

PV PROJECT - 10.95kWdc



BAPS
Engineering & Permitting

Project Type - Photovoltaic

Project Location:
176 SW Polaris Terrace,
Fort White, FL 32038

Parcel Number: 13-7S-16-04203-013
Assessor Phone # (386) 758-1083

PV SYSTEM SPECIFICATIONS

1. PV MODULE: 30 x Aptos DNA-120-MF26-365W; 10.95kWdc
2. INVERTER: IQ7+-72-2-US
3. RACKING: Ecofasten Rock-it
4. ROOF TYPE: METAL PANEL
5. AZIMUTH: 88°
6. ROOF SLOPE: 22.26°

File Name:

01_JANKOWSKI MARY_COVER.DWG

Sheet Number and Title:

PV01 - COVER

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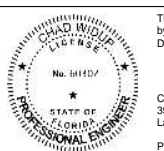
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Permit manager

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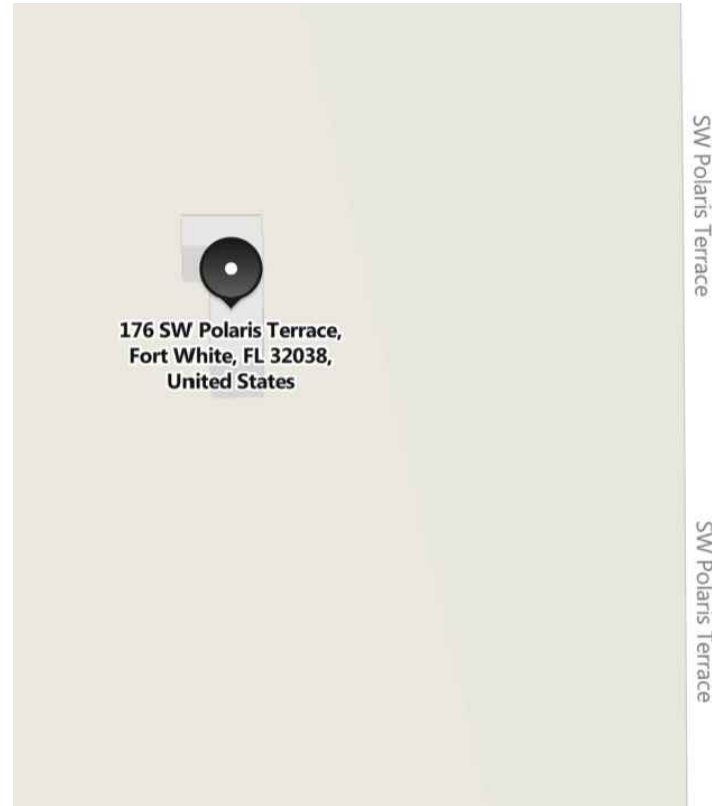
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PV01



1 PROPERTY ASSESSOR 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 CLAY UTILITY GRID THROUGH EXISTING ELECTRICAL EQUIPMENT AND WILL OPERATE IN PARALLEL VIA LOAD SIDE CONNECTION WITH NET ENERGY METER.

GOVERNING BUILDING CODES

1. 2020 FLORIDA BUILDING CODE, 7TH EDITION
2. 2020 FLORIDA RESIDENTIAL CODE, 7TH EDITION
3. 2017 NATIONAL ELECTRICAL CODE, NEC
4. 2020 FLORIDA FIRE PREVENTION CODE 7TH EDITION.
5. UL STANDARDS
 - 5.1. RACKING - UL 2703
 - 5.2. PV MODULE - UL 1703
 - 5.3. INVERTER - UL 1741

DESIGN SPECIFICATIONS

1. AHJ - Columbia County
2. UTILITY - CLAY
3. BUILDING RISK CATEGORY II
4. DESIGN WIND SPEED (ULT) - 130MPH
5. DESIGN SNOW LOAD - 0PSF
6. EXPOSURE CATEGORY - C
7. MEAN ROOF HEIGHT - 15FT
8. ROOF SLOPE - 22.26°

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PV INSTALLATION OVERVIEW

ELECTRICAL

- a. POINT OF CONNECTION: LOAD
- b. MAX INV OUTPUT CURRENT: 1.21A Ea.
- c. PV AC DEDICATED OCP DEVICE RATING: $(30 * 1.21A) * 125\% = 45.375A, 50A$ OCP
- d. UTILITY AC DISCONNECT REQ'D: YES

STRUCTURAL

- a. MAX ALLOWABLE SPACING BETWEEN ATTACH POINTS: 45 Inches
- b. MIN. NUMBER OF ATTACHMENT POINTS: 78
- c. WEIGHT PER ATTACHMENT POINT: 18.9LBS/ATTACH
- d. PV DEAD LOAD: 2.50PSF

Sheet List Table

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

A

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.

B

GENERAL PV SITE NOTES

1. PV ARRAY NOT TO DIRUPT 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.

C

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

E

SYMBOLS

UTILITY METER

PV MODULE

DC/AC UTILITY INTERACTIVE INVERTER

DISCONNECT

CB DOUBLE POLE

CB SINGLE POLE

FUSE

FUSED DISCONNECT

F

G

ELECTRICAL NOTES

1. INSTALLATION TO BE COMPLIANT WITH NFPA 1 & NFPA70 (NATIONAL ELECTRICAL CODE)
2. THE PV SYSTEM IS AN UNGROUNDED PV ARRAY AND HAS A GROUND-FAULT PROTECTION DEVICE THAT MEETS THE REQUIREMENTS OF 690.41(B)(1) AND (2)
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. ALL CLEARANCES AND WORK SPACE AS REQUIRED PER NEC 110.26 SHALL BE FOLLOWED
5. THE INVERTER(S) SHALL MEET ALL CURRENT CODE REQUIREMENTS FOR RAPID SHUTDOWN AS DEFINED IN NEC 690.12.
6. ALL EQUIPMENT TO BE LISTED OR LABELED FOR ITS APPLICATION(UL OR OTHER APPROVED LISTINGS)
 - 6.1. PV MODULE - UL1703
 - 6.2. INVERTER - UL1741
 - 6.3. RACKING SYSTEM - UL2703
7. GROUNDING
 - 7.1. ALL EQUIPMENT SHALL BE PROPERLY GROUNDED PER THE REQUIREMENTS OF NEC ARTICLES 250 & 690
 - 7.2. MODULE BONDING METHOD SHALL BE INTEGRATED GROUNDING MID CLAPS. REFER TO MANUFACTURES SPECIFIC INSTRUCTIONS FOR PROPER BONDING TECHNIQUES.
 - 7.3. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES SHALL BE RATED FOR DIRECT BURIAL
 - 7.4. EGC SHALL BE SIZED IN ACCORDACE WITH 250.122 AND ARRAY EGC'S SMALLER THAN 6AWG SHALL COMPLY WITH 250.120(C)
8. ALL CONDUCTORS ARE COPPER, UNLESS SPECIFIED OTHERWISE
9. ALL CONDUIT, RACEWAYS, AND JUNCTION BOXES SHALL BE SIZED ACCORDING TO THE APPLICABLE CODE IF THE SIZE IS NOT SPECIFIED.
10. SIGNAGE SHALL BE APPLIED ACCORDING TO GOVERNING BUILDING CODES AND LOCAL JURISDICTIONS SPECIFIC REQUIREMENTS.
11. EQUIPMENT INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC.
12. CALCULATION OF MAXIMUM CIRCUIT CURRENT FOR THE SPECIFIC CIRCUIT SHALL BE CALCULATED IN ACCORDANCE WITH 690.8(A)(1) THROUGH (A)(6). CONDUCTOR AMPACITY SHALL BE SIZED TO NOT CARRY LESS THAN THE LARGER OF 690.8(B)(1) OR (2)
13. 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))
14. 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)
15. PV POINT OF CONNECTION. THE OUTPUT OF AN INTERCONNECTED ELECTRIC POWER SOURCE SHALL BE CONNECTED AS SPECIFIED IN 705.12(A) or (B).

