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1011 N Causeway Blvd, Suite 19 ♦ Mandeville, Louisiana 70471 ♦ Phone: 985.624.5001 ♦ Fax: 985.624.5303

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Wednesday, March 1, 2023

Property Owner: Nathan Lane

Property Address: 385 Papoose Trail, Lillington, NC 27546

**RE: Photovoltaic System Roof Installations**

I have reviewed the existing structure referenced above to determine the adequacy of the existing structure support the proposed installation of an array of solar panels on the roof.

Based on my review, the existing structure meets or exceeds applicable codes listed below to support the proposed solar panel installation. This assessment is based on recent on-site inspection by solar inspectors and photographs of the existing structure. The photovoltaic system is designed to withstand uplift and downward forces; our assessment is regarding the structure's support of the array. Stresses induced by the introduction of individual mount loads on the rafters or truss top chord are within acceptable limits as shown on the attached calculations. The structural considerations used in our review and assessment include the following:

**Evaluation Criteria:**

Applied Codes: ASCE 7-10 NCBC 2018 NCRC 2018 NEC 2017

Risk Category: II

Design Wind Speed (3-second gust): 117 mph

Wind Exposure Category: B

Ground Snow Load: 10 PSF

Seismic Design Category: D

**Existing Structure:**

Roof Material: Shingle

Roof Structure: 2x3 Truss Top Chord

Roof Slope: 2/12

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NORTH CAROLINA FIRM NO. C4113

**PRINCIPAL Infrastructure®**

Architecture ♦ Engineering ♦ Construction

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**Effect of the Solar Array on Structure Loading:**

Gravity Load:

Per IBC Section 1607, the areas of the roof where solar panels are located are considered inaccessible, and therefore not subject to roof live loading. Live load in these areas is replaced by the dead load of the solar array, 3 psf. The total gravity load on the structure is therefore reduced and the structure may remain unaltered. Connections of the mounts to the underlying structure are to be installed in a staggered pattern, except at the array ends, to distribute the loading evenly to the roof structure. The stresses within the rafters or truss top chord due to the introduction of discrete mount loads are within acceptable limits, as shown on the attached calculations.

Wind Load:

The solar panel array will be flush mounted (no more than 6" above the surrounding roof surface, and parallel to the roof surface. Any additional wind loading on the structure due to the presence of the array is negligible. The array structure is designed by the manufacturer to withstand uplift and downward forces resulting from wind and snow loads. The attached calculations verify the capacity of the connection of the solar array to the roof to resist uplift due to wind loads, the governing load case.

Snow Load:

The reduced friction of the glass surface of the solar panels allows for the lower slope factor (Cs) per Section 7.4 of ASCE 7.10 resulting in a reduced design snow load for the structure. This analysis conservatively considered the snow load to be unchanged.

Seismic Load:

Analysis shows that additional seismic loads due to the array installation will be small. Even conservatively neglecting the wall materials, the solar panel installation represents an increase in the total weight of the roof and corresponding seismic load of less than 10%. This magnitude of additional forces meets the requirements of the exception in Section 11B.4 of ASCE 7-10. The existing lateral force resisting system of the structure is therefore allowed to remain unaltered.

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Conclusion:

To the best of my professional knowledge and belief, the subject construction and photovoltaic system installation will be in compliance with all state and local building codes and guidelines in effect at the time of our review.

Limitations:

Engineer's assessment of the existing structure is based on recent field reports and current photographs of the elements of the structure that were readily accessible at the time of inspection. The design of the solar panel racking (mounts, rails, connectors, etc.), connections between the racking and panels, and electrical construction related to the installation are the responsibility of others. The photovoltaic system installation must be by competent personnel in accordance with manufacturer recommendations and specifications and should meet or exceed industry standards for quality. The contractor is responsible for ensuring that the solar array is installed according to the approved plans and must notify the engineer of any undocumented damage or deterioration of the structure, or of discrepancies between the conditions depicted in the approved plans and those discovered on site so that the project may be reevaluated and altered as required. Engineer does not assume any responsibility for improper installation of the proposed photovoltaic system.

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**Uplift and Wind Downforce Calculation Summary (ASCE 7-10)  
Mount, Rack, & Panel Proportioning**

Property Owner:	Nathan Lane	Individual Panel Dimensions		
Project Address:	385 Pappoose Trail	Length (in)	Width (in)	Area (sf)
City, State:	Lillington, NC 27546	77	39	20.85

Wind Load Calculation Summary (ASCE 7-10 C&C Provisions)				
Building Characteristics, Design Input, and Adjustment Factors				
Roof Dimensions:	Length (b):	77 ft.	Least Dimension:	29 ft.
	Width (w):	29 ft.		
Roof Height (h):		15 ft.	Must be less than 60	✓
Pitch:	2 on 12 =	9.5°	Must be less than 45°	✓
Roof Configuration		Gable		
Roof Structure:		2x3 Truss Top Chord		
Roof material:		Plywood		
Ultimate Wind Speed (mph):		117	From ASCE 7-10, Fig. 26.5	
Exposure Category:		B	Para 26.7.3	
Directionality Factor, $K_d$		0.85	Table 26.6-1	
Risk Category:		2	Table 1.5-2	
Exposure Coefficient, $K_z$		0.7	Table 30.3-1	
Topographic Adj., $K_{zt}$		1	Fig. 26.8-1	
Effective Wind Area (sf):		21	(Area per individual panel)	
Velocity Pressure (psf), $q_h$ :		20.85	psf, Eq. 30.3-1	
Internal Pressure Coeff, $GC_{pi}$		0.18	Table 26.11-1	

Roof Zone Strip (a), in ft, Fig. 30.5-1, Note 5	
1 - Least Roof Horizontal Dimension (L or W) x 0.10	2.9
2 - Roof Height x 0.4	6
3 - Least Roof Horizontal Dimension (L or W) x 0.04	1.16
4 - Lesser of (1) and (2)	2.9
5 - Greater of (3) and (4)	2.9
6 - Greater of (5) and 3 feet	<b>a= 3 ft.</b>

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Net Design Wind Pressures					
(ASCE 7, Eq. 30.4.1; Load Factor for ASD = 0.6, per ASCE 7, 2.4.1)					
	Uplift (-psf)		Down (psf)		Description of Zone
	GC <sub>p</sub>	Pressure	GC <sub>p</sub>	Pressure	
Zone 1	-0.88	<b>16.0</b>	0.40	<b>16.0</b>	Interior Roof Area, >(a) ft from edge
Zone 2	-1.53	<b>-21.3</b>	0.40	<b>16.0</b>	Strip of (a) ft wide at roof edge
Zone 3	-2.40	<b>-32.2</b>	0.39	<b>16.0</b>	Corner intersection of Zone 2 strips

Snow Load		
Ground Snow Load, p <sub>g</sub>	10.0	From ASCE 7 or AHJ
Terrain Category:	B	Para 6.5.6.3
Exposure	Fully	
Exposure Factor C <sub>e</sub>	0.8	Table 7-2
Thermal Factor, C <sub>t</sub>	1.0	Table 7-3
Importance Factor, I <sub>s</sub>	1.0	Table 1.5.2
Roof Configuration	Gable	
Roof Slope	09.5°	
Distance from Eave to Ridge	14.5	
p <sub>m</sub> , Minimum required Snow Load	10.00 psf	Para. 7.3.4
p <sub>f</sub> , Calculated Snow Load	5.60	Eq. 7.3-1
p <sub>f</sub> , Design Snow Load	10.00 psf	

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Mount Selection and Spacing		
Manufacturer:	Unirac	Perpendicular Panel Orientation
Mount:	Flashloc Duo	Allowable Arrangement by Uplift Pressure
Substrate:	Wood Rafters/Truss Top Chord	< 39 psf : 2 rails, mounts @ 4'-0" o.c.
Connector:	(2) #12-14 HWH SP Screws	39 to 77 psf : 2 rails, mounts @ 2'-0" o.c.
		77 to 116 psf : 3 rails, mounts @ 2'-0" o.c.
Allowable Uplift:	495 max.	116 to 154 psf : 4 rails, mounts @ 2'-0" o.c.
		> 154 psf : Mount capacity exceeded
<b>Required Mount Layout</b>		
<b>Zone 1</b>	2 rails, mounts @ 4'-0" o.c.	
<b>Zone 2</b>	2 rails, mounts @ 4'-0" o.c.	
<b>Zone 3</b>	2 rails, mounts @ 4'-0" o.c.	
<i>(Allowable loads are based on individual mount failure before rail failure)</i>		

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# PHOTOVOLTAIC ROOF MOUNT SYSTEM

20 MODULES-ROOF MOUNTED - 7.300 KW DC STC, 6.766 KW DC PTC, 5.800 KW AC



385 PAPOOSE TRAIL, LILLINGTON, NC 27546



NOTICE TO CONTRACTOR:  
All construction must comply with current NC Building Codes and is subject to field inspection and enforcement.

APPROVED  
Sealed building only review  
Professional responsibility lies  
Full compliance with the code

03/07/2023


22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

## PROJECT DATA

PROJECT ADDRESS: 385 PAPOOSE TRAIL, LILLINGTON, NC 27546

OWNER: NATHAN LANE

CONTRACTOR: ADT SOLAR LLC  
PHONE: (985) 238-0864

DESIGNER: ESR

SCOPE: 7.300 KW DC ROOF MOUNT SOLAR PV SYSTEM WITH 20 HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W PV MODULES WITH 20 ENPHASE IQ8PLUS-72-M-US MICROINVERTERS  
1 ESS: ENCHARGE 10 = 3.84KW / 10.08KWH



AUTHORITIES HAVING JURISDICTION:  
BUILDING: HARNETT, COUNTY OF (NC)  
ZONING: HARNETT, COUNTY OF (NC)  
UTILITY: CENTRAL ELECTRIC MEMBERSHIP CORPORATION (NC)

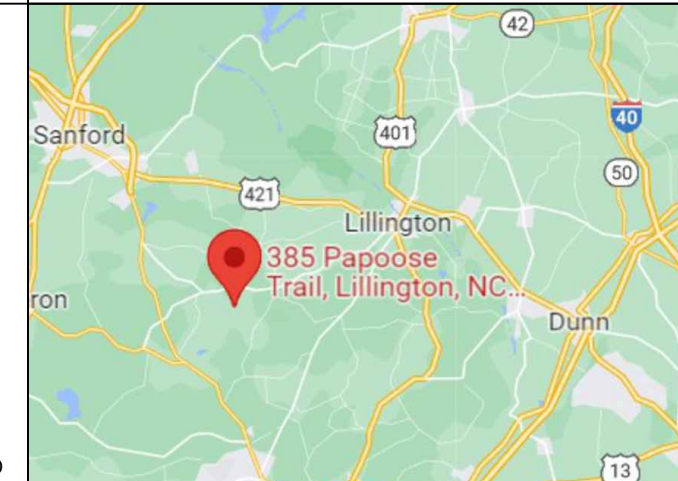
## SHEET INDEX

PV-1 COVER SHEET  
PV-2 SITE PLAN  
PV-3 ROOF PLAN & MODULES  
PV-4 ELECTRICAL PLAN  
PV-5 STRUCTURAL DETAIL  
PV-6 ELECTRICAL LINE DIAGRAM  
PV-7 WIRING CALCULATIONS  
PV-7.1 LOAD CALCULATION  
PV-8 LABELS  
PV-9 PLACARD  
PV-10 JHA FORM  
PV-11 MICRO INVERTER CHART  
PV-12+ EQUIPMENT SPECIFICATIONS

