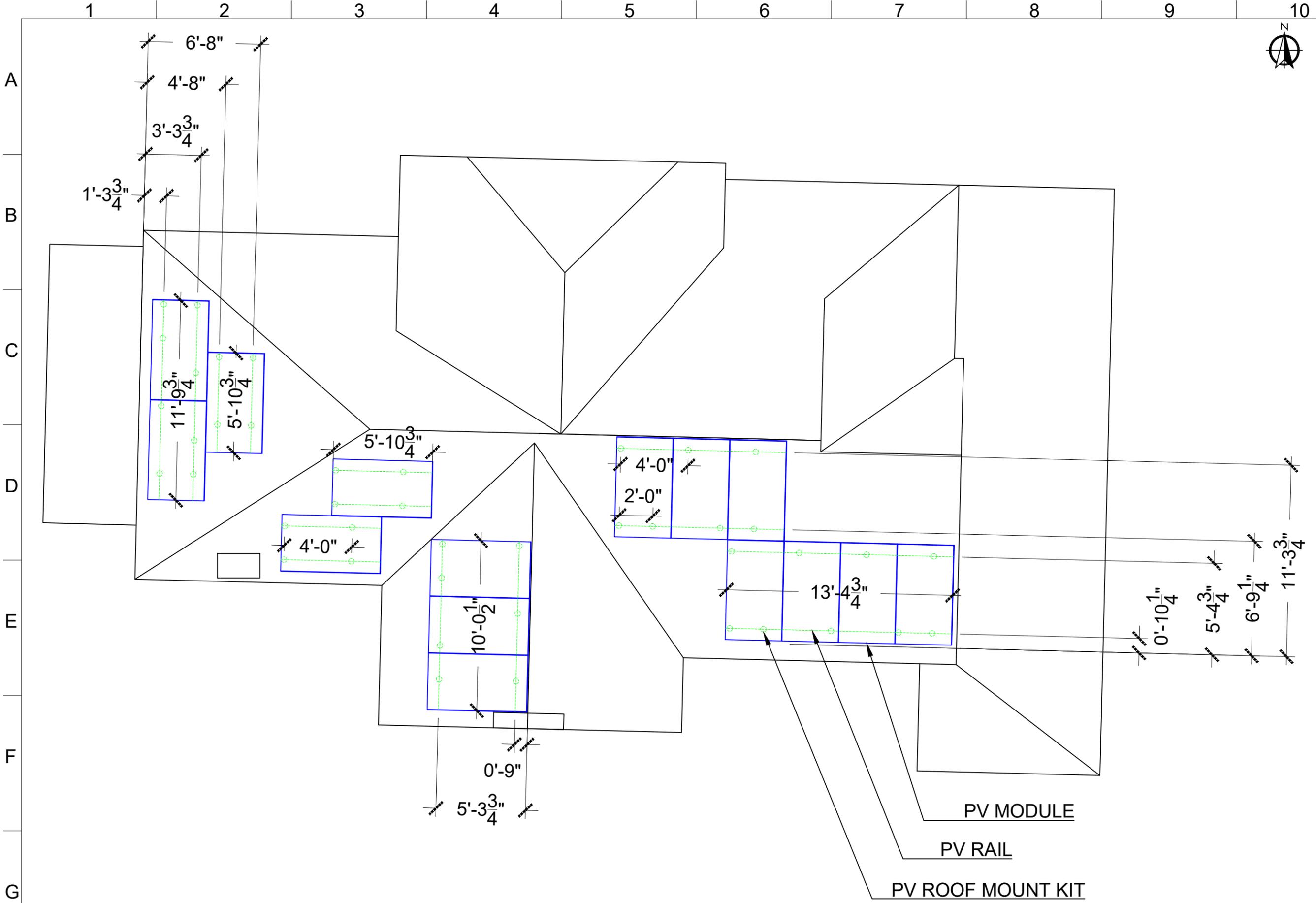


Conduit and Conductor Schedule						
Tag	Description and Conductor Type	Min. Conductor Gauge	Number of Conductors	Typical Conduit Type	Min. Conduit Size	Max one way length (ft)
A	Enphase Q Cable	12AWG	(L <sub>1</sub> , L <sub>2</sub> ), (G)	FREE AIR	MFG CABLE	20
B	J-box to Combiner., THWN-2	12AWG	2 x (L <sub>1</sub> , L <sub>2</sub> ), (G)	*MC CABLE	MC	40
C	Combiner to Disco, THWN-2	10AWG	L <sub>1</sub> , L <sub>2</sub> , N, (#10 G)	PVC, EMT, or FMC	3/4"	5
D	Disco to POC, THWN-2	6AWG	L <sub>1</sub> , L <sub>2</sub> , N, (#8 G)	PVC, EMT, or FMC	3/4"	5

Notes: \* MC Cable can also be EMT or FMC  
 (G) can be #8AWG THWN-2  
 \*6AWG min. size req'd for meter socket. For Conduit sizing refer to Chapter 9 Tables, NEC

NEC 690.45-46,  
 Table 250.66, Table 250.122

Inverter output CKT			Combiner output ckts		
Distance above roof	1/2 in.-3 1/2 in.	310.15(B)c	PV Combiner A		
Amb. Temp. Adder for Rooftops (°F)	40		Design temperature (°F)	94	
Design temperature (°F)	135		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	75°C		No. of Current Carrying Cond.	<4	310.15(B)(3)(a)
No. of Current Carrying Cond.	<4	310.15(B)(3)(a)	Max Continuous Load (A)	27	
Overcurrent Protection (A)	20	690.8(B)(1)(a)			
125% of Output for Min. OCP(A)	14.5	690.8(A)	Overcurrent Protection (A)	30	
Amb. Temp Correction Factor	0.58	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)
Wire Size (AWG or MCM)	12	310.15(B)(16)	Wire Size (AWG or MCM)	10	310.15(B)(16)
Allowable Ampacity (Amps)	25		Allowable Ampacity (Amps)	35	
Adjusted Ampacity (Amps)	15	25*0.58*1=14.5	Adjusted Ampacity (Amps)	33	35*0.94*1=32.9