FIRE OFFSETS - SYSTEM WILL BE INSTALLED PER 2018 NFPA 1, CH 11.12

NFPA 11.12.2.2.2.1 - PATHWAYS
 NOT LESS THAN TWO 36IN WIDE PATHWAYSON SEPARATE ROOF PLANES, FROM GUTTER TO RIDGE, SHALL BE PROVIDED ON ALL BUILDINGS. ONE PATHWAY SHALL BE PROVIDED ON THE STREET OR DRIVEWAY SIDE OF THE ROOF. FOR EACH ROOF PLANS WITH A PV ARRAY, A 36IN WIDE PATHWAY FROM GUTTER TO RIDGE SHALL BE PROVIDED ON THE SAME PLAN AS THE PV ARRAY, ON AN ADJACENT ROOF PLANE OR STRADDLING THE SAME AND ADJACENT ROOF PLANES. PATHWAYS SHALL BE LOCATED IN AREAS WITH MINIMAL OBSTRUCTIONS SUCH AS VENT PIPES, CONDUIT, OR MECHANICAL EQUIPMENT.

11.12.2.2.2
 FOR PV ARRAYS OCCUPYING UP TO 33 PERCENT OF THE PLAN VIEW ROOF AREA, A MIN. 18IN PATHWAY SHALL BE PROVIDED ON EITHER SIDE OF A HORIZONTAL RIDGE, FOR PV ARRAYS OCCUPYING MORE THAN 33 PERCENT OF THE PLAN VIEW ROOF AREA, A MIN 36IN PATHWAY SHALL BE PROVIDED ON EITHER SIDE OF A HORIZONTAL RIDGE.

THE ACCESS PATHWAY SHALL BE LOCATED AT A STRUCTURALLY STRONG LOCATION OF THE BUILDING, SUCH AS A BEARING WALL.

STRUCTURAL NOTES

1. PV SYSTEM CONSIST OF THE PV MODULES, RACKING AND CONNECTION HARDWARE
2. RACKING SYSTEM & PV ARRAY SHALL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL
3. MAXIMUM SPACING BETWEEN CONNECTION POINTS 45 Inches
8. THE ATTACHMENTS SHOULD BE STAGGERED, WHERE POSSIBLE, TO ALLOW DISTRIBUTION OF THE DESIGN LOADS EVENLY TO THE STRUCTURE.
9. ALL ROOF PENETRATIONS SHALL BE FLASHED AND SEALED BY APPROVED METHOD PER ROOF TYPE MANUFACTURE.
10. TYP. ROOF SUPPORT STRUCTURE; 2" X 4", 24"O.C.
11. REFER TO TABLE 1.1 FOR MAX OVERHANG FROM LAST ATTACHMENT.
12. 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: 78
3. WEIGHT PER ATTACHMENT POINT: 18.9LBS/ATTACH
4. PV DEAD LOAD: 2.50PSF
5. DESIGN SNOW LOAD
 - 5.1. GROUND SNOW LOAD - 0PSF
6. ALLOWABLE DESIGN LOADS FOR PV MODULE:
 - 6.1. WIND = 62PSF
 - 6.2. SNOW = 125PSF



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4. ROOF TYPE:METAL PANEL
5. AZIMUTH:88°
6. ROOF SLOPE:22.26°

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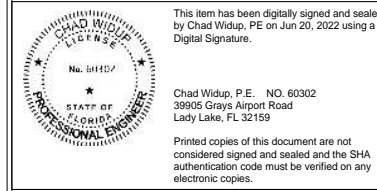
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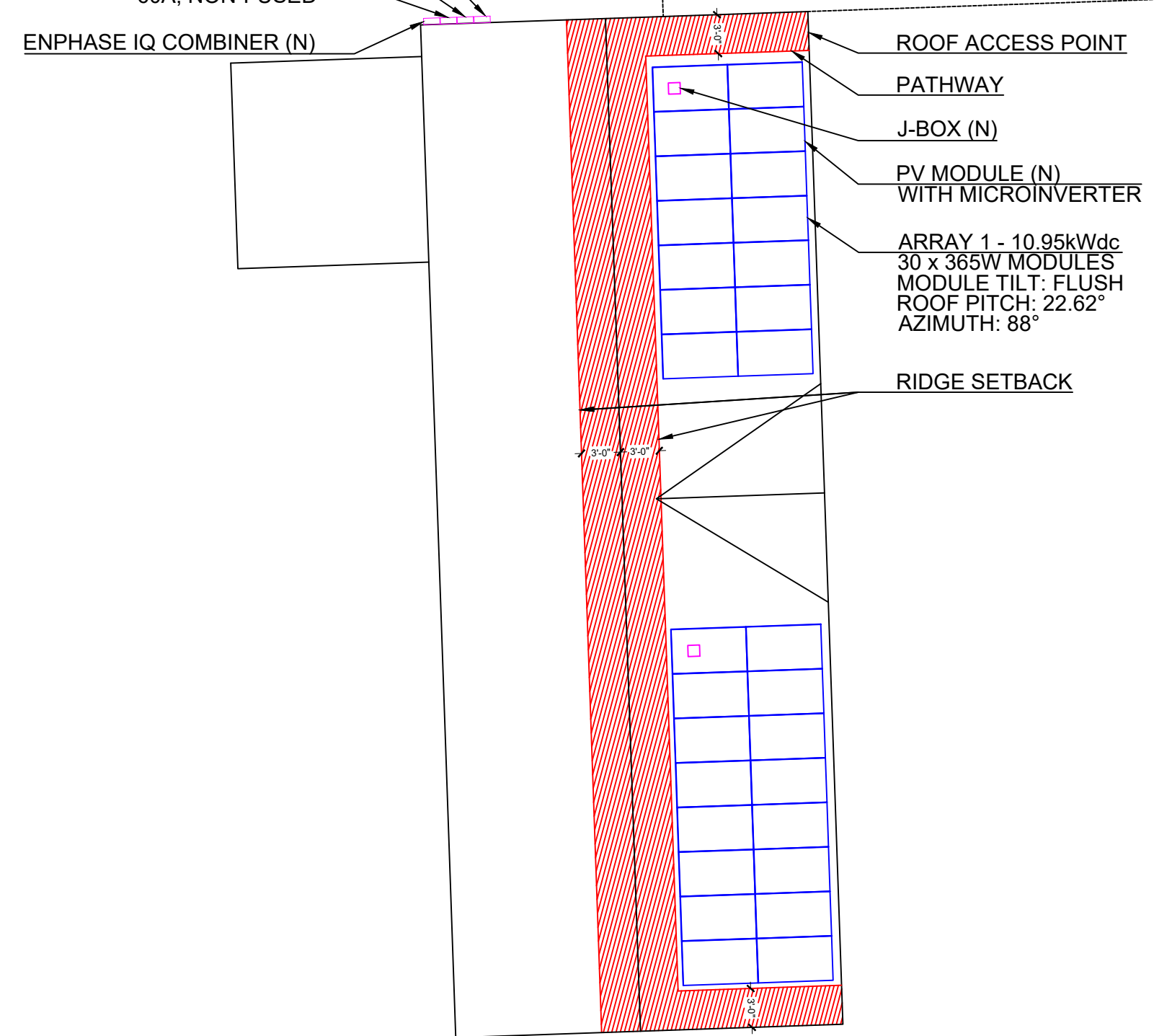
PV02



SW POLARIS TER

- UTILITY METER/MSP COMBO (E)
200A, 200A MB
REDUCE MAIN BREAKER TO 175A
- PV AC DISCONNECT (N)
60A, NON-FUSED
- REC METER (N)
- PV AC DISCONNECT (N)
60A, NON-FUSED
- ENPHASE IQ COMBINER (N)