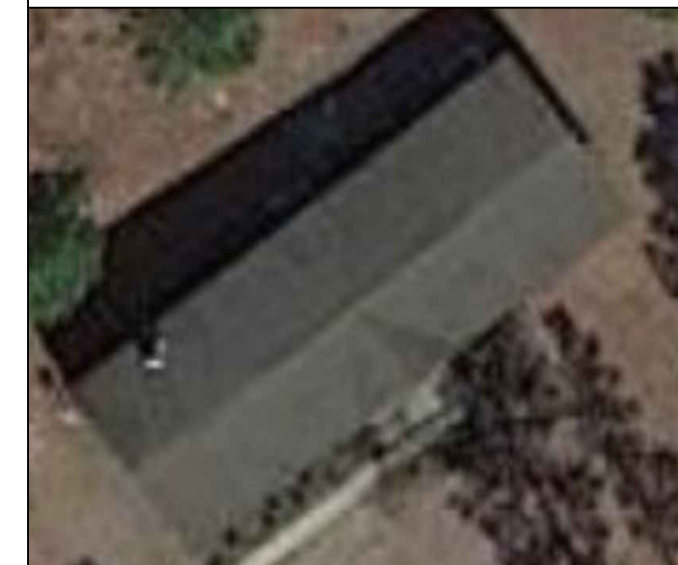
## GENERAL NOTES

- ALL COMPONENTS ARE UL LISTED AND CEC CERTIFIED, WHERE WARRANTED.
- THE SOLAR PV SYSTEM WILL BE INSTALLED IN ACCORDANCE WITH ARTICLE 690 OF THE NEC 2017.
- THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION.
- ALL CONDUCTORS OF A CIRCUIT, INCLUDING THE EGC, MUST BE INSTALLED IN THE SAME RACEWAY, OR CABLE, OR OTHERWISE RUN WITH THE PV ARRAY CIRCUIT CONDUCTORS WHEN THEY LEAVE THE VICINITY OF THE PV ARRAY.
- WHERE METALLIC CONDUIT CONTAINING DC CONDUCTORS IS USED INSIDE THE BUILDING, IT SHALL BE IDENTIFIED AS "CAUTION: SOLAR CIRCUIT" EVERY 10FT.
- HEIGHT OF THE AC DISCONNECT SHALL NOT EXCEED 6'-7" PER NEC CODE 240.24.
- A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH CEC 690.47 AND 250.50 THROUGH 60 AND 250-166 SHALL BE PROVIDED. PER NEC GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE OR INADEQUATE A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT. GROUND ROD WITH ACORN CLAMP. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN #8 AWG AND NO LARGER THAN #6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
- PHOTOVOLTAIC MODULES ARE TO BE CONSIDERED NON-COMBUSTIBLE.
- PHOTOVOLTAIC INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
- ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE. WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF THE ROOF SURFACE.
- ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH THE LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.
- INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE UL 1741 LISTED.
- THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS [NEC 690.4(C)]
- ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED (OR BETTER), INCLUDING ALL ROOF MOUNTED TRANSITION BOXES AND SWITCHES.
- ALL EQUIPMENT SHALL BE PROPERLY GROUNDED AND BONDED IN ACCORDANCE WITH NEC ARTICLE 250.
- SYSTEM GROUNDING SHALL BE IN ACCORDANCE WITH NEC 690.41.
- PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION IN ACCORDANCE WITH NEC 690.12
- DISCONNECTING MEANS SHALL BE LOCATED IN A VISIBLE, READILY ACCESSIBLE LOCATION WITHIN THE PV SYSTEM EQUIPMENT OR A MAXIMUM OF 10 FEET AWAY FROM THE SYSTEM [NEC 690.13(A)]
- ALL WIRING METHODS SHALL BE IN ACCORDANCE WITH NEC 690.31
- WORK CLEARANCES AROUND ELECTRICAL EQUIPMENT WILL BE MAINTAINED PER NEC 110.26(A)(1), 110.26(A)(2) AND 110.26(A)(3).
- ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED & IDENTIFIED IN ACCORDANCE WITH UL1703
- ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.
- THE ENCHARGE BATTERY AS PART OF THE ENSEMBLE SYSTEM DOES NOT EXPORT POWER TO THE GRID IN ANY STORAGE MODE.

## VICINITY MAP



## HOUSE PHOTO



## CODE REFERENCES

PROJECT TO COMPLY WITH THE FOLLOWING:

2018 NORTH CAROLINA BUILDING CODE  
2018 NORTH CAROLINA RESIDENTIAL CODE  
2018 NORTH CAROLINA FIRE CODE  
2018 NORTH CAROLINA ENERGY CONSERVATION CODE  
2017 NATIONAL ELECTRICAL CODE

## REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

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## PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

## SHEET NAME

COVER SHEET

## SHEET SIZE

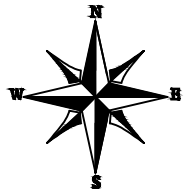
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11" X 17"

## SHEET NUMBER

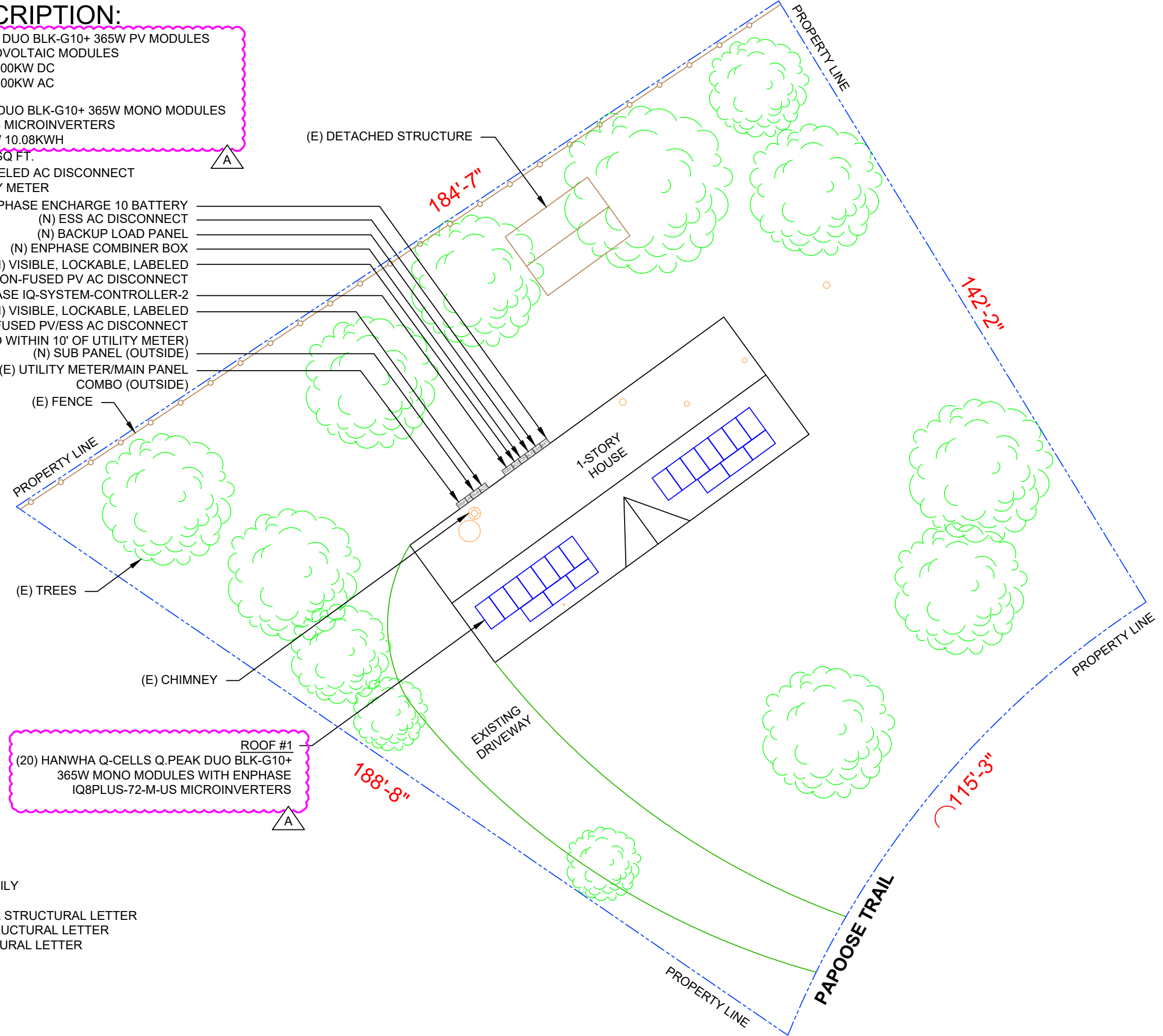
PV-1

# PROJECT DESCRIPTION:

20 X HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W PV MODULES  
 ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES  
 DC SYSTEM SIZE: 20 x 365 = 7.300KW DC  
 AC SYSTEM SIZE: 20 x 290 = 5.800KW AC  
 EQUIPMENT SUMMARY  
 20 HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES  
 20 ENPHASE IQ8PLUS-72-M-US MICROINVERTERS  
 1 ESS: ENCHARGE 10 = 3.84KW / 10.08KWH  
 ROOF ARRAY AREA #1:- 385.80 SQ FT.  
 NOTE: VISIBLE, LOCKABLE, LABELED AC DISCONNECT  
 LOCATED WITHIN 10' OF UTILITY METER



- (N) ENPHASE ENCHARGE 10 BATTERY
- (N) ESS AC DISCONNECT
- (N) BACKUP LOAD PANEL
- (N) ENPHASE COMBINER BOX
- (N) VISIBLE, LOCKABLE, LABELED  
NON-FUSED PV AC DISCONNECT
- (N) ENPHASE IQ-SYSTEM-CONTROLLER-2
- (N) VISIBLE, LOCKABLE, LABELED  
NON-FUSED PV/ESS AC DISCONNECT  
(LOCATED WITHIN 10' OF UTILITY METER)
- (N) SUB PANEL (OUTSIDE)
- (E) UTILITY METER/MAIN PANEL  
COMBO (OUTSIDE)



ROOF #1  
 (20) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+  
 365W MONO MODULES WITH ENPHASE  
 IQ8PLUS-72-M-US MICROINVERTERS

DESIGN SPECIFICATION  
 OCCUPANCY: II  
 CONSTRUCTION: SINGLE-FAMILY  
 ZONING: RESIDENTIAL  
 GROUND SNOW LOAD: REFER STRUCTURAL LETTER  
 WIND EXPOSURE: REFER STRUCTURAL LETTER  
 WIND SPEED: REFER STRUCTURAL LETTER

1 | SITE PLAN  
 PV-2 | SCALE: 1"=20'-0"



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REVISIONS		
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SHEET NAME  
 SITE PLAN

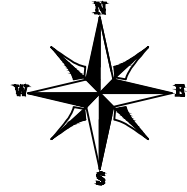
SHEET SIZE  
 ANSI B  
 11" X 17"

SHEET NUMBER  
 PV-2



**MODULE TYPE, DIMENSIONS & WEIGHT**

NUMBER OF MODULES = 20 MODULES  
 MODULE TYPE = HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES  
 MODULE WEIGHT = 43.8 LBS / 19.9 KG.  
 MODULE DIMENSIONS = 67.6" x 41.1" = 19.29 SF.