**Contractor Info**  
Photon Brothers  
4921 N. Elizabeth  
Pueblo, CO 81008  
----

**Project Type - Photovoltaic**

**Project Location:**  
CRANE RESIDENCE  
1524 N Nevada Ave,  
Colorado Springs, CO 80907  
(719) 505-6490  
Dogdoc500@hotmail.com  
  
Parcel Number: 6406423007  
Assessor Phone # (719) 327-2880

- PV SYSTEM SPECIFICATIONS**
1. PV MODULE: 15 x SIL-380 BK Elite; 5.7kWdc
  2. INVERTER: IQ7A-72-2-US
  3. RACKING: Unirac Lite\_RT Mini
  4. ROOF TYPE: SHINGLE
  5. AZIMUTH: 183°, 273°
  6. ROOF SLOPE: 45°

**File Name:**  
05\_CRANE\_PV SITE LAYOUT.DWG

**Sheet Number and Title:**  
PV06 - S\_PV SITE LAYOUT

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

**Drawing history**

no.	drawn by	revision	date
01	DCG	---	11/4/21

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

4 PV SITE PLAN W/ MODULE LAYOUT  
Scale: 3/16" = 1'-0"

PV Dead Load				Module and Racking Specs			
# of Modules		15		Module Model Number	SIL-380 BK Elite		
Module	$W_{mod}$	42	lbs	Dimensions, LxWxH (in)	70.67 x 39.98 x 1.5		
Array	$W_{mods}$	629	lbs	Width	39.98	in	
Micro/optimizer	$W_{mic}$	60	lbs	Height	70.67	in	
PV Rail	$W_{PV rail}$	128	lbs	Module Area	19.62	ft <sup>2</sup>	
Total Weight	$W_{total}$	817	lbs	PV Racking	Unirac w/ RT mini		
Total Area	$A_T$	294.31	ft <sup>2</sup>	Rail, Clamps, Mounts	1	plf	
Dead Load	$D_{PV}$	2.78	psf	Total Rail Length, L	128	ft	
				Micro/opt, W	4	lbs per	
PV Attachment Summary							
Max Allowable Spacing		4	ft				
# of attachment points		43					
Weight/attachment		19.0	lbs				

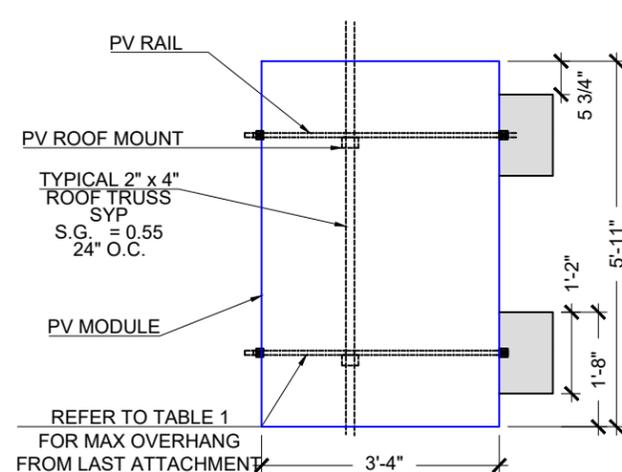
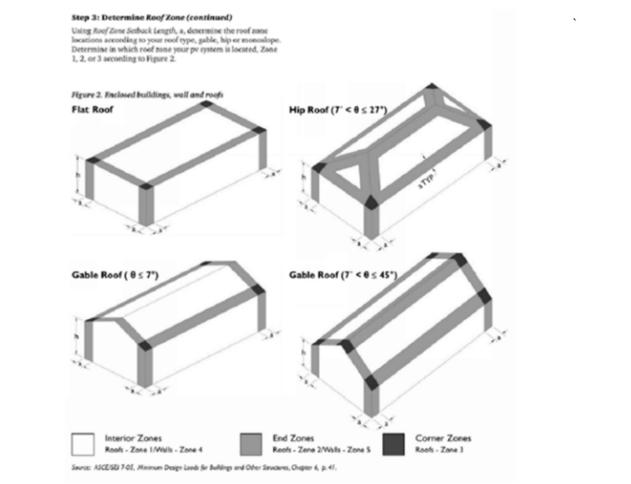
BUILDING DESIGN PROPERTIES	SYMBOL	VALUE	UNIT
BASIC WIND SPEED	V	130	mph
ROOF PITCH	$\theta$	>27 to 45	degrees
MEAN ROOF HEIGHT	h	15	ft
ROOF SETBACK	a	3	ft
ADJUSTMENT FACTOR FOR BUILDING HEIGHT AND EXPOSURE	$\lambda$	1.21	
TOPOGRAPHICAL FACTOR	$K_{zt}$	1	
EXPOSURE	C		
EFFECTIVE WIND AREA		10	sf

ZONE 1	ZONE 2	ZONE 3	UNIT	
NET DESIGN WIND PRESSURE (UPLIFT)	-30.4	-35.6	-35.6	psf
NET DESIGN WIND PRESSURE (DOWN)	20.3	20.3	20.3	psf
NET DESIGN WIND PRESSURE (UP)	-36.78	-43.08	-43.08	psf
NET DESIGN WIND PRESSURE (DOWN)	24.56	24.56	24.56	psf