DRIVEWAY



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PV03 - E_PV SITE PLAN

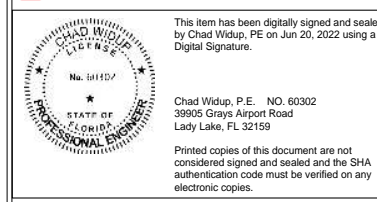
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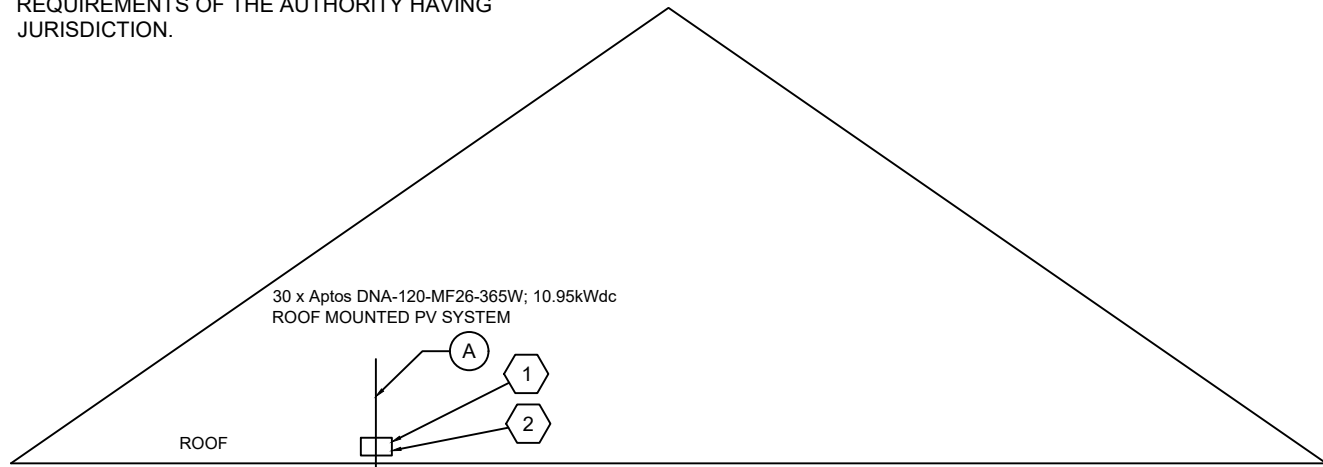
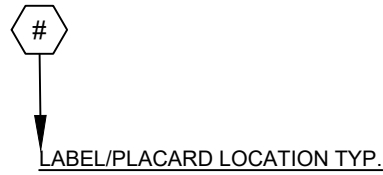


4 PV SITE PLAN W/ MODULE LAYOUT
Scale: 3/32" = 1'-0"

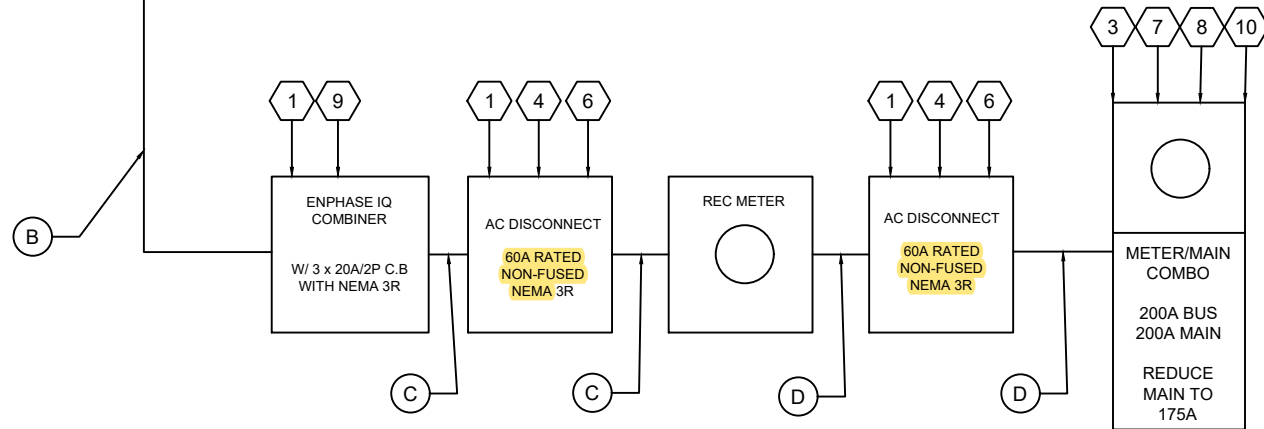
PV03

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.

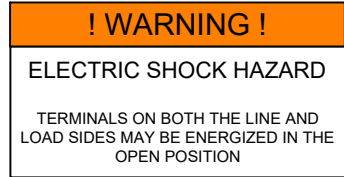


- NOTES:**
1. DESCRIPTION OF COMBINER BOX.
 2. DESCRIPTION OF NON-FUSED DISCONNECT (AUXILLARY GENERATION DISCONNECT)
 3. DESCRIPTION OF CONDUIT BEING USED, INCLUDING DIAMETER OF CONDUIT TYPE. REFER TO CONDUIT AND CONDUCTOR SCHEDULE ON LINE DIAGRAM



4 RISER DIAGRAM Scale: NTS

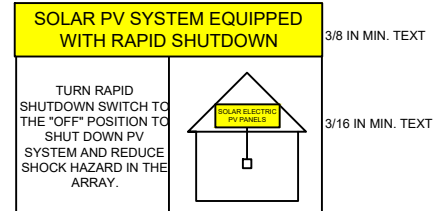
LABEL 1 - NEC 690.13(B)
 APPLY TO DISCONNECTING MEANS WHERE THE LINE AND LOAD TERMINALS MAY BE ENERGIZED IN THE OPEN POSITION



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.



LABEL 3 - 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



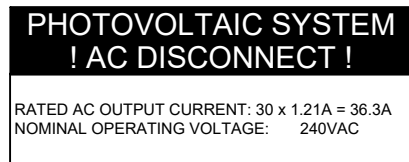
LABEL 4 - NEC 690.56(B) & NFPA 11.12.2.1.1.6
 APPLY TO RAPID SHUTDOWN SWITCH PV SYSTEM COMMENCES RAPID SHUTDOWN SEQUENCE UPON DISCONNECT FROM AC SOURCE - COMPLIES WITH NEC 690.12
 INITIATION DEVICE SHALL BE LOCATED AT A READILY ACCESSIBLE LOCATION OUTSIDE THE BUILDING(LABEL SHALL BE WITHIN 3FT OF SWITCH)



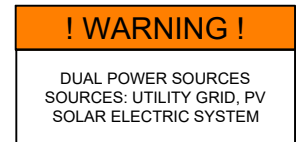
LABEL 5 - 690.53(IF APPLICABLE)
 APPLY TO DC DISCONNECT/INVERTER



LABEL 6 - NEC 690.54
 APPLY TO MAIN PV AC DISCONNECT



LABEL 7 - NEC 705.12(B)(3)
 APPLY TO MSP



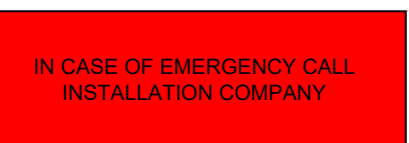
LABEL 8 - NEC 705.12(B)(2)(3)(b)
 APPLY TO BACK-FED BREAKER, IF APPLICABLE



LABEL 9 - NEC 705.12(B)(2)(3)(c)
 PROVIDE AT PV COMBINER OR MSP IF APPLICABLE



LABEL 10 - NFPA 1, 11.12.2.1.5
 INSTALLER INFORMATION LOCATED ADJACENT TO THE MAIN DISCONNECT, INDICATING THE NAME AND EMERGENCY TELEPHONE NUMBER OF THE COMPANY