ROOF DESCRIPTION				
ROOF TYPE		ASPHALT SHINGLE		
ROOF	ROOF PITCH	AZIMUTH	TRUSS SIZE	TRUSS SPACING
#1	9°	144°	2X3	24"

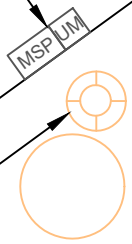
ARRAY AREA & ROOF AREA CALC'S			
TOTAL # OF MODULES	TOTAL ARRAY AREA (Sq. Ft.)	TOTAL ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
20	385.88	2289.63	17



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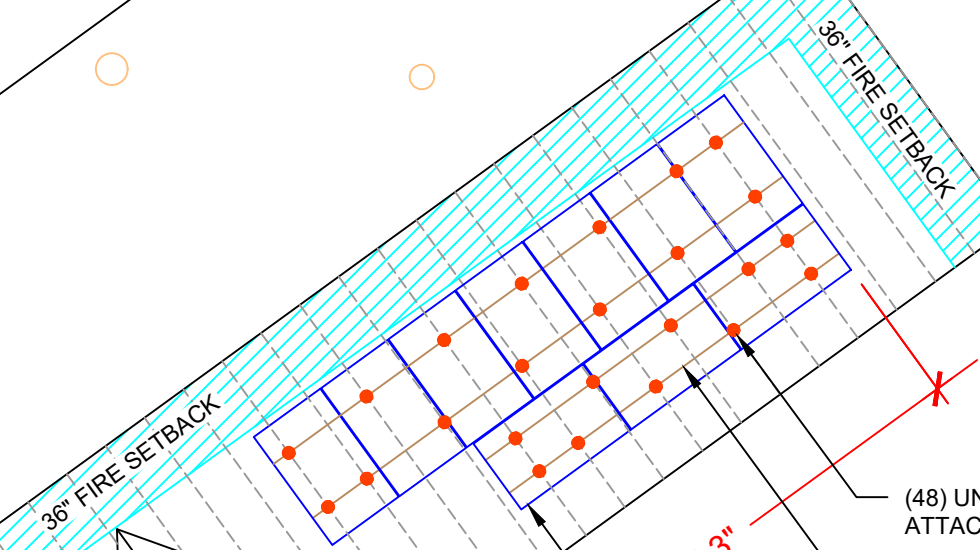
REVISIONS		
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REVISION	02/22/2023	A

(E) UTILITY METER/MAIN PANEL COMBO (OUTSIDE)



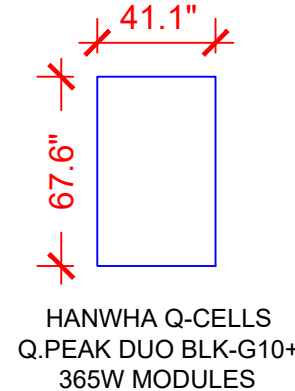
(E) CHIMNEY

ROOF #1  
 PITCH - 9°  
 AZIM. - 144°



(48) UNIRAC FLASHLOC DUO ATTACHMENTS  
 (N) UNIRAC SOLARMOUNT RAIL

ROOF #1  
 (20) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES WITH ENPHASE IQ8PLUS-72-M-US MICROINVERTERS



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PROJECT NAME & ADDRESS

NATHAN LANE RESIDENCE  
 385 PAPOOSE TRAIL,  
 LILLINGTON, NC 27546

SHEET NAME  
**ROOF PLAN & MODULES**

SHEET SIZE  
**ANSI B  
 11" X 17"**

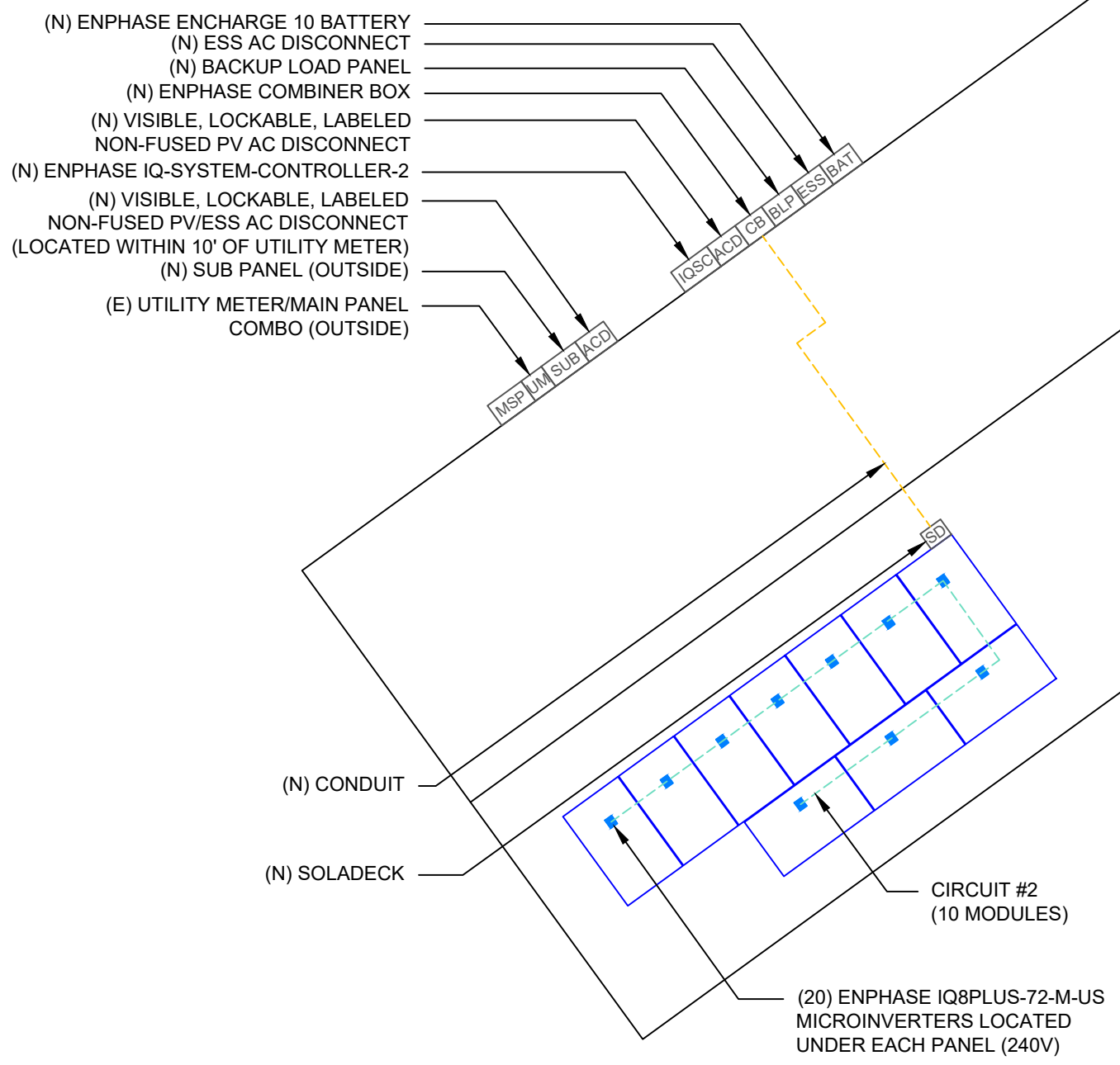
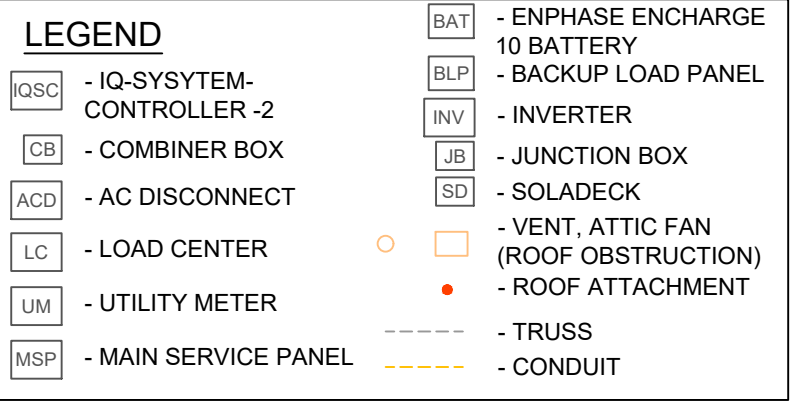
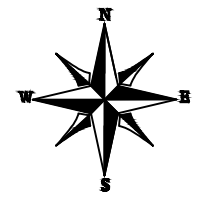
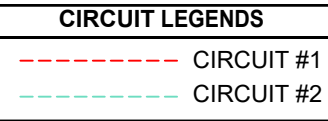
SHEET NUMBER  
**PV-3**

LEGEND	
IQSC	- IQ-SYSTEM-CONTROLLER-2
CB	- COMBINER BOX
ACD	- AC DISCONNECT
LC	- LOAD CENTER
UM	- UTILITY METER
MSP	- MAIN SERVICE PANEL
BAT	- ENPHASE ENCHARGE 10 BATTERY
BLP	- BACKUP LOAD PANEL
INV	- INVERTER
JB	- JUNCTION BOX
SD	- SOLADECK
○	- VENT, ATTIC FAN (ROOF OBSTRUCTION)
●	- ROOF ATTACHMENT
---	- TRUSS
---	- CONDUIT

**1 ROOF PLAN & MODULES**

PV-3 SCALE: 1/8" = 1'-0"

DC SYSTEM SIZE: 20 x 365 = 7.300KW DC  
 AC SYSTEM SIZE: 20 x 290 = 5.800KW AC  
 (20) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES  
 WITH (20) ENPHASE IQ8PLUS-72-M-US MICROINVERTERS  
 LOCATED UNDER EACH PANEL (240V)



BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULES	20	HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MODULES
MICRO INVERTERS	20	ENPHASE IQ8PLUS-72-M-US MICROINVERTERS
SOLADECK	1	SOLADECK
RAIL	12	UNIRAC SM STANDARD RAIL, 168" SILVER
SPLICE	8	SPLICE KIT
MID MODULE CLAMPS	32	MID MODULE CLAMPS
END CLAMPS	16	END CLAMPS / STOPPER SLEEVE
ATTACHMENTS	48	UNIRAC FLASHLOC DUO ATTACHMENT
INVERTER MOUNT CLIP	20	INVERTER MOUNT CLIP
INVERTER T-BOLTS	20	INVERTER T-BOLTS
TRUNK CABLES	24	TRUNK CABLES
GROUND LUGS	2	GROUND LUGS
TP LINKS	1	TP LINKS
TERMINAL BLOCKS	5	TERMINAL BLOCKS
ZIPTIES	100	ZIPTIES
TRUNK BRANCH TERMINAL	6	TRUNK BRANCH TERMINAL
TRUNK WATER TIGHT COVER	6	TRUNK WATER TIGHT COVER
BATTERY	1	ENPHASE ENCHARGE 10 = 3.84KW / 10.08KWH

**ADT Solar**  
 22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
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 MANDEVILLE, LA 70471  
 985.624.5001  
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 NORTH CAROLINA FIRM NO. C4113

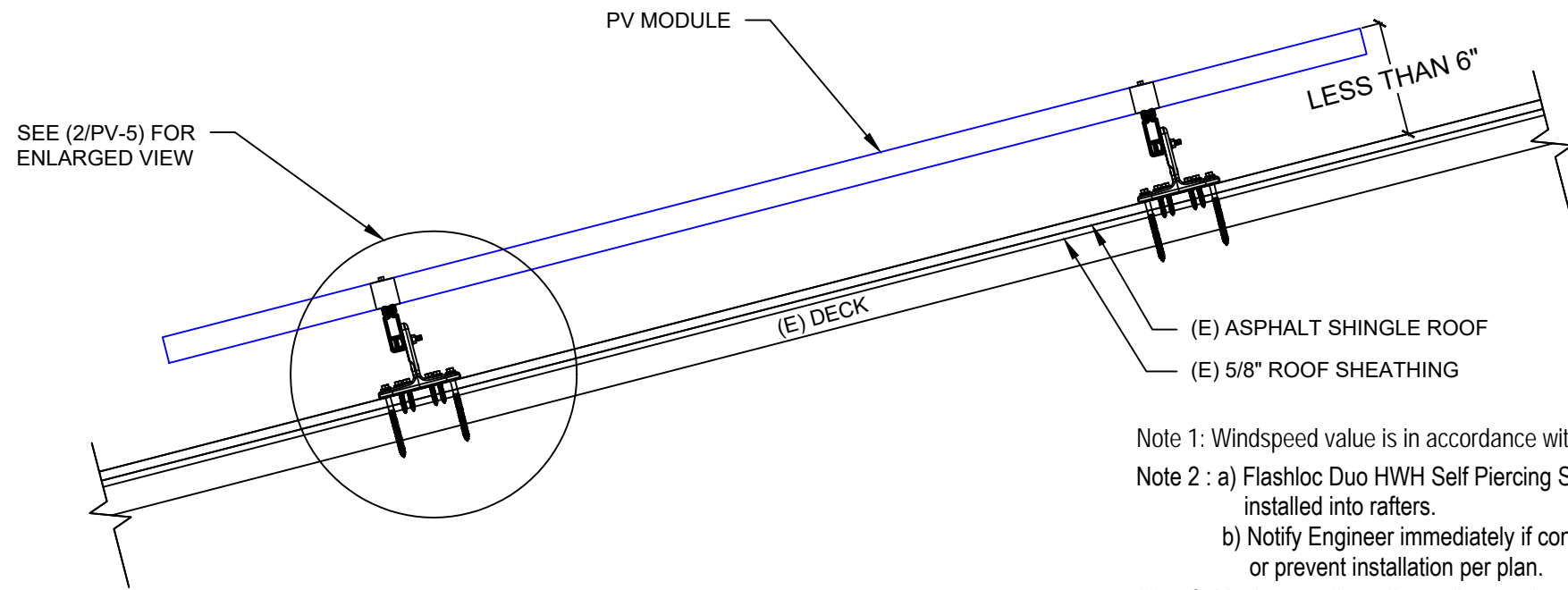
PROJECT NAME & ADDRESS  
**NATHAN LANE RESIDENCE**  
 385 PAPOOSE TRAIL,  
 LILLINGTON, NC 27546

SHEET NAME  
**ELECTRICAL PLAN**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-4**

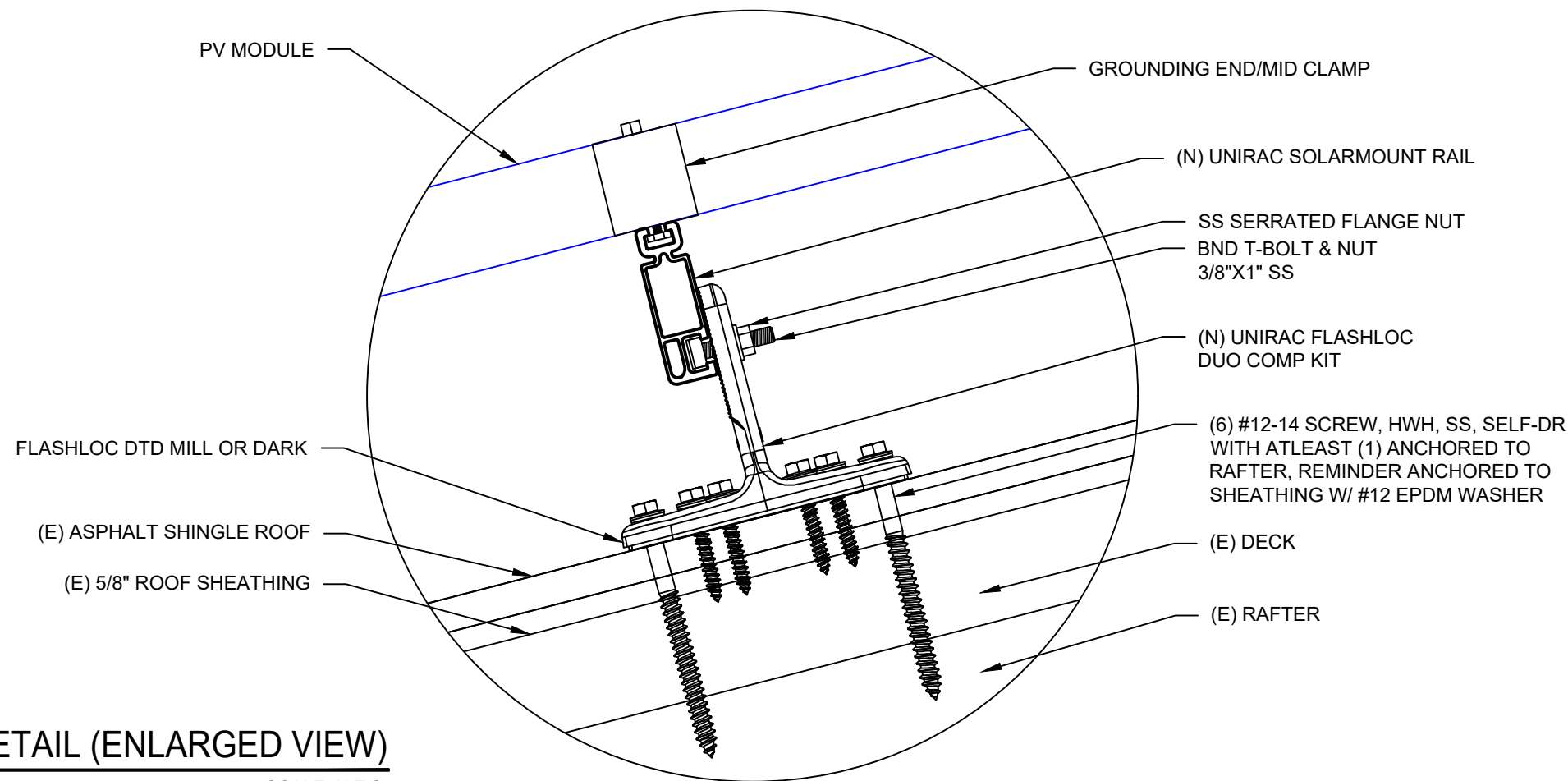
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- Note 1: Windspeed value is in accordance with ASCE 7-10, Risk Cat II
- Note 2 : a) Flashloc Duo HWH Self Piercing Screw shall be installed into rafters.  
b) Notify Engineer immediately if conditions differ or prevent installation per plan.
- Note 3: Maximum rail cantilever distance beyond outermost mount is One-third the zone-specific mount spacing.
- Note 4: Installer shall adjust mount spacing by zone to match prescribed values on engineer's calculation letter

**1 ATTACHMENT DETAIL**

PV-5 SCALE: N.T.S.



**2 ATTACHMENT DETAIL (ENLARGED VIEW)**

PV-5 SCALE: N.T.S.



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NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
**STRUCTURAL DETAIL**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-5**

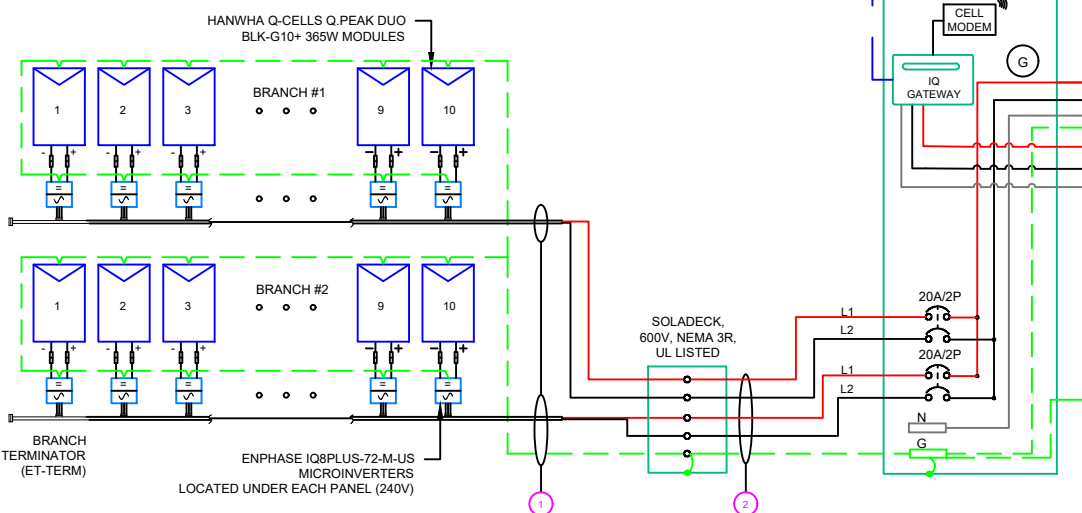


DC SYSTEM SIZE: 20 x 365 = 7.300KW DC  
 AC SYSTEM SIZE: 20 x 290 = 5.800KW AC

(20) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES WITH (20) ENPHASE IQ8PLUS-72-M-US MICROINVERTERS LOCATED UNDER EACH PANEL (240V)  
 (2) BRANCH CIRCUITS OF 10 MODULES CONNECTED IN PARALLEL  
 1 ESS: ENCHARGE 10 = 3.84KW / 10.08KWH

**ENPHASE IQ SYSTEM CONTROLLER-2 NOTE:**

THE ENPHASE IQ SYSTEM CONTROLLER-2 CONNECTS THE HOME TO GRID POWER, THE ENCHARGE STORAGE SYSTEM, AND SOLAR PV. IT PROVIDES MICROGRID INTERCONNECTION DEVICE (MID) FUNCTIONALITY BY AUTOMATICALLY DETECTING AND SEAMLESSLY TRANSITIONING THE HOME ENERGY SYSTEM FROM GRID POWER TO BACKUP POWER IN THE EVENT OF A GRID FAILURE. IT CONSOLIDATES INTERCONNECTION EQUIPMENT INTO A SINGLE ENCLOSURE AND STREAMLINES GRID INDEPENDENT CAPABILITIES OF PV AND STORAGE INSTALLATIONS BY PROVIDING A CONSISTENT, PRE-WIRED SOLUTION FOR RESIDENTIAL APPLICATIONS.