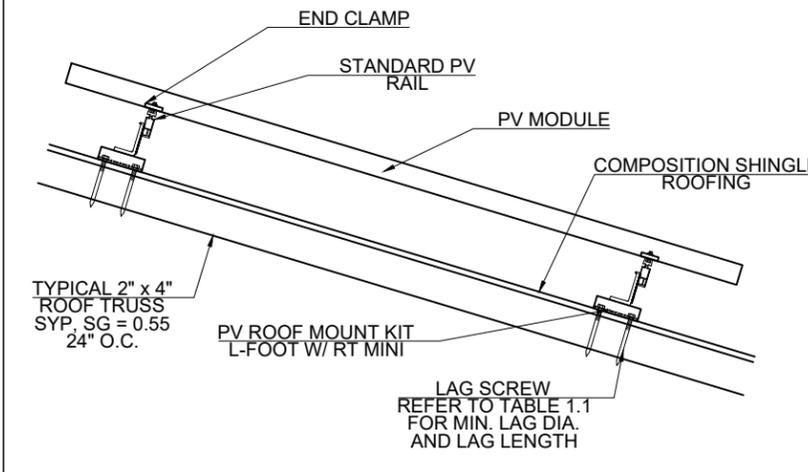
DESCRIPTION	SYMBOL	VALUE	VALUE	VALUE	UNIT
DEAD LOAD	D	2.78	2.78	2.78	psf
SNOW LOAD	S	30	30	30	psf
DESIGN WIND LOAD	W	-36.78	-43.08	-43.08	psf
ASD DESIGN LOAD (UPLIFT)	$P_{design}$	-26.82	-31.70	-31.70	psf
DOWNFORCE CASE 1	$P_{design}$	33	33	33	psf
DOWNFORCE CASE 2	$P_{design}$	27.34	27.34	27.34	psf
DOWNFORCE CASE 3	$P_{design}$	43.70	43.70	43.70	psf

DESCRIPTION	SYMBOL	VALUE	VALUE	VALUE	UNIT
MODULE WIDTH	B	3.33	3.33	3.33	ft
TOTAL DESIGN LOAD (UPLIFT)	P	-26.82	-31.70	-31.70	psf
TOTAL DESIGN LOAD (DOWNFORCE)	P	27.34	27.34	27.34	psf
DISTRIBUTED LOAD (UPLIFT)	w	-44.66	-52.78	-52.78	plf
DISTRIBUTED LOAD (DOWNFORCE)	w	45.53	45.53	45.53	plf
RAIL SPAN BETWEEN ANCHORS POINTS	L	4	4	4	ft
POINT LOAD (UPLIFT)	R	-178.65	-211.11	-105.56	lbs
POINT LOAD (DOWNFORCE)	R	182.10	182.10	91.05	lbs

L-FOOT CONNECTED BY lag screw to roof truss					
Specific Gravity	G	0.55	0.55	0.55	
Min. Dia. of Lag Screw	D	0.1968	0.1968	0.1968	in
Pullout Value of	W	216.94	216.938	216.938	lbs/in
# of Lag screws		2	2	2	
Thread Length	$T_d$	1.5	1.5	1.5	in
Design Pullout Value per Mount	$W_t$	650.81	650.814	650.814	
SAFETY FACTOR	SF	3.64	3.08	6.17	