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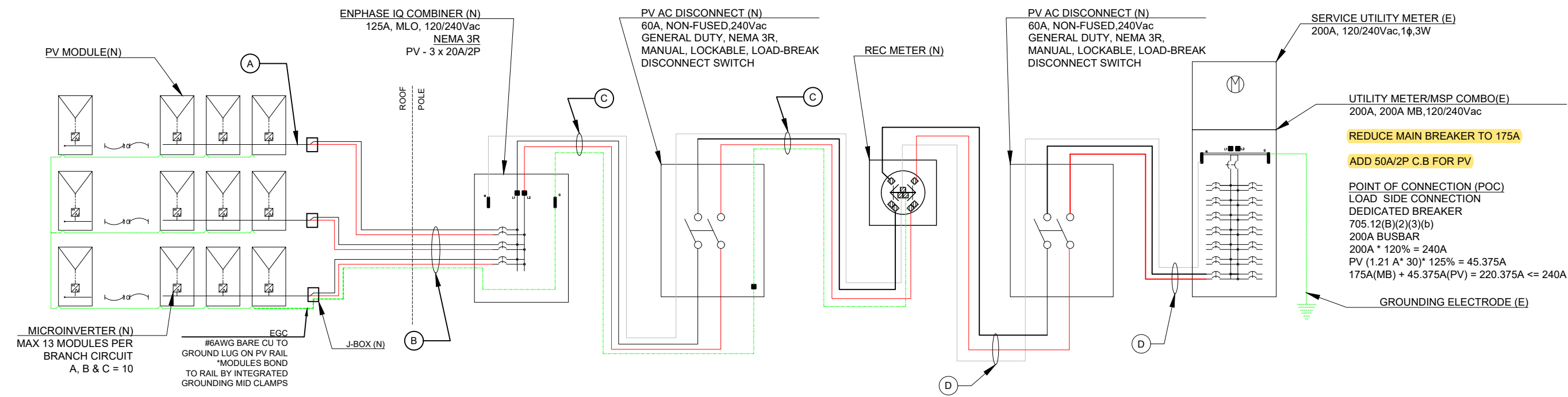
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PV04

Project Details		Microinverter		PV Module		Branch Circuit Summary	
Project Name	PV PROJECT	Model Number	IQ7PLUS-72-2-US	Model Number	DNA-120-MF26 365	PV Combiner A	
Project Location	FORT WHITE, FL	Max input PV Power	440 Wdc	Nominal Output @ STC, Pmp	365 Wdc	# of Microinverters	30
Module -	30 Aptos DNA-120-MF26 365	DC Max Voltage	60	Open Circuit Voltage, Voc	40.7 Vdc	Max Continuous Load (A)	45
Inverter -	30 Enphase IQ7PLUS-72-2-US	Nominal Output Current	1.21 A	Max Power Point, Vmp	33.96 Vdc	# of branch Circuits	3
Utility -	240 Vac	Nominal Voltage	240 Vac	Short Circuit Current, Isc	11.24 A	Busbar Calculation = 200 * 120% = 240	
DC Rating	10.95 kW	AC Max Output Power	295 Wac	Max Power Point Current, Imp	10.66 A	Sum of OCP supplying bus = 220	
AC Rating	8.85 kW	Max Continuous output Power	290 Wac	VOC Temp Coeff	-0.29 %/°C	240A >= 220.375A; 705.12(B)(2)(3)(b) Satisfied	
Min. Ambient Temp, °C	0 32 °F	CEC Weighted Efficiency	97 %	Dimensions, LxWxH (in)	69.13 x 40.9 x 1.37		
Max. Ambient Temp, °C	35 95 °F	Max Units per 20A Branch Circuit	13	Weight	45.19 lbs		

Branch Circuit Sizing			
Inputs	Branch Circuit Combiner A		
# of Branch Circuits	3		
Individual Branch Circuits	A	B	C
Microinverters per Branch Circuit	10	10	10
Output current per string (A)	12.10	12.10	12.10
125% of Output for min. OCP (A)	15.13	15.13	15.13
Min. Breaker Size (A)	20	20	20



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04_JANKOWSKI MARY_LINE DIAGRAM.DWG

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PV05 - LINE DIAGRAM

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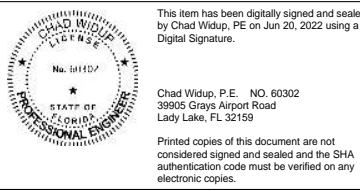
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Digitally signed
by Chad E
Widup
Date:
2022.06.25
17:15:44 -04'00'

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	{L1, L2} {G}	FREE AIR	MFG CABLE	20
B	J-box to Comb., THWN-2	12AWG	3 x {L1, L2}, G	*MC CABLE	MC	40
C	Comb to REC, THWN 2	6AWG	L ₁ , L ₂ , N, {#10G}	PVC, EMT, or FMC	3/4"	5
D	REC to POC, THWN-2	6AWG	L ₁ , L ₂ , N	PVC, EMT, or FMC	3/4"	5

Note: LFMC or LFNC can be used as necessary, if "uses permitted" of the current version of the NEC are met. (G) can be #8AWG THWN-2
For Conduit sizing refer to Chapter 9 Tables, NEC

Conductor Sizing			
Inverter output CKT		Combiner output ckts	
Distance above roof	1/2in.-31/2 in.	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
Adjusted Temp. Range for Roof	132-140	Temp. Rating of Conductor	75°C
Temp. Rating of Conductor	75°C	No. of Current Carrying Cond.	<4
No. of Current Carrying Cond.	<4	Max Continuous Load (A)	45
Overcurrent Protection (A)	20	Overcurrent Protection (A)	50
125% of Output for Min. OCP(A)	15.1	Amb. Temp Correction Factor	0.94
Amb. Temp Correction Factor	0.58	Rayway Fill Adjustment Factor	100%
Rayway Fill Adjustment Factor	100%	Wire Size (AWG or MCM)	6
Wire Size (AWG or MCM)	12	Allowable Ampacity (Amps)	65
Allowable Ampacity (Amps)	25	Adjusted Ampacity (Amps)	61
Adjusted Ampacity (Amps)	15		



PV05



BAPS
Engineering & Permitting

Project Type - Photovoltaic

Project Location:
176 SW Polaris Terrace,
Fort White, FL 32038

Parcel Number: 13-7S-16-04203-013
Assessor Phone # (386) 758-1083

- PV SYSTEM SPECIFICATIONS
1. PV MODULE: 30 x Aptos
DNA-120-MF26-365W; 10.95kWdc
 2. INVERTER: IQ7+-72-2-US
 3. RACKING: Ecofasten Rock-it
 4. ROOF TYPE: METAL PANEL
 5. AZIMUTH: 88°
 6. ROOF SLOPE: 22.26°

File Name:
05_JANKOWSKI MARY_S_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	---	6/17/22