**INTERCONNECTION NOTES:**

1. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.59].
2. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95].
3. ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
4. PV BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR RELATIVE TO THE MAIN BREAKER.

**DISCONNECT NOTES:**

1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH
3. DISCONNECT MEANS AND THEIR LOCATION SHALL BE IN ACCORDANCE WITH [NEC 225.31] AND [NEC 225.32].

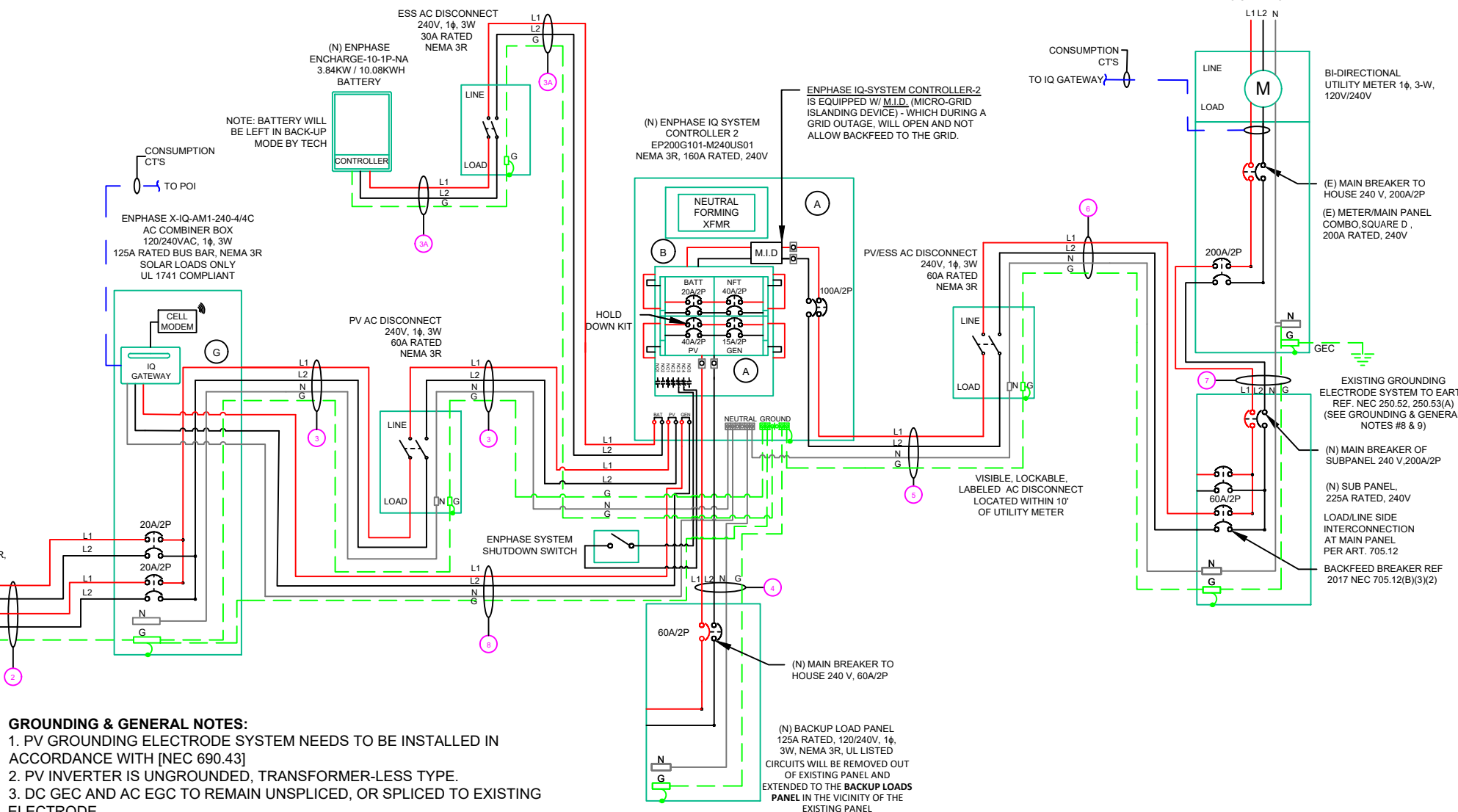
- (A) ENPOWER MAIN LUG RATED FOR #1 AWG-350 KcmIL-(ALL SMALLER WIRE TERMINATIONS REQUIRED U L RING TERMINAL.)
- (B) ENPOWER DRY CONTACTOR RATINGS - 12V - 24V MAX. (1A)
- (G) COMMUNICATION KIT

**BACKFEED BREAKER CALCULATION (120% RULE):**

(MAIN BUSS X 1.2 - MAIN BREAKER) >= (INVERTER+BATTERY CURRENT\*1.25)  
 (225A X 1.2 - 200A) >= (50.25A)  
 (70A) >= (50.25A) HENCE OK

**OCPD CALCULATIONS:**

NEC 690.9(B)  
 (20 IQ8 PLUS \* 1.21A + 16A 1-ENCHARGE 10) \* 1.25 = 50.25A



**GROUNDING & GENERAL NOTES:**

1. PV GROUNDING ELECTRODE SYSTEM NEEDS TO BE INSTALLED IN ACCORDANCE WITH [NEC 690.43]
2. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
3. DC GEC AND AC EGC TO REMAIN UNSPLICED, OR SPLICED TO EXISTING ELECTRODE
4. ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION.
5. SOLADECK QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - SOLADECK DEPICTED ON ELECTRICAL DIAGRAM REPRESENT WIRE TYPE TRANSITIONS.
6. AC DISCONNECT NOTED IN EQUIPMENT SCHEDULE OPTIONAL IF OTHER AC DISCONNECTING MEANS IS LOCATED WITHIN 10' OF SERVICE DISCONNECT.
7. RACEWAYS AND CABLES EXPOSED TO SUNLIGHT ON ROOFTOPS SHOULD BE INSTALLED MORE THAN 7/8" ABOVE THE ROOF USING CONDUIT SUPPORTS.
8. VERIFY UFER/EXISTING ROD OR ADD TWO GROUNDING RODS(5/8" X 8' EMBEDMENT) SPACED 6 FEET MINIMUM APART.
9. BOND COLD WATER AND GAS LINES(IF PRESENT) TO GROUNDING ELECTRODE CONDUCTOR

**(GN) GENERAL NOTES:**

1. CONDUIT TO BE UL LISTED FOR WET LOCATION AND UV PROTECTED (EX. -EMT, SCH 80 PVC OR RMC).
2. FMC MAYBE USED IN INDOOR APPLICATIONS WHERE PERMITTED BY NEC ART. 348
3. THE ENCHARGE BATTERY AS PART OF THE ENSEMBLE SYSTEM DOES NOT EXPORT POWER TO THE GRID IN ANY STORAGE MODE.

QTY	CONDUCTOR INFORMATION	CONDUIT TYPE	CONDUIT SIZE
(4)	#12AWG - Q CABLE (L1 & L2 NO NEUTRAL)	N/A	N/A
(1)	#6AWG - BARE COPPER IN FREE AIR		
(4)	#12AWG - THWN-2 (L1,L2) (EXTERIOR) / #12/2 ROMEX IN ATTIC	EMT, LFMC OR PVC	1"
(1)	#12AWG - THWN-2 GND		
(3)	#6AWG - THWN-2 (L1,L2,N)	EMT, LFMC OR PVC	1"
(1)	#10AWG - THWN-2 GND		
(2)	#8AWG - THWN-2 (L1,L2)	EMT, LFMC OR PVC	1"
(1)	#8AWG - THWN-2 GND		
(2)	#6AWG - THWN-2 (L1,L2)		
(1)	#6AWG - THWN-2 N	EMT, LFMC OR PVC	1"
(1)	#10AWG - THWN-2 GND		
(2)	#6AWG - THWN-2 (L1,L2)		
(1)	#6AWG - THWN-2 N	EMT, LFMC OR PVC	1"
(1)	#10AWG - THWN-2 GND		
(3)	#6AWG - THWN-2 (L1,L2,N)	EMT, LFMC OR PVC	1"
(1)	#10AWG - THWN-2 GND		
(3)	#2/0AWG - THWN-2 (L1,L2,N)	EMT, LFMC OR PVC	2"
(1)	#6AWG - THWN-2 GND		
(3)	#12AWG - THWN-2 (L1,L2,N)	EMT, LFMC OR PVC	1"
(1)	#10AWG - THWN-2 GND		



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 MANDEVILLE, LA 70471  
 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**NATHAN LANE RESIDENCE**  
 385 PAPOOSE TRAIL,  
 LILLINGTON, NC 27546

SHEET NAME  
**ELECTRICAL LINE DIAGRAM**

SHEET SIZE  
**ANSI B 11" X 17"**

SHEET NUMBER  
**PV-6**



INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ8PLUS-72-M-US MICROINVERTERS
MIN/MAX DC VOLT RATING	30V MIN/ 58V MAX
MAX INPUT POWER	235W-440W
NOMINAL AC VOLTAGE RATING	240V/ 211-264V
MAX AC CURRENT	1.21A
MAX MODULES PER CIRCUIT	13 (SINGLE PHASE)
MAX OUTPUT POWER	290 VA

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MODULE
VMP	34.58V
IMP	10.56A
VOC	41.21V
ISC	11.07A
TEMP. COEFF. VOC	-0.27%/°C
MODULE DIMENSION	67.6"L x 41.1"W x 1.26"D (In Inch)

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-10°
AMBIENT TEMP (HIGH TEMP 2%)	35°
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.27%/°C

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN EMT
.80	4-6
.70	7-9
.50	10-20