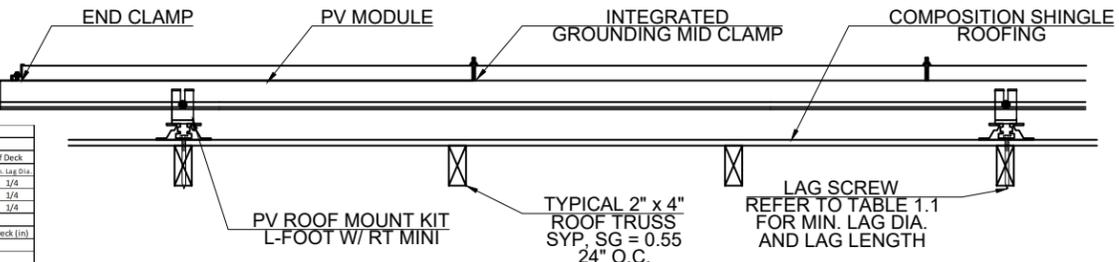


**A** ALLOW. CLAMPING AREA - TOP DOWN  
Scale: 3/8" = 1'-0"

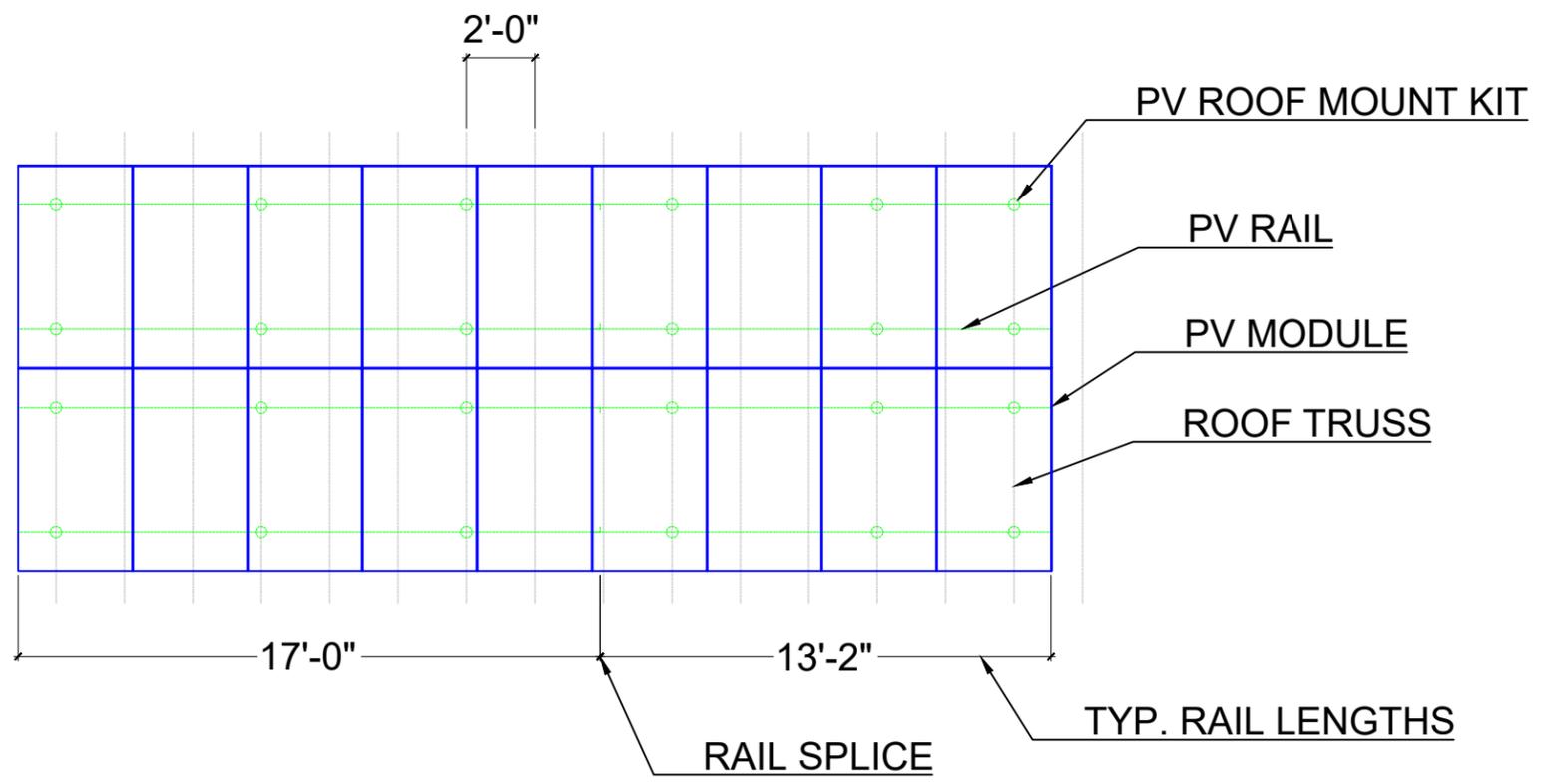


**B** CONNECTION DETAIL - SIDE VIEW  
Scale: 1:16

Table 1.1 Maximum Rail Span Allowance per Roof Zone						
Zone	Spans	RT MINI Mount - Truss/Rafter			RT MINI Mount - Roof Deck	
		# of Lags	Min. Lag Dia. (in)	Min. Lag Length (in)	# of Lags	Min. Lag Dia.
1	4	2	5/16	2.36	2	5
2	4	2	5/16	2.36	0	5
3	2	2	5/16	2.36	0	5



**C** CONNECTION DETAIL - FRONT VIEW  
Scale: 3/4" = 1'



**D** MODULE ATTACHMENT PLAN W/ RAIL LENGTHS  
Scale: 3/16" = 1'-0"

**Contractor Info**  
Photon Brothers  
4921 N. Elizabeth  
Pueblo, CO 81008  
----

**Project Type - Photovoltaic**

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Colorado Springs, CO 80907  
(719) 505-6490  
Dogdoc500@hotmail.com

Parcel Number: 6406423007  
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  2. INVERTER: IQ7A-72-2-US
  3. RACKING: Unirac Lite\_RT Mini
  4. ROOF TYPE: SHINGLE
  5. AZIMUTH: 183°, 273°
  6. ROOF SLOPE: 45°

File Name:  
06\_CRANE\_SHINGLE\_QPEAK\_RTMINI.DWG

Sheet Number and Title:  
PV07 - PV ATTACH PLAN

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

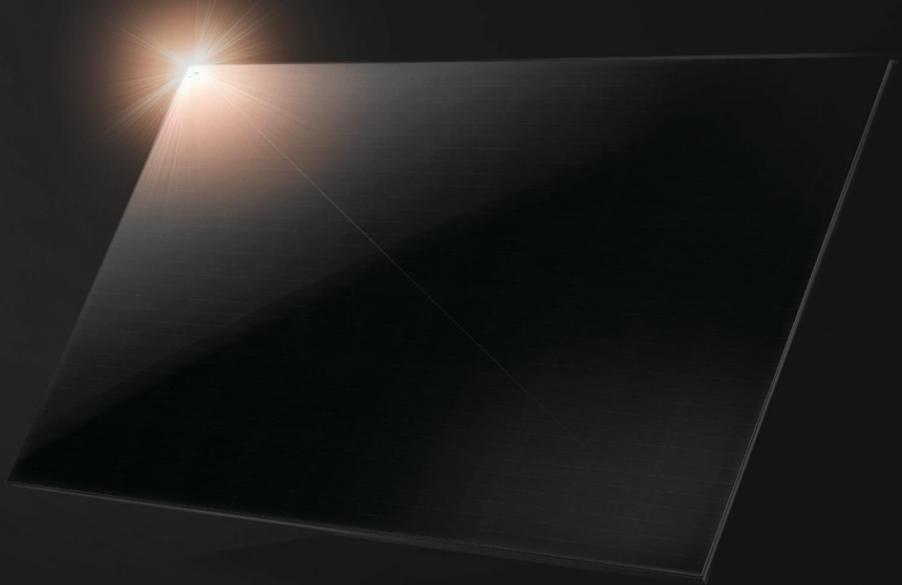
Drawing history			
no.	drawn by	revision	date
01	DCG	----	11/4/21

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



SIL-370/375/380 BK





**NOT JUST ANOTHER SOLAR PANEL.**

**Introducing Silfab Elite.**

The highest efficiency solar panel (up to 21.4%)\*\* manufactured exclusively in the United States.