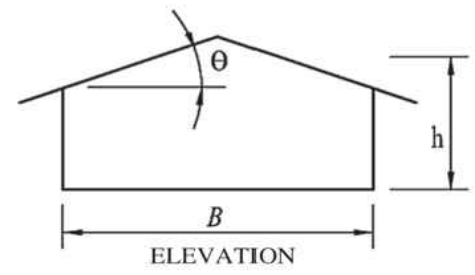
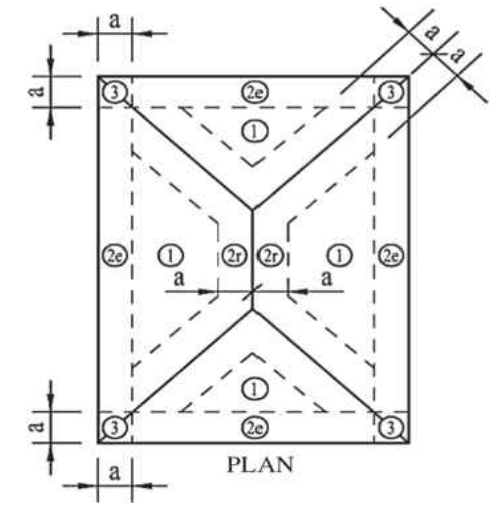
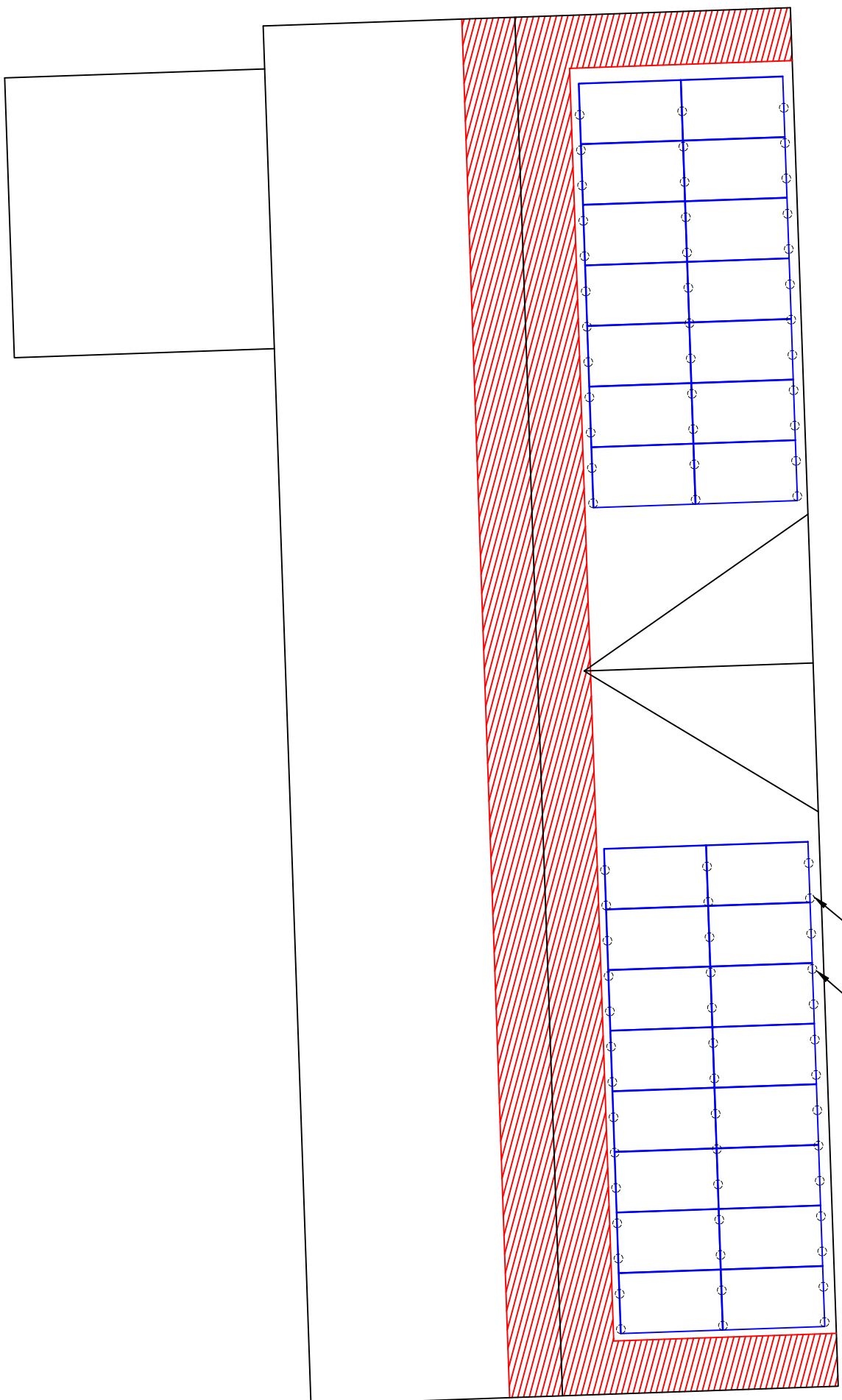
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Rachael@bayareaprojectsolutions.com

Chad E Widup Digitally signed by
Chad E Widup
Date:
2022.06.25 17:16:01
-04'00'

This item has been digitally signed and sealed by Chad Widup, PE on Jun 20, 2022 using a Digital Signature.

Chad Widup, P.E. NO. 60302
39905 Gray Airport Road
Lady Lake, FL 32159

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I CERTIFY THAT THE SHEETING AND FRAMING OF THIS STRUCTURE WILL SAFELY ACCOMMODATE CALCULATED WIND UPLIFT AND LATERAL FORCES AND EQUIPMENT DEAD LOADS. THIS IS ATTESTED TO BE MY SIGNATURE AND SEAL ON THIS DRAWING AT THE LOWER RIGHT BOTTOM

PV MODULE
PV ROOF MOUNT KIT

- MATERIALS**
- a. MAX ALLOWABLE SPACING BETWEEN ATTACH POINTS: 45 Inches
 - b. MIN. NUMBER OF ATTACHMENT POINTS: 78
 - c. MID CLAMPS: 52
 - d. ENDS: 16
 - e. GROUND LUGS: 04

TABLE 1

ASCE 7-16 CHAPTER 29 WIND LOADS - Rooftop Solar Panels Minimum Design Loads - Part 1: Enclosed(Gable,Hip,Flat h<60ft, 0°<0<45°)

Wind Load Parameters - Inputs		
Risk Category	II	Table 1.5-1
Basic Wind Speed (Ult)	130 mph	Figure 26.5-1B
Roof Angle	21° to 27°	
Roof Type	Gable	
Exposure Cat. B,C, or D	C	Section 26.7
Mean Roof Height h	15.00 ft	
Roof attachment	5/16" x 4.75" Lag Screw	
Rail/Truss Spacing	24 in O.C.	
No. of Rails	2	
No. of Modules - Portrait	30	
No. of Modules - Landscape	0	
Module Model Number	DNA-120-MF26-365	
bdg. least horizontal dim (typ.)	360 in	
Elevation	<1000 ft	
Est. # of attachment points	78	

PV Dead Load			Module and Racking Specs		
# of Modules	30		Dimensions, LxWxH (in)	69.13 x 40.9 x 1.37	
Module	W _{mod}	45 lbs	Width	3.41	ft
Array	W _{mod}	1356 lbs	Length	5.76	ft
Micro/optimizer	W _{mic}	120 lbs	Module Area	19.66	ft ²
PV Rail	W _{rail}	0 lbs	Dead Load - Rail, Clamps, Mounts	1	lb/ft
Total Weight	W _{total}	1476 lbs	Total Rail Length	0	ft
Total Area	A _T	589.91 ft ²	Module load ratings		
Dead Load	D _{PV}	2.50 psf	Load Rating - Snow(psf)	113.4	75.6
Weight/attachment		18.9 lbs	Load Rating - Wind(psf)	-113.4	-75.6

PV Attachment - Results

Roof Zones - Gable 21° to 27°

	1	2e	2r	2n	3e	3r	
GC _p - Uplift	-1.5	-1.5	-2.1	-2.1	-2.1	-2.3	
GC _p - Down	0.5	0.5	0.5	0.5	0.5	0.5	
p = q _h (GC _p)(γ _s)(γ _w)	-26.3	-26.3	-37.8	-37.8	-37.8	-41.7	psf 29.4-7
p = q _h (GC _p)(γ _s)(γ _w)	9.6	9.6	9.6	9.6	9.6	9.6	psf 29.4-7
Max Allowable Span	6	6	6	6	6	4	ft *notes
Max Cantilever (in)	24	24	24	24	24	16	Max span * 33% (in)