AC CALCULATIONS																						
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OC PD SIZE (A)	NEUTRAL SIZE	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(2)(a)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(B)(3)(a)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)
CIRCUIT 1	SOLADECK	240	12.1	15.125	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	35	2	30	0.96	1	28.8	PASS			0.31	N/A	#N/A
CIRCUIT 2	SOLADECK	240	12.1	15.125	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	35	2	30	0.96	1	28.8	PASS			0.31	N/A	#N/A
SOLADECK	COMBINER PANEL	240	12.1	15.125	20	N/A	CU #12 AWG	CU #12 AWG	25	PASS	35	4	30	0.96	0.8	23.04	PASS	20	1.98	0.380	1" PVC	7.992788
COMBINER PANEL	PV AC DISCONNECT	240	24.2	30.25	40	CU #6 AWG	CU #10 AWG	CU #6 AWG	65	PASS	35	2	75	0.96	1	72	PASS	5	0.491	0.050	1" PVC	20.81731
PV AC DISCONNECT	IQ SYSTEM CONTROLLER 2	240	24.2	30.25	40	CU #6 AWG	CU #10 AWG	CU #6 AWG	65	PASS	35	2	75	0.96	1	72	PASS	5	0.491	0.050	1" PVC	20.81731
IQ SYSTEM CONTROLLER 2	ESS AC DISCONNECT	240	16	20	20	N/A	CU #8 AWG	CU #8 AWG	50	PASS	35	2	55	0.96	1	52.8	PASS	5	0.778	0.052	1" PVC	13.19712
ESS AC DISCONNECT	ENCHARGE	240	16	20	20	N/A	CU #8 AWG	CU #8 AWG	50	PASS	35	2	55	0.96	1	52.8	PASS	5	0.778	0.052	1" PVC	13.19712
IQ SYSTEM CONTROLLER 2	BACKUP LOAD PANEL	240	48	60	60	CU #6 AWG	CU #10 AWG	CU #6 AWG	65	PASS	35	2	75	0.96	1	72	PASS	5	0.491	0.098	1" PVC	20.81731
IQ SYSTEM CONTROLLER 2	PV/ESS AC DISCONNECT	240	40.2	50.25	60	CU #6 AWG	CU #10 AWG	CU #6 AWG	65	PASS	35	2	75	0.96	1	72	PASS	5	0.491	0.082	1" PVC	20.81731
PV/ESS AC DISCONNECT	POI	240	40.2	50.25	60	CU #6 AWG	CU #10 AWG	CU #6 AWG	65	PASS	35	2	75	0.96	1	72	PASS	5	0.491	0.082	1" PVC	20.81731

Circuit 1 Voltage Drop	0.954
Circuit 2 Voltage Drop	0.954

**INSTALLATION NOTES:**

**ENCHARGE BATTERY/ENPOWER MOUNTING NOTES:**

1. THERE MUST BE NO HIGHLY FLAMMABLE OR EXPLOSIVE MATERIALS NEARBY.
2. THE AMBIENT TEMPERATURE SHOULD BE WITHIN THE RANGE OF 5 ~ 131°F (-15 ~ 55°C)
3. THE ENCHARGE/ENPOWER HOUSING IS NEMA TYPE 3R AND CAN BE INSTALLED INDOORS OR OUTDOORS. THE TERMINAL BLOCKS ACCEPTS COPPER CONDUCTORS OF NO. 12 - 8 AWG.
4. MAINTAIN AT LEAST THREE FEET OF CLEARANCE IN FRONT OF EACH PRODUCT. ALLOW AT LEAST 15CM (SIX INCHES) CLEARANCE ON TOP AND BOTTOM OF THE PRODUCT SO THAT THE VENTS ON THE TOP AND BOTTOM OF THE UNITS ARE NOT BLOCKED FOR AIR CIRCULATION.
5. UP TO TWO ENCHARGE 10 (OR SIX ENCHARGE 3) UNITS CAN BE DAISY CHAINED ON ONE CIRCUIT. FOR INSTALLATIONS WITH MORE THAN THIS NUMBER OF UNITS, THERE MUST BE A SEPARATE LOAD CENTER, SUBPANEL, OR CIRCUIT COMBINER WITH OVER CURRENT PROTECTION TO COMBINE THE DAISY CHAINED CIRCUITS, AND YOU MUST RUN ONLY ONE CIRCUIT FOR ALL THE ENCHARGE UNITS TO THE ENPOWER (OR TO ENPHASE IQ COMBINER FOR GRID-TIED-ONLY INSTALLATIONS).

**AC DISCONNECT INSTALL NOTES:**

1. INSTALL AN AC DISCONNECT THAT CAN BREAK THE MAXIMUM RATED CURRENT OF THE BRANCH CIRCUIT UNDER LOAD. THE AC DISCONNECT MUST BE INSTALLED IN LINE-OF-SIGHT OF ENCHARGE, PER NEC 2017 706.7(A).
2. EACH ENCHARGE UNIT IS SUITABLE FOR USE WITH UP TO NO. 8 AWG WIRES ON A MAXIMUM 40 A BRANCH CIRCUIT. IF MORE THAN 32 A OF ENCHARGE BATTERIES (CORRESPONDING TO A 40 A BRANCH CIRCUIT) ARE INSTALLED, A SEPARATE SUBPANEL MUST BE INSTALLED BETWEEN THE ENCHARGE UNITS AND ENPOWER TO COMBINE THE ENPOWER CIRCUITS TOGETHER. ALL CIRCUIT BREAKERS IN THE SUBPANEL MUST BE SUITABLE FOR BACK-FEEDING, PER NEC 408.36(D).
3. VERIFY THAT AC VOLTAGE AT THE SITE IS WITHIN RANGE: SINGLE-PHASE L1 TO L2 VOLTAGE MUST MEASURE BETWEEN 211 AND 264 VAC, WHILE L-N SHOULD MEASURE BETWEEN 106 AND 132 VAC.

**RECOMMENDED:**

1. THE BUILDING SHOULD BE DESIGNED TO WITHSTAND EARTHQUAKES.
2. THE WATERPROOF AND PROPERLY VENTILATED AREA IS RECOMMENDED. (IP55)
3. INSTALL THE PRODUCT OUT OF REACH OF CHILDREN AND ANIMALS.

**ELECTRICAL NOTES**

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
2. ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
3. WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
4. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
5. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
6. WHERE SIZES OF SOLADECLS, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
7. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
8. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
9. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
10. TEMPERATURE RATINGS OF ALL CONDUCTORS, TERMINATIONS, BREAKERS, OR OTHER DEVICES ASSOCIATED WITH THE SOLAR PV SYSTEM SHALL BE RATED FOR AT LEAST 75 DEGREE C.



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NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**NATHAN LANE RESIDENCE**  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
**WIRING CALCULATIONS**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-7**



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PROJECT NAME & ADDRESS

NATHAN LANE  
 RESIDENCE  
 385 PAPOOSE TRAIL,  
 LILLINGTON, NC 27546

SHEET NAME  
**LOAD CALCULATION**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-7.1**

### Residential Optional Calculation

9/25/1997 Nathan Lane

by John Sokolik Version 2011 L

**STEP 1 Article 220.82 (B) (1),(2)**

sq. ft	2000	General Lighting load	6,000 VA		0
	4	Small Appliance	6,000 VA		0
	1	Laundry circuit	1,500 VA		0
		Gen.Lgt, Sm App.& Laun. Load	13,500 VA		

8/30/2022 8:33

Marc Jones Construction, LLC Sunpro Solar

**STEP 2 Article 220.82 (C)**

**General lighting, Sm. Appl. & Laundry 13,500 VA**

A/C Condenser & Fixed Electric Space Heating		QTY		Total	
5 ton	7,130 VA	AHU 1	9.6kW	10,800 VA	1
A/C #2	VA	AHU 2	5kW	5,800 VA	1
A/C #3	VA	AHU 3	Select	VA	Qty
A/C #4	VA	AHU 4	Select	VA	Qty
A/C #5	VA	AHU 5	Select	VA	Qty

Heating Load **11,490 VA**  
 CU Load **9,130 VA**

**Electric Space Heat @ 65% <4, 40% >3, vs. A/C @ 100% 11,490 VA**

**STEP 3 Article 220.82 (B) (3)**

4,500 VA	1	Water Heater	4,500 VA		
1,400 VA	1	Refrigerator	1,400 VA		
600 VA		Freezer	VA		
1,030 VA		Dishwasher	VA		
690 VA		Disposal	VA		
400 VA		R / Hood	VA		
1,630 VA	1	Microwave	1,630 VA		
<input type="checkbox"/> 4,000 VA		Microwave	VA		
170 VA		Mini Refrig	VA		
<input type="checkbox"/> 400 VA		Wine Clr	VA		
<input type="checkbox"/> 5,000 VA		Insta Hot	VA		
1,500 VA		Ironing Center	VA		
<input type="checkbox"/> select		Jacuzzi Tub	VA		
<input type="checkbox"/> select		Sprinkler Pump	VA		
<input type="checkbox"/> select		Well Pump	VA		
select		Fountain Pump	VA		
select		Elevator	VA		
<input type="checkbox"/>		Pool Equip. Panel	VA Apply Demand		
<input type="checkbox"/> 7680		Heat Pump	7,680 VA Apply Demand		
<input type="checkbox"/>		Other load	VA No Demand		

**Appliance Demand Load 15,210 VA**

**Dryer Demand Load 5,000 VA**

**Range Demand Load 10,000 VA**

**Service Demand 34,974 VA**

**Demand Load 146 A**

**Neutral Demand 78 A**

**Min.Service Req. 150 A**

**Min. Feeder size 1**

**Min. Neutral size 4**

**Eq. Grding Cond. 6**

Copper

**Total Appliance Load 15,210 VA**

**STEP 4 Article 220.82 (B) (3)**  
 Electric Clothes Dryers **5,000 VA**

**STEP 5 Article 220.82 (B) (3)**  
 Electric Ranges **10,000 W** Col C demand **8000**

or Number of appliances

Check Box for Gas Range

Cooktop	Col B demand
Cooktop	Col B demand
Oven(s)	Col B demand
Oven(s)	Col B demand

Number of appliances **0** Dem. Factor

Cooktop & Oven Demand Load

jmp1ids@comcast.net

Pool Panel Feeder Calculation (See Note)		A	B	N
Continuous Motors	0	0	0	0
Non-continuous	0	0	0	0
Spa heater 11 kVA		0	0	
Pool heater 3.5 ton		0	0	
Pool heater 5 ton		0	0	
Pool Light	select	0	0	0
Blower	select	0	0	0
other load	0 <input type="checkbox"/> 240v	0	0	0
other load	0 <input type="checkbox"/> 240v	0	0	0
<input type="checkbox"/> Min.Copper Pool Feeder	<b>AWG</b>	<b>A</b>	<b>A</b>	<b>A</b>
Minimum Panel Rating		<b>A</b>		

Continuous Motors	Non-continuous Motors
select <input type="checkbox"/> 240v	select <input type="checkbox"/> 240v
select <input type="checkbox"/> 240v	select <input type="checkbox"/> 240v
select <input type="checkbox"/> 240v	select <input type="checkbox"/> 240v
select <input type="checkbox"/> 240v	select <input type="checkbox"/> 240v
select <input type="checkbox"/> 240v	select <input type="checkbox"/> 240v

0.0 Motor Neutral Load

Max.Unbalanced Neutral Load

**CAUTION:  
AUTHORIZED SOLAR  
PERSONNEL ONLY!**

LABEL-1:  
LABEL LOCATION:  
AC DISCONNECT

**⚠ WARNING**  
**ELECTRICAL SHOCK HAZARD**  
TERMINALS ON THE LINE AND LOAD SIDES MAY  
BE ENERGIZED IN THE OPEN POSITION