[SILFABELITE.COM](http://SILFABELITE.COM)



ELECTRICAL SPECIFICATIONS		370		375		380	
Test Conditions		STC	NOCT	STC	NOCT	STC	NOCT
Module Power (Pmax)	Wp	370	277.78	375	282.05	380	284.6
Maximum power voltage (Vpmax)	V	38.34	35.90	38.61	36.15	38.88	36.41
Maximum power current (Ipmax)	A	9.69	7.74	9.77	7.80	9.79	7.82
Open circuit voltage (Voc)	V	44.76	42.01	44.94	42.18	45.13	42.36
Short circuit current (Isc)	A	10.33	8.32	10.41	8.39	10.50	8.46
Module efficiency	%	20.8	19.5	21.1	19.8	21.4	20.0
Maximum system voltage (VDC)	V	1000					
Series fuse rating	A	20					
Power Tolerance	Wp	0 to +10					

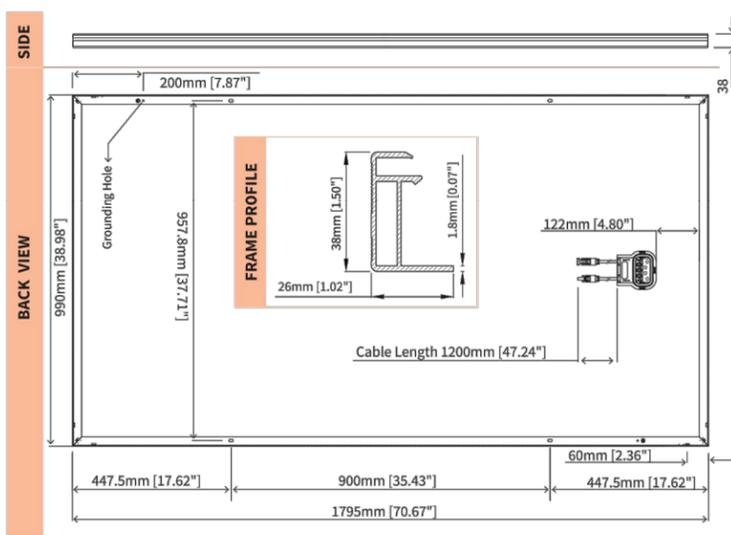
Measurement conditions: STC 1000 W/m2 • AM 1.5 • Temperature 25 °C • NOCT 800 W/m2 • AM 1.5 • Measurement uncertainty ± 3%  
Sun simulator calibration reference modules from Fraunhofer Institute. Electrical characteristics may vary by ±5% and power by 0 to +10W.

MECHANICAL PROPERTIES / COMPONENTS	METRIC	IMPERIAL
Module weight	19.0±0.2 kg	41.9±0.4 lbs
Dimensions (H x L x D)	1795 mm x 990 mm x 38 mm	70.67 in x 39.98 in x 1.5 in
Maximum surface load (wind/snow)*	4000 Pa rear load / 5400 Pa front load	83.5/112.8 lb/ft²
Hail impact resistance	Ø 25 mm at 83 km/h	Ø 1 in at 51.6 mph
Cells	66 high efficiency back contact mono-PERC c-Si cells	66 high efficiency back contact mono-PERC c-Si cells
Glass	3.2 mm high transmittance, tempered, DSM anti-reflective coating	0.126 in high transmittance, tempered, DSM anti-reflective coating
Cables and connectors (refer to installation manual)	1200 mm Ø 5.7 mm, MC4 from Staubli	47.24 in, Ø 0.22 in, MC4 from Staubli
Backsheet	Multilayer, integrated insulation film and electrically conductive backsheet, superior hydrolysis and UV resistance, fluorine-free PV backsheet	
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	

TEMPERATURE RATINGS		WARRANTIES	
Temperature Coefficient Isc	+0.046 %/°C	Module product workmanship warranty	25 years**
Temperature Coefficient Voc	-0.279 %/°C	Linear power performance guarantee	30 years
Temperature Coefficient Pmax	-0.377 %/°C		≥ 97.1% end 1st yr ≥ 91.6% end 12th yr ≥ 85.1% end 25th yr ≥ 82.6% end 30th yr
NOCT (± 2°C)	43.5 °C		
Operating temperature	-40/+85 °C		

CERTIFICATIONS		SHIPPING SPECS	
Product	ULC ORD C1703, UL1703, CEC listed***, UL 61215-1/-1-1/-2, UL 61730-1/-2, IEC 61215-1/-1-1/-2***, IEC 61730-1/-2***, CSA C22.2#61730-1/-2, IEC 62716 Ammonia Corrosion; IEC61701:2011 Salt Mist Corrosion Certified, UL Fire Rating: Type 1	Modules Per Pallet:	26 or 26 (California)
Factory	ISO9001:2015	Pallets Per Truck	34 or 32 (California)
		Modules Per Truck	884 or 832 (California)

\* 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 [silfab.com](http://silfab.com)  
\*\*\* Certification anticipated January 2021.