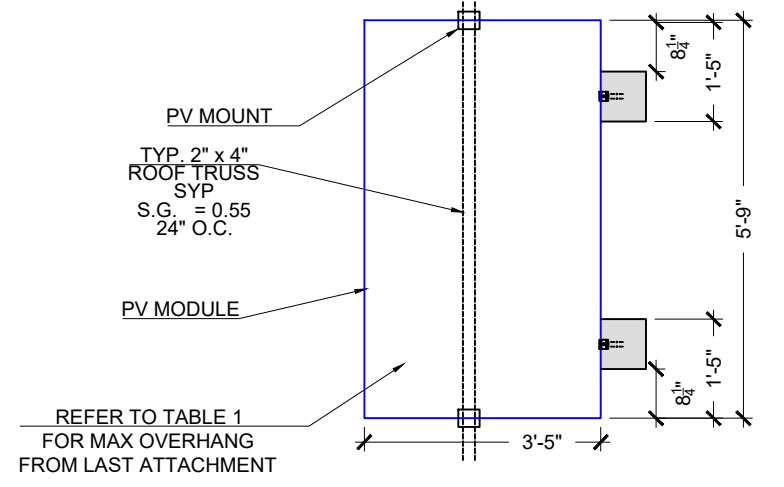
Notes

Eq.1 Point Load = Roof Zone psf * TA
 Eq.2 TA = (Module Length / 2) * Max Span
 Eq.3 *Max span Equation, SF = Allowable pullout / Point Load
 Eq.4 Max Span = Allowable Pullout / (SF * Roof Zone psf * L/2)
 a) The Max span between attachment points must not exceed the rail spans provided by racking manufacture.
 b) Allowable Module load ratings are determined by SF = 1.5

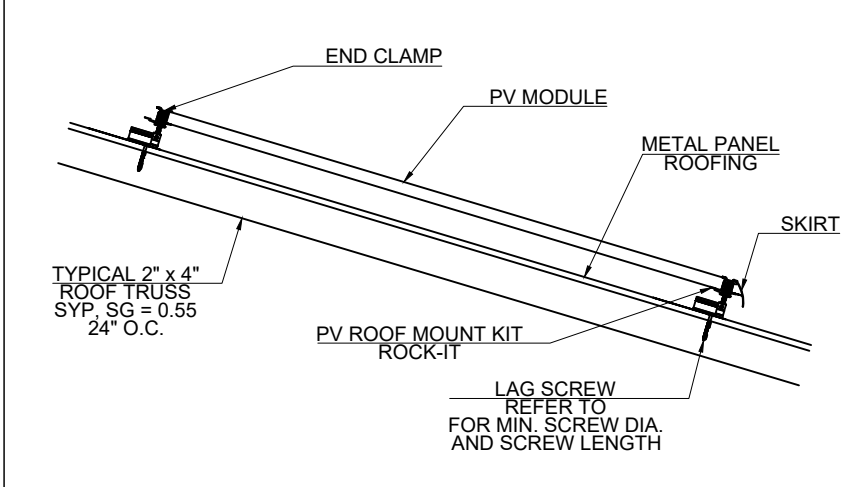
Wind Load Parameters

Wind Speed (asd)	101	mph	FRC R301.2.1.3
Effective Wind Area	19.66	ft ²	26.20
Wind Directionality	K _d	0.85	Table 26.6-1
Topographic factor	K _t	1.00	26.8 or 26.8.2
Ground Elevation Factor	K _e	1.00	Table 26.9-1
Velocity Exposure Coefficient	K _z	0.85	Table 26.10-1
Array Edge Factor	γ _e	1.50	29.4.4 *Modules are considered Exposed
Solar Panel Equalization Factor	γ _a	0.68	Fig. 29.4-8
Velocity Pressure	q _h	18.75	psf q _h = 0.00256 K _d K _t K _e K _z V ²
Added Safety Factor		1.2	
Allowable Pullout per mount		859.2	lbs
0.4h or 0.6h		6.00	ft Flat - 0.6h, Gable, Hip - 0.4h
10% of least horizontal dim		3.00	ft 10% of least hor. Dim. Or 0.4h, whichever is smaller, but not less than either 4% of least hor. Or 3h (Flat roof - 0.6h)
Roof Zone Set Back	a	3.00	ft
	h ₂	5	in Not > 10in (panel height above roof)
	2h ₂	10	in *min distance array shall be from the roof edge, Gable Ridge, or hip ridge
		0.25	in min gap between all panels but not > 6.7ft
	d1	1.00	ft Horizontal distance orthogonal to panel edge
	d2	0.25	ft Horizontal distance from edge of one panel to the nearest edge in the next row
	0.5h	7.50	ft *modules are considered exposed that are within 1.51p from roof edge

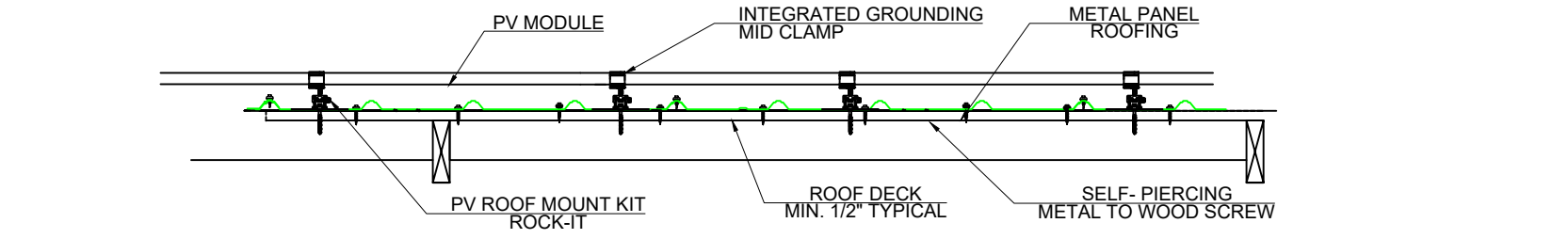
** No Exposed or Edge Conditions Allowed
 MAX ALLOWABLE SPACING BETWEEN ATTACH POINTS: 1/2e - 45 Inches
 2n/2r/3e - 26 Inches
 3r - 18 Inches



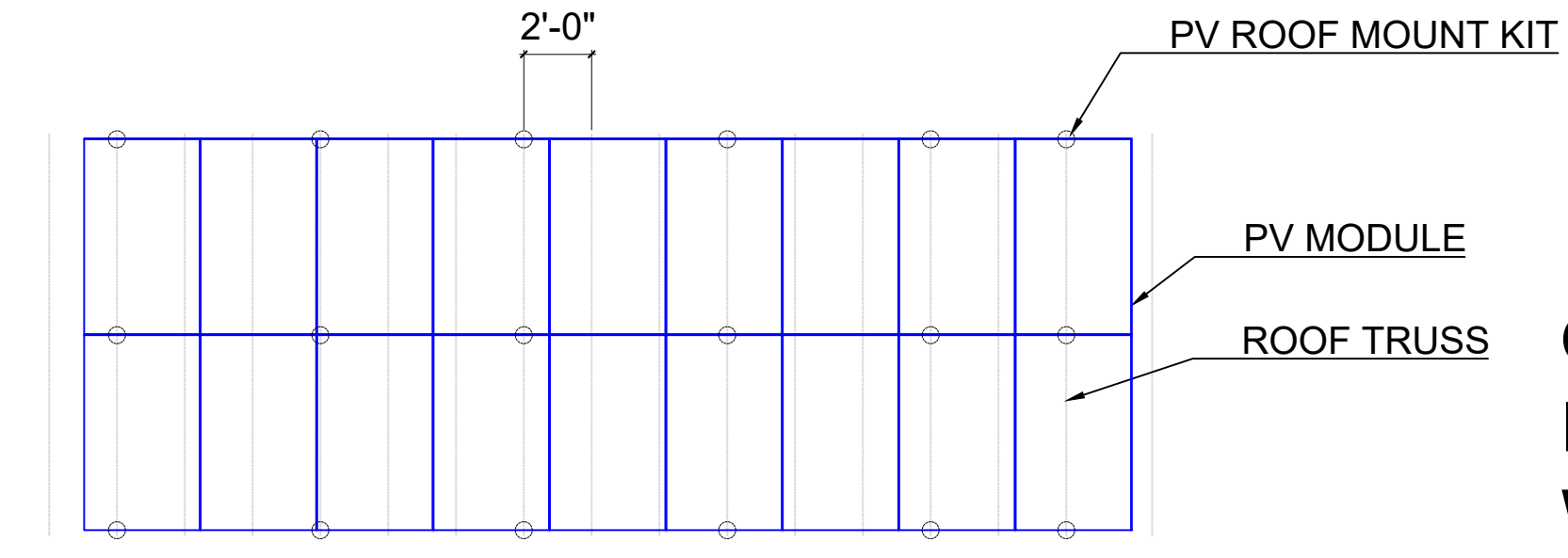
A ALLOW. CLAMPING AREA - TOP DOWN Scale: 3/8" = 1'-0"