LABEL- 2:  
LABEL LOCATION:  
AC DISCONNECT  
COMBINER  
MAIN SERVICE PANEL  
SUBPANEL  
MAIN SERVICE DISCONNECT  
CODE REF: NEC 690.13(B)

**⚠ WARNING DUAL POWER SOURCE  
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM**

LABEL- 3:  
LABEL LOCATION:  
PRODUCTION METER  
UTILITY METER  
MAIN SERVICE PANEL  
SUBPANEL  
CODE REF: NEC 705.12(C) & NEC 690.59

**⚠ WARNING**  
**TURN OFF PHOTOVOLTAIC AC  
DISCONNECT PRIOR TO  
WORKING INSIDE PANEL**

LABEL- 4:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
SUBPANEL  
MAIN SERVICE DISCONNECT  
COMBINER  
CODE REF: NEC 110.27(C) & OSHA 1910.145 (f) (7)

**⚠ CAUTION**  
**PHOTOVOLTAIC SYSTEM CIRCUIT IS  
BACKFEED**

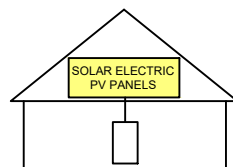
LABEL- 5:  
LABEL LOCATION:  
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)  
SUBPANEL (ONLY IF SOLAR IS BACK-FED)  
CODE REF: NEC 705.12(D) & NEC 690.59

**⚠ WARNING**  
**POWER SOURCE OUTPUT  
CONNECTION. DO NOT  
RELOCATE THIS  
OVERCURRENT DEVICE**

LABEL- 6:  
LABEL LOCATION:  
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)  
SUBPANEL (ONLY IF SOLAR IS BACK-FED)  
CODE REF: NEC 705.12(B)(3)(2)

**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:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: IFC 605.11.3.1(1) & NEC 690.56(C)

**RAPID SHUTDOWN SWITCH  
FOR SOLAR PV SYSTEM**

LABEL- 8:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: NEC 690.56(C)(2)

**PHOTOVOLTAIC**  
**AC DISCONNECT**

LABEL- 9:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: NEC 690.13(B)

**PHOTOVOLTAIC / ESS  
AC DISCONNECT**  
NOMINAL OPERATING AC VOLATGE **240 V**  
RATED AC OUTPUT CURRENT **40.20 A**

LABEL- 10:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
SUBPANEL  
AC DISCONNECT  
CODE REF: NEC 690.54

**MAIN PHOTOVOLTAIC  
SYSTEM DISCONNECT**

LABEL- 11:  
LABEL LOCATION:  
MAIN SERVICE DISCONNECT (ONLY IF MAIN SERVICE DISCONNECT IS PRESENT)  
CODE REF: NEC 690.13(B)

NOMINAL ESS AC VOLTAGE: **240 VAC**  
MAXIMUM ESS DC VOLTAGE: **73.5 VDC**  
AVAILABLE FAULT CURRENT  
DERIVED FROM THE ESS: **69.6 Arms**  
DATE CALCULATION PERFORMED: **09/05/2022**

LABEL- 12:  
LABEL LOCATION:  
BATTERY  
CODE REF: NEC 706.15(C)

**ENERGY  
STORAGE SYSTEM  
DISCONNECT**

LABEL- 13:  
LABEL LOCATION:  
ESS DISCONNECT  
CODE REF: NEC 706.15(C)

**PHOTOVOLTAIC  
AC DISCONNECT**  
NOMINAL OPERATING AC VOLATGE **240 V**  
RATED AC OUTPUT CURRENT **24.20 A**

LABEL- 14:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
SUBPANEL  
AC DISCONNECT  
CODE REF: NEC 690.54

**ESS  
AC DISCONNECT**  
NOMINAL OPERATING AC VOLATGE **240 V**  
RATED AC OUTPUT CURRENT **16.00 A**

LABEL- 15:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
SUBPANEL  
AC DISCONNECT  
CODE REF: NEC 690.54



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

This item has been digitally  
signed and sealed by  
Nestor J. Houghton, P.E.  
on **March 1, 2023**  
Printed copies of this  
document are not considered  
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signature must be verified  
on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
1011 N. CAUSEWAY BLVD. STE 19  
MANDEVILLE, LA 70471  
985.624.5001  
INFO@PI-AEC.COM  
NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS

**NATHAN LANE  
RESIDENCE**  
**385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546**

SHEET NAME  
**LABELS**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-8**



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
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REVISION	02/22/2023	A

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 NORTH CAROLINA FIRM NO. C4113

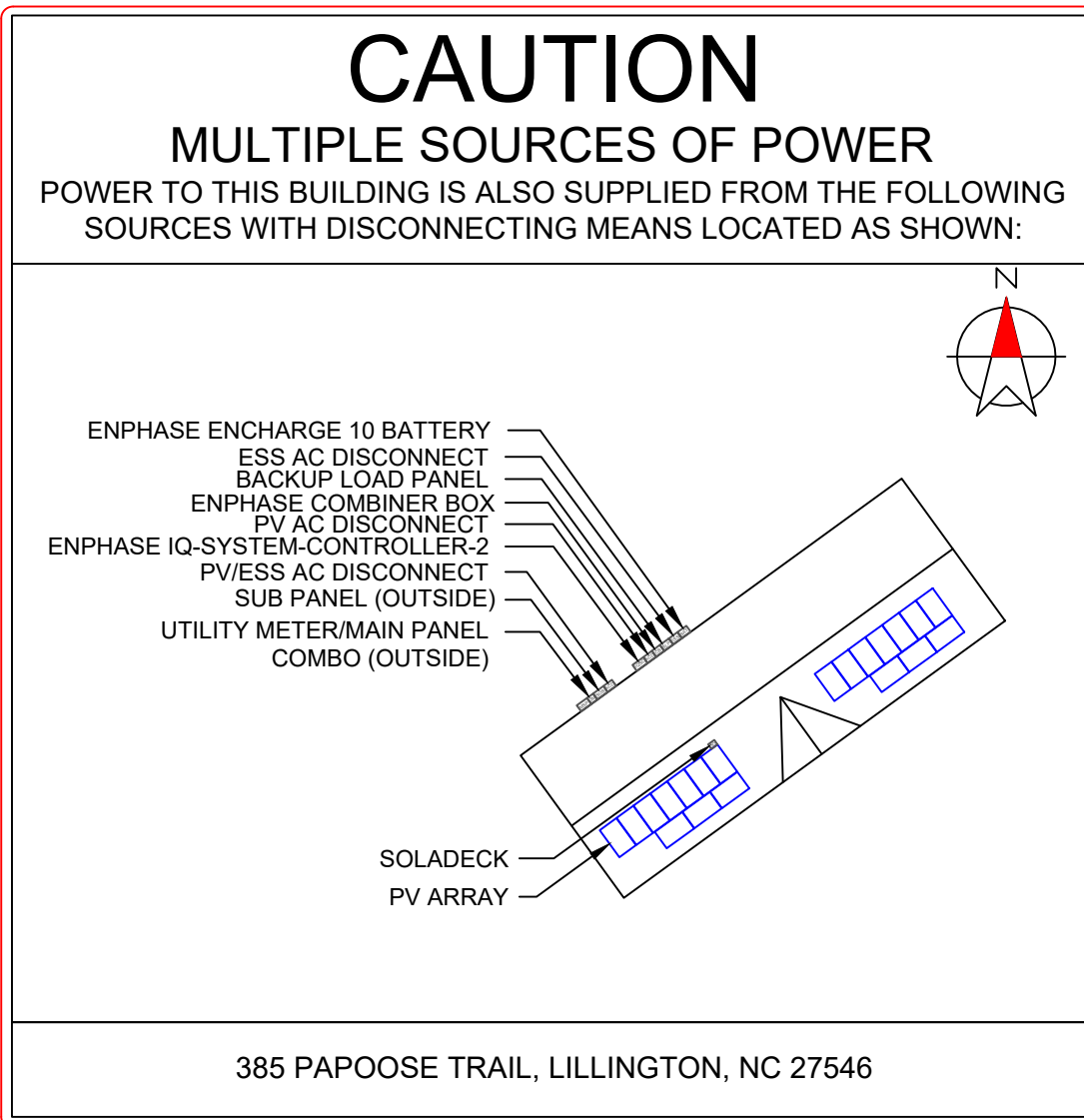
PROJECT NAME & ADDRESS

NATHAN LANE  
 RESIDENCE  
 385 PAPOOSE TRAIL,  
 LILLINGTON, NC 27546

SHEET NAME  
 PLACARD

SHEET SIZE  
 ANSI B  
 11" X 17"

SHEET NUMBER  
 PV-9



**DIRECTORY**

PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM.

(ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS OUTLINED WITHIN: NEC 690.56(B)&(C), [NEC 705.10])

LABELING NOTES:

1. LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
2. LABELING REQUIREMENTS BASED ON THE 2017 NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
3. MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
4. LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED [NEC 110.21]
5. LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8", WHITE ON RED BACKGROUND; REFLECTIVE, AND PERMANENTLY AFFIXED [IFC 605.11.1.1]





**(H)** - INSPECT ENTIRE JOBSITE FOR HAZARDS

**(SV)** - DRAW SUNPRO VEHICLE LOCATION ON PLANS

**(HHZ)** - DRAW HARD HAT ZONE AROUND HOUSE

**(X)** - DRAW FALL PROTECTION ANCHOR LOCATIONS

**(L)** - DRAW LADDER & ROOF ACCESS POINTS

**(EH)** - DRAW ELECTRICAL HAZARD AREAS

**(W/TH)** - DRAW WATER & TRIP HAZARD LOCATIONS

**SKY LIGHT:** YES | NO IF SO, HOW MANY: \_\_\_\_\_

**SERVICE LINE ENTRANCE:** OVERHEAD | UNDERGROUND  
 \*IF OVERHEAD, DRAW POWERLINE ON PLAN SET AND PROVIDE APPROPRIATE WORK BOUNDARY

**ROOF SURFACE:** SHINGLE | METAL | TILE | TPO

**CIRCLE WEATHER CONDITIONS:**

SUNNY    OVERCAST    LIGHT RAIN

HEAVY RAIN    FOGGY    WINDY

TEMPERATURE: \_\_\_\_\_ IF WINDY, STATE WIND SPEED: \_\_\_\_\_

CHECK IF THE FOLLOWING EQUIPMENT IS READILY AVAILABLE ON ALL SUNPRO SOLAR INSTALLATION VEHICLES ON EACH JOB SITE:

- \_\_\_ EYE WASH BOTTLE/SOLUTION
- \_\_\_ DRINKING WATER
- \_\_\_ FIRE EXTINGUISHER
- \_\_\_ FIRST AID KIT
- \_\_\_ NECESSARY JOB SPECIFICS

**ADDRESS OF NEAREST MEDICAL CARE FACILITY:**

\_\_\_\_\_

LEAD INSTALLER IS TO CONDUCT A DAILY SAFETY BRIEFING AND THE INCLUDED CHECKLIST MUST BE COMPLETED WITH ALL NECESSARY LABELS PRIOR TO BEGINNING ANY ONSITE WORK.