**SILFAB SOLAR INC.**

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Bellingham WA 98225 USA  
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Mississauga ON L5T 2Y3 Canada  
T +1 905.255.2501  
F +1 905.696.0267

**Silfab - SIL-370/375/380-BK-20201020**  
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**Contractor Info**  
Photon Brothers  
4921 N. Elizabeth  
Pueblo, CO 81008  
----

**Project Type - Photovoltaic**

**Project Location:**  
CRANE RESIDENCE  
1524 N Nevada Ave,  
Colorado Springs, CO 80907  
(719) 505-6490  
Dogdoc500@hotmail.com

Parcel Number: 6406423007  
Assessor Phone # (719) 327-2880

- PV SYSTEM SPECIFICATIONS**
1. PV MODULE: 15 x SIL-380 BK Elite; 5.7kWdc
  2. INVERTER: IQ7A-72-2-US
  3. RACKING: Unirac Lite\_RT Mini
  4. ROOF TYPE: SHINGLE
  5. AZIMUTH: 183°, 273°
  6. ROOF SLOPE: 45°

**File Name:**  
R01\_H-Q.PEAK G5 305-330.DWG

**Sheet Number and Title:**  
R01 - MODULE 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

**Contractor Info**  
 Photon Brothers  
 4921 N. Elizabeth  
 Pueblo, CO 81008  
 ----

**Project Type - Photovoltaic**

**Project Location:**  
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 1524 N Nevada Ave,  
 Colorado Springs, CO 80907  
 (719) 505-6490  
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  2. INVERTER: IQ7A-72-2-US
  3. RACKING: Unirac Lite\_RT Mini
  4. ROOF TYPE: SHINGLE
  5. AZIMUTH: 183°, 273°
  6. ROOF SLOPE: 45°

**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  
 Chad@godwineng.com

Data Sheet  
**Enphase Microinverters**  
 Region: AMERICAS

## Enphase IQ 7A Microinverter

The high-powered smart grid-ready **Enphase IQ 7A Micro™** dramatically simplifies the installation process while achieving the highest system efficiency for systems with 60-cell and 72-cell modules.

Part of the Enphase IQ System, the IQ 7A Micro integrates with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

The IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.



### High Power

- Peak output power 366 VA @ 240 VAC and 295 VA @ 208 VAC

### Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

### Efficient and Reliable

- Optimized for high powered 60-cell and 72-cell modules
- Highest CEC efficiency of 97%
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

### Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Envoy and Internet connection required
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)



To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)



## Enphase IQ 7A Microinverter

INPUT (DC)	IQ7A-72-2-US	
Commonly used module pairings <sup>1</sup>	295 W–460 W +	
Module compatibility	60-cell, 66-cell, and 72-cell PV modules	
Maximum input DC voltage	58 V	
Power point tracking voltage range <sup>2</sup>	18 V–58 V	
Min/Max start voltage	30 V / 58 V	
Max DC short circuit current (module I <sub>sc</sub> ) <sup>3</sup>	15 A	
Overtoltage class DC port	II	
DC port backfeed current	0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT (AC)	@ 240 VAC	@ 208 VAC
Peak output power	366 VA	295 VA
Maximum continuous output power	349 VA	290 VA
Nominal (L-L) voltage/range <sup>4</sup>	240 V / 211–264 V	208 V / 183–229 V
Maximum continuous output current	1.45 A (240 VAC)	1.39 A (208 VAC)
Nominal frequency	60 Hz	
Extended frequency range	47–68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms	
Maximum units per 20 A (L-L) branch circuit <sup>5</sup>	11 (240 VAC) 11 (208 VAC)	
Overtoltage class AC port	III	
AC port backfeed current	18 mA	
Power factor setting	1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging	
EFFICIENCY	@240 VAC	@208 VAC
CEC weighted efficiency	97.0 %	96.5%
MECHANICAL		
Ambient temperature range	-40°C to +60°C	
Relative humidity range	4% to 100% (condensing)	
Connector type: DC (IQ7A-72-2-US)	MC4	
Dimensions (WxHxD)	212 mm x 175 mm x 30.2 mm (without bracket)	
Weight	1.08 kg (2.38 lbs)	
Cooling	Natural convection – No fans	
Approved for wet locations	Yes	
Pollution degree	PD3	
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure	
Environmental category / UV exposure rating	NEMA Type 6 / outdoor	
FEATURES		
Communication	Power Line Communication (PLC)	
Monitoring	Enlighten Manager and MyEnlighten monitoring options Compatible with Enphase IQ Envoy	
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.	
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.	

1. No enforced DC/AC ratio. See the compatibility calculator at <https://enphase.com/en-us/support/module-compatibility>.  
 2. CEC peak power tracking voltage range is 38 V to 43 V.  
 3. Maximum continuous input DC current is 10.2A.  
 4. Voltage range can be extended beyond nominal if required by the utility.  
 5. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)

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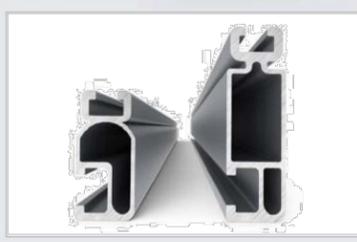




**SOLARMOUNT** defined the standard in solar racking. New enhancements are designed to get installers off the roof faster than ever before. Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding 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



## OPTIMIZED COMPONENTS

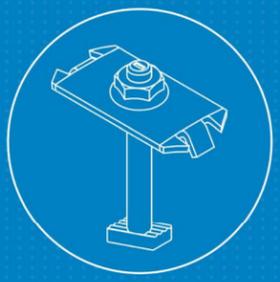
**INTEGRATED BONDING & PRE-ASSEMBLED PARTS**  
Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding straps or bonding jumpers to reduce costs. Utilize the microinverter mount with a wire management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

## VERSATILITY

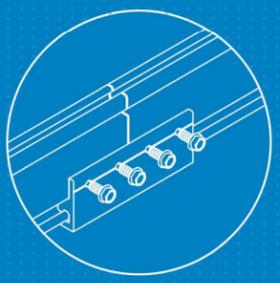
**ONE PRODUCT - MANY APPLICATIONS**  
Quickly set modules flush to the roof or at a desired tilt angle. Change module orientation to portrait or landscape while securing a large variety of framed modules on flat, low sloped or steep pitched roofs. Available in mill, clear and dark anodized finishes to 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.