B CONNECTION DETAIL - SIDE VIEW Scale: 1:16



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



D MODULE ATTACHMENT PLAN Scale: 3/16" = 1'-0"



Project Type - Photovoltaic

Project Location:
 176 SW Polaris Terrace,
 Fort White, FL 32038

Parcel Number: 13-7S-16-04203-013
 Assessor Phone # (386) 758-1083

- PV SYSTEM SPECIFICATIONS**
1. PV MODULE: 30 x Aptos
 2. INVERTER: IQ7+-72-2-US
 3. RACKING: Ecofasten Rock-it
 4. ROOF TYPE: METAL PANEL
 5. AZIMUTH: 88°
 6. ROOF SLOPE: 22.26°

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 06_JANKOWSKI MARY_SHINGLE_H.DWG

Sheet Number and Title:
 PV07 - PV ATTACH PLAN

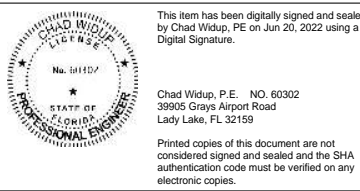
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Drawing history

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01	DCG	---	6/17/22

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 39905 Grays Airport Road
 Lady Lake, FL 32159
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PV07


DNA™ 120


Solar for Innovators


Residential | Commercial

Designed & Engineered in Silicon Valley
370W | 365W | 360W

Our DNA™ Split Cell Series impressively combines advanced solar technologies to maximize performance. Our patented Dual Nano Absorber (DNA™) Technology allows the panel to operate at high-efficiencies in extreme temperatures. Contact our sales team today to learn more about our line of high-efficiency solar panels.

 Patented DNA™ technology boosts power performance & module efficiency

 Advanced split cell technology with 9 ultra-thin busbars allows for less resistance and more photon capture

 Ideal solution for applications affected by shading

 All-black design for pristine aesthetics
No excessive silver bussing or ribbons

 Robust product design is resilient in extreme weather. Up to 5400 Pa snow load and 210 mph wind speeds

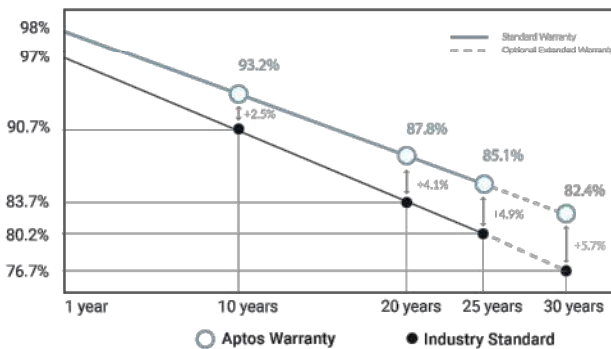


30 Year Warranty | 3X IEC Standards | RETC Top Performer



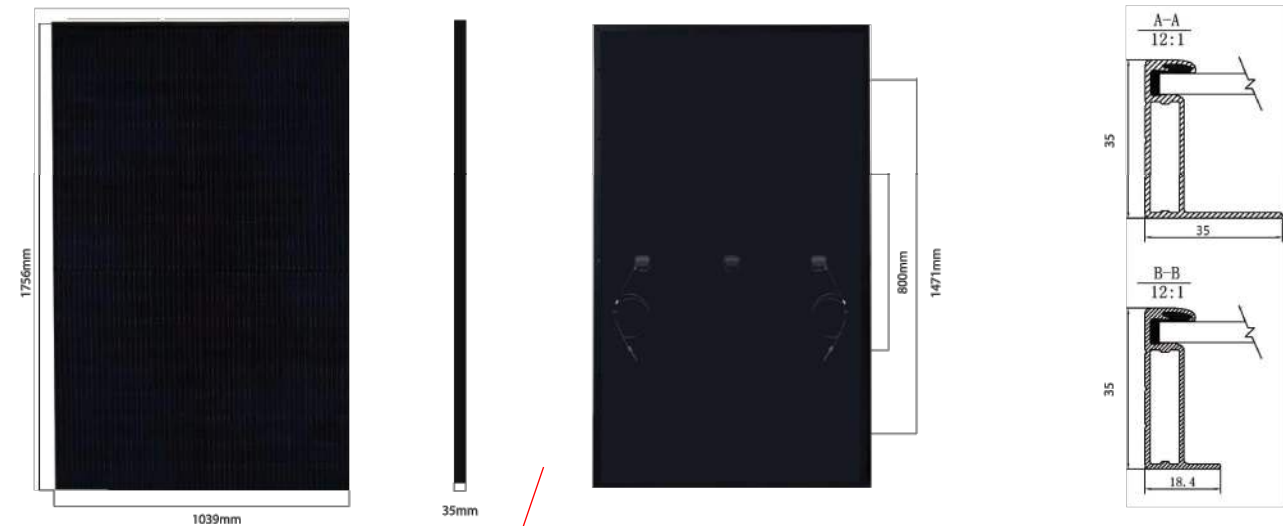
3140 De La Cruz Blvd., Ste 200
Santa Clara, CA 95054
www.aptossolar.com
info@aptossolar.com

Linear Performance Warranty



DNA™ 120

Solar for Innovators



Electrical Specifications	DNA-120-MF26-360W	DNA-120-MF26-365W	DNA-120-MF26-370W
STCrated Output P _{mpp} (W)	360W	365W	370W
Module Efficiency	19.73%	20.01%	20.29%
Open Circuit Voltage V _{oc} (V)	40.6	40.7	40.8
Short Circuit Current I _{sc} (A)	11.24	11.36	11.51
Rated Voltage V _{mpp} (V)	33.8	33.96	34.06
Rated Voltage I _{mpp} (A)	10.66	10.75	10.87

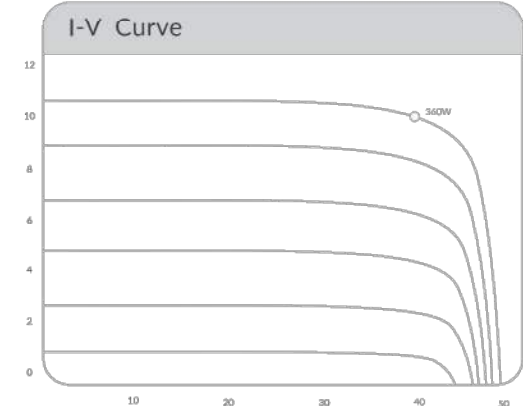
Standard Test Conditions for front-face of panel: 1000 W/m², 25°C, measurement uncertainty $\leq 5\%$

Temperature Coefficients	
Temperature Coefficients P _{mpp}	-0.36%
Temperature Coefficients I _{sc}	+0.05%/°C
Temperature Coefficients V _{oc}	-0.29%/°C
Normal Operating Cell Temperature (NOCT)	44°C

Test Operating Conditions	
Maximum Series Fuse	20A
Maximum System Voltage	1,500 VDC (UL&IEC)
Maximum Load Capacity (Per UL 1703)	5400 PA Snow Load / 210mph Wind Rating
Fire Performance Class	Class C/Type 1

Packaging Configuration	
Number of Modules per Pallet	30
Number of Pallets per 40ft. Container	26
Pallet Dimensions	1740 X 1140 X 1165
Pallet Weight (kg)	640
Container Weight (kg)	16640

Mechanical Properties	
Cell Type	Monocrystalline
Glass	3.2mm, anti-reflection coating, high transmission, low iron, tempered glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68
Dimensions	1756 X 1039 X 35mm
Output Cable	4mm2 (EU)12AWG,39.37in.(1200mm)
Weight	45.19lbs.(20.5kg)
Cable Length	1200mm
Encapsulant	POE



Certifications
intertek CE California State Seal
UL61730-1, UL61730-2



Data Sheet
Enphase Microinverters
Region: AMERICAS

Enphase IQ 7 and IQ 7+ Microinverters

The high-powered smart grid-ready **Enphase IQ 7 Micro™** and **Enphase IQ 7+ Micro™** dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

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.