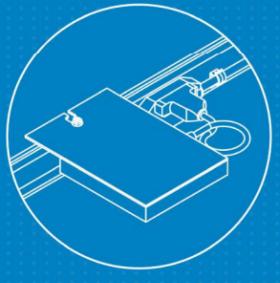
INTEGRATED BONDING MIDCLAMP



INTEGRATED BONDING SPLICE BAR



INTEGRATED BONDING L-FOOT w/ T-BOLT



INTEGRATED BONDING MICROINVERTER MOUNT w/ WIRE MANAGEMENT



## 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  
4921 N. Elizabeth  
Pueblo, CO 81008  
----

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3. RACKING: Unirac Lite\_RT Mini  
4. ROOF TYPE:SHINGLE  
5. AZIMUTH:183°, 273°  
6. ROOF SLOPE:45°

**File Name:**  
R03 UNIRAC DATASHEET.DWG

**Sheet Number and Title:**  
R03 - 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

Roof Tech, Inc.  
Mr. Takashi Chiyoda  
Roof Tech RT-[E] Mount Mini

June 20, 2018  
page 3 of 28

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	
0 PSF	B	0 to 6 Degrees	1	8	8	8	8	8	8	7	6	5	8
		7 to 27 Degrees	1	8	8	8	8	8	8	8	7	6	6
		28 to 45 Degrees	1	8	8	8	8	8	8	7	6	5	5
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	3
	C	0 to 6 Degrees	1	8	8	8	8	8	6	5	5	4	4
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	4
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	4	2
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	3
	D	0 to 6 Degrees	1	8	8	8	8	6	5	4	4	3	3
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	3	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	2
1-10 PSF	B	0 to 6 Degrees	1	8	8	8	8	8	8	7	6	5	8
		7 to 27 Degrees	1	8	8	8	8	8	8	7	6	6	6
		28 to 45 Degrees	1	8	8	8	8	8	7	6	5	4	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	3
	C	0 to 6 Degrees	1	8	8	8	8	6	5	5	4	4	4
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	4
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	3
	D	0 to 6 Degrees	1	8	8	8	8	6	5	4	4	3	3
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	3	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	2
11-20 PSF	B	0 to 6 Degrees	1	8	8	8	8	8	8	7	6	5	8
		7 to 27 Degrees	1	8	8	8	8	8	8	7	6	6	6
		28 to 45 Degrees	1	8	8	8	8	8	7	6	5	4	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	3
	C	0 to 6 Degrees	1	8	8	8	8	6	5	5	4	4	4
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	4
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	3
	D	0 to 6 Degrees	1	8	8	8	8	6	5	4	4	3	3
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	3	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	2

Starling Madison Lofquist, Inc. Consulting Structural and Forensic Engineers

Roof Tech, Inc.  
Mr. Takashi Chiyoda  
Roof Tech RT-[E] Mount Mini

June 20, 2018  
page 4 of 28

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 Degrees	1	8	8	8	8	8	8	7	6	5	8
		7 to 27 Degrees	1	8	8	8	8	8	8	8	7	6	6
		28 to 45 Degrees	1	8	8	8	8	8	8	7	6	5	5
		28 to 45 Degrees	2	8	8	8	8	8	7	6	5	4	4
	C	0 to 6 Degrees	1	8	8	8	8	8	6	5	5	4	4
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	4
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	3
	D	0 to 6 Degrees	1	8	8	8	8	6	5	4	4	3	3
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	3	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	2
31-40 PSF	B	0 to 6 Degrees	1	8	8	8	8	8	8	7	6	5	8
		7 to 27 Degrees	1	8	8	8	8	8	8	8	7	6	6
		28 to 45 Degrees	1	8	8	8	8	8	7	6	5	4	3
		28 to 45 Degrees	2	8	8	8	8	8	7	6	5	4	4
	C	0 to 6 Degrees	1	8	8	8	8	6	5	5	4	4	4
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	4
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	3
	D	0 to 6 Degrees	1	8	8	8	8	6	5	4	4	3	3
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	3	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	2
41-50 PSF	B	0 to 6 Degrees	1	8	8	8	8	8	8	7	6	5	8
		7 to 27 Degrees	1	8	8	8	8	8	8	8	7	6	6
		28 to 45 Degrees	1	8	8	8	8	8	7	6	5	4	3
		28 to 45 Degrees	2	8	8	8	8	8	7	6	5	4	4
	C	0 to 6 Degrees	1	8	8	8	8	6	5	5	4	4	4
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	4
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	3
	D	0 to 6 Degrees	1	8	8	8	8	6	5	4	4	3	3
		7 to 27 Degrees	1	8	8	8	8	7	6	5	4	4	3
		28 to 45 Degrees	1	8	8	8	8	7	6	5	4	3	3
		28 to 45 Degrees	2	8	8	8	8	7	6	5	4	3	2

Starling Madison Lofquist, Inc. Consulting Structural and Forensic Engineers

**Contractor Info**  
Photon Brothers  
4921 N. Elizabeth  
Pueblo, CO 81008  
----

**Project Type - Photovoltaic**

**Project Location:**  
CRANE RESIDENCE  
1524 N Nevada Ave,  
Colorado Springs, CO 80907  
(719) 505-6490  
Dogdoc500@hotmail.com  
  
Parcel Number: 6406423007  
Assessor Phone # (719) 327-2880

- PV SYSTEM SPECIFICATIONS**
- PV MODULE: 15 x SIL-380 BK Elite; 5.7kWdc
  - INVERTER: IQ7A-72-2-US
  - RACKING: Unirac Lite\_RT Mini
  - ROOF TYPE: SHINGLE
  - AZIMUTH: 183°, 273°
  - ROOF SLOPE: 45°

**File Name:**  
R04\_RACKING DATASHEET.DWG

**Sheet Number and Title:**  
R04 - 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



June 5<sup>th</sup>, 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.