Easy to Install

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

Productive and Reliable

- Optimized for high powered 60-cell and 72-cell* modules
- 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
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell modules.



To learn more about Enphase offerings, visit enphase.com



Enphase IQ 7 and IQ 7+ Microinverters

INPUT DATA (DC)	IQ7-60-2-US / IQ7-60-B-US	IQ7PLUS-72-2-US / IQ7PLUS-72-B-US
Commonly used module pairings ¹	235 W - 350 W +	235 W - 440 W +
Module compatibility	60-cell PV modules only	60-cell and 72-cell PV modules
Maximum input DC voltage	48 V	60 V
Peak power tracking voltage	27 V - 37 V	27 V - 45 V
Operating range	16 V - 48 V	16 V - 60 V
Min/Max start voltage	22 V / 48 V	22 V / 60 V
Max DC short circuit current (module Isc)	15 A	15 A
Overvoltage class DC port	II	II
DC port backfeed current	0 A	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 DATA (AC)	IQ 7 Microinverter	IQ 7+ Microinverter
Peak output power	250 VA	295 VA
Maximum continuous output power	240 VA	290 VA
Nominal (L-L) voltage/range ²	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)
Nominal frequency	60 Hz	60 Hz
Extended frequency range	47 - 68 Hz	47 - 68 Hz
AC short circuit fault current over 3 cycles	5.8 Arms	5.8 Arms
Maximum units per 20 A (L-L) branch circuit ³	16 (240 VAC)	13 (208 VAC)
Overvoltage class AC port	III	III
AC port backfeed current	0 A	0 A
Power factor setting	1.0	1.0
Power factor (adjustable)	0.7 leading ... 0.7 lagging	0.7 leading ... 0.7 lagging
EFFICIENCY	@240 V	@208 V
Peak CEC efficiency	97.6 %	97.6 %
CEC weighted efficiency	97.0 %	97.0 %
MECHANICAL DATA		
Ambient temperature range	-40°C to +65°C	
Relative humidity range	4% to 100% (condensing)	
Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US)	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)	
Connector type (IQ7-60-B-US & IQ7PLUS-72-B-US)	Friends PV2 (MC4 intermateable). Adapters for modules with MC4 or UTX connectors: - PV2 to MC4: order ECA-S20-S22 - PV2 to UTX: order ECA-S20-S25	
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. Both options require installation of an 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. 1071-01 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. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

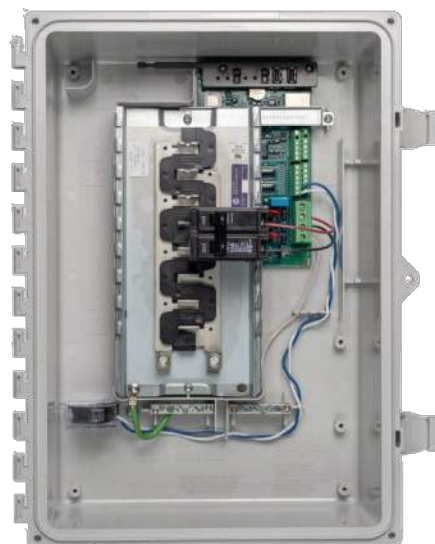
To learn more about Enphase offerings, visit enphase.com

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Enphase IQ Combiner 3 (X-IQ-AM1-240-3)

The **Enphase IQ Combiner 3™** with Enphase IQ Envoy™ consolidates interconnection equipment into a single enclosure and streamlines PV and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.



Smart

- Includes IQ Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring

Simple

- Reduced size from previous combiner
- Centered mounting brackets support single stud mounting
- Supports back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year warranty
- UL listed



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 3

MODEL NUMBER	
IQ Combiner 3 X-IQ-AM1-240-3	IQ Combiner 3 with Enphase IQ Envoy™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%).
ACCESSORIES and REPLACEMENT PARTS (not included, order separately)	
Enphase Mobile Connect™ CELLMODEM-03 (4G / 12-year data plan) CELLMODEM-01 (3G / 5-year data plan) CELLMODEM-M1 (4G based LTE-M / 5-year data plan)	Plug and play industrial grade cellular modem with data plan for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.)
Consumption Monitoring* CT CT-200-SPLIT	Split core current transformers enable whole home consumption metering (+/- 2.5%).
Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220
EPLC-01	Power line carrier (communication bridge pair), quantity 2
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Envoy printed circuit board (PCB) for Combiner 3
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating (output to grid)	65 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. continuous current rating (input from PV)	64 A
Max. total branch circuit breaker rating (input)	80A of distributed generation / 90A with IQ Envoy breaker included
Production Metering CT	200 A solid core pre-installed and wired to IQ Envoy
MECHANICAL DATA	
Dimensions (WxHxD)	49.5 x 37.5 x 16.8 cm (19.5" x 14.75" x 6.63"). Height is 21.06" (53.5 cm with mounting brackets).
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	<ul style="list-style-type: none"> • 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Cellular	Optional, CELLMODEM-01 (3G) or CELLMODEM-03 (4G) or CELLMODEM-M1 (4G based LTE-M) (not included)
COMPLIANCE	
Compliance, Combiner	UL 1741 CAN/CSA C22.2 No. 107.1 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
Compliance, IQ Envoy	UL 60601-1/CANCSA 22.2 No. 61010-1

* Consumption monitoring is required for Enphase Storage Systems.

To learn more about Enphase offerings, visit enphase.com

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2018-09-13





COMPLETE RAIL-LESS RACKING SYSTEM

The RockIt system is the industry's premier rail-less PV racking system for composition shingle, tile, and metal roofs. Designed in conjunction with the needs of installers, RockIt quickly & easily installs with a single tool. Featuring an easy-to-position alignment slide and a top-down leveling system, RockIt is logistically intelligent with no need to ship or transport long rails. Components are available in a black finish that complements both commercial and residential applications. Conforms to UL 2703.

FEATURES & BENEFITS

- Patented watertight technology
- Fully integrated bonding
- Top-down leveling system
- North-South adjustability
- Single tool install

STREAMLINED INSTALLATION WITH MINIMAL ROOF PENETRATIONS

-  **Composition Shingle, Tile, Metal**
-  **Rail-Less**
-  **Structural-Attach Direct-Attach**

-  **WATER TIGHT TECHNOLOGY**
-  **25 YEAR WARRANTY**



COUPLING

The fast installing Rockit Coupling easily attaches to the module frame to bridge the gaps between modules.

SKIRT

The sleek black Skirt installs first and acts as an alignment guide for the entire array. The Skirt End Cap does double duty as a skirt coupling device and an aesthetically-pleasing finishing touch.

ROCKIT MOUNT

Featuring integrated bonding pins, the Rockit Mount connects to the Slide and can easily be positioned for fast installation. Features top-down leveling.



ROCKIT SLIDE

Available in three variations, the Rockit Slide allows installation on composition shingle, tile, and metal roofs.

FRAME MLPE MOUNT

Attaches and fully bonds MLPE's (Module Level Power Electronics) to the module frame with a single bolt clip.