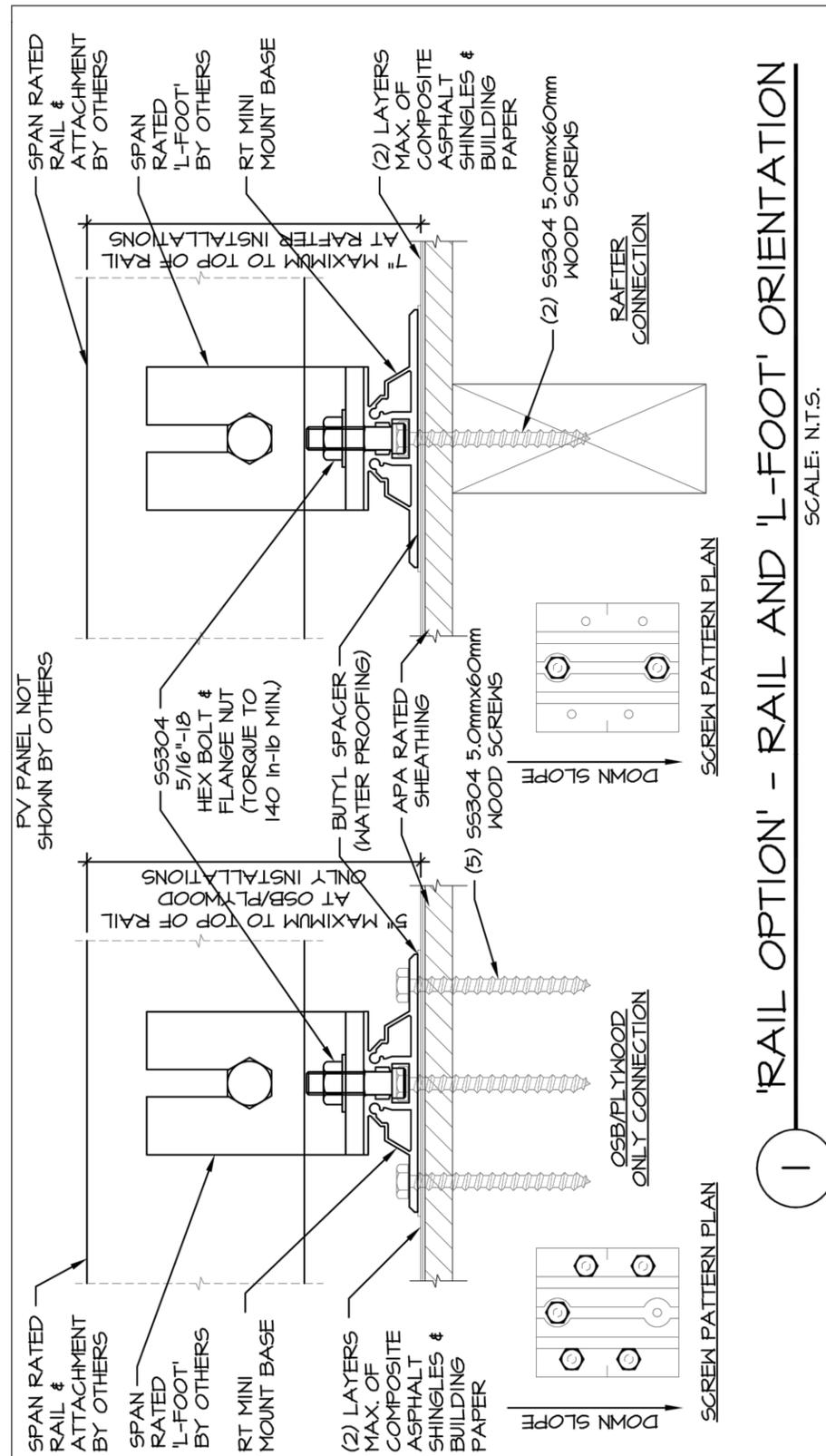
Regards,

*Connor Morrison*

Connor Morrison  
Residential Product Manager

Unirac, Inc. • [www.unirac.com](http://www.unirac.com)

1411 Broadway Blvd. NE • Albuquerque, NM • 87102-1545 • Ph: (505) 242-6411 • Fax: (505) 242-6412



'RAIL OPTION' - RAIL AND 'L-FOOT' ORIENTATION  
 SCALE: N.T.S.

**Starling Madison Lofquist, Inc.**  
 5224 S. 39th Street  
 Phoenix, Arizona 85040  
 (602) 438-2500  
 fax. (602) 438-2505

**EXHIBIT A**  
**1 OF 4**

---

**SM**  
 Consulting Structural and Forensic Engineers

DATE: 10-22-19  
 JOB NO: 471-13

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J.S. D.H.  
 DRAWN BY: DESIGNED BY:

ROOF TECH, INC.  
 10620 TREENA ST., SUITE 230  
 SAN DIEGO, CA 92131

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ROOF TECH  
 RT MINI MOUNT + RAIL  
 STRUCTURAL ANALYSIS

ROOF TECH, INC.  
 10620 TREENA ST., SUITE 230  
 SAN DIEGO, CA 92131

**Contractor Info**  
 Photon Brothers  
 4921 N. Elizabeth  
 Pueblo, CO 81008  
 ----

**Project Type - Photovoltaic**

**Project Location:**  
 CRANE RESIDENCE  
 1524 N Nevada Ave,  
 Colorado Springs, CO 80907  
 (719) 505-6490  
 Dogdoc500@hotmail.com

Parcel Number: 6406423007  
 Assessor Phone # (719) 327-2880

- PV SYSTEM SPECIFICATIONS**
1. PV MODULE: 15 x SIL-380 BK Elite; 5.7kWdc
  2. INVERTER: IQ7A-72-2-US
  3. RACKING: Unirac Lite\_RT Mini
  4. ROOF TYPE: SHINGLE
  5. AZIMUTH: 183°, 273°
  6. ROOF SLOPE: 45°

**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