\_\_\_\_\_  
 LEAD INSTALLER SIGNATURE      DATE

**CREW SIGNATURES:**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**PROJECT ADDRESS:**

\_\_\_\_\_



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

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REVISION	02/22/2023	A

DATE: 09/05/2022

**PROJECT NAME & ADDRESS**

NATHAN LANE  
 RESIDENCE  
 385 PAPOOSE TRAIL,  
 LILLINGTON, NC 27546

**SHEET NAME**

JHA FORM

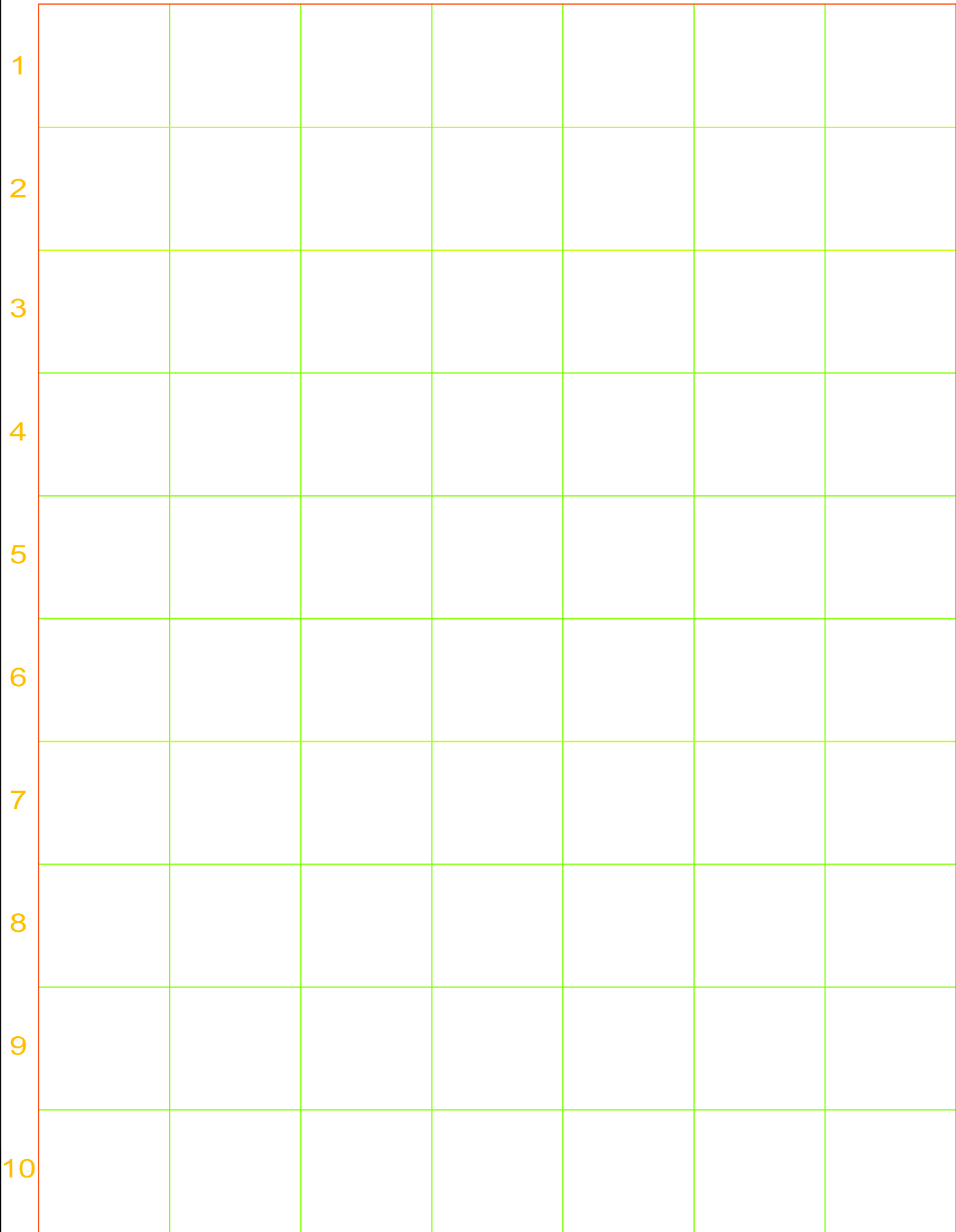
**SHEET SIZE**

ANSI B  
 11" X 17"

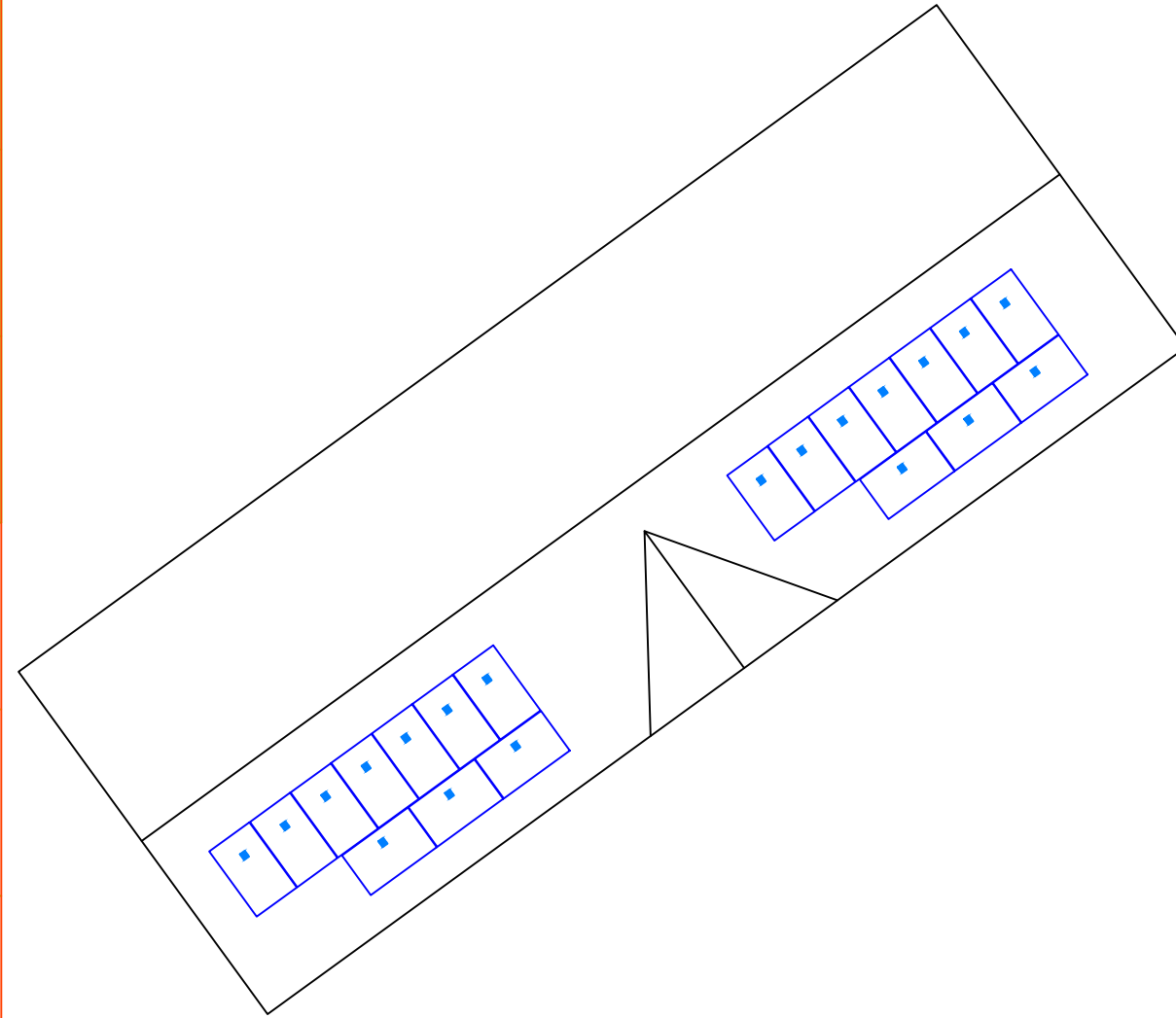
**SHEET NUMBER**

PV-10

1-10    11-20    21-30    31-40    41-50    51-60    61-70



# MICRO INVERTER CHART



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
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DATE: 09/05/2022

PROJECT NAME & ADDRESS

**NATHAN LANE  
 RESIDENCE**

385 PAPOOSE TRAIL,  
 LILLINGTON, NC 27546

SHEET NAME  
**MICRO INVERTER CHART**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-11**



powered by  
**Q.ANTUM DUO Z**

# Q.PEAK DUO BLK-G10+ 360-380

ENDURING HIGH  
PERFORMANCE



### BREAKING THE 21% EFFICIENCY BARRIER

Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.9%.



### THE MOST THOROUGH TESTING PROGRAMME IN THE INDUSTRY

Q CELLS is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.



### INNOVATIVE ALL-WEATHER TECHNOLOGY

Optimal yields, whatever the weather with excellent low-light and temperature behaviour.



### ENDURING HIGH PERFORMANCE

Long-term yield security with Anti LID Technology, Anti PID Technology<sup>1</sup>, Hot-Spot Protect and Traceable Quality Tra.Q™.



### EXTREME WEATHER RATING

High-tech aluminium alloy frame, certified for high snow (5400Pa) and wind loads (4000Pa).



### A RELIABLE INVESTMENT

Inclusive 25-year product warranty and 25-year linear performance warranty<sup>2</sup>.

<sup>1</sup> APT test conditions according to IEC/TS 62804-1:2015, method A (-1500V, 96h)

<sup>2</sup> See data sheet on rear for further information.

### THE IDEAL SOLUTION FOR:



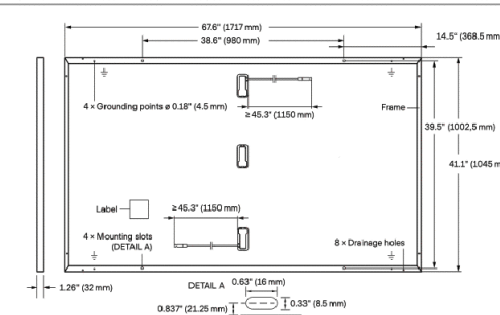
Rooftop arrays on residential buildings

Engineered in Germany



Format	67.6 in × 41.1 in × 1.26 in (including frame) (1717 mm × 1045 mm × 32 mm)
Weight	43.8 lbs (19.9 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 20 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 × 1.26-2.36 × 0.59-0.71 in (53-101 × 32-60 × 15-18 mm), Protection class IP67, with bypass diodes
Cable	4 mm <sup>2</sup> Solar cable; (+) ≥ 45.3 in (1150 mm), (-) ≥ 45.3 in (1150 mm)
Connector	Stäubli MC4; IP68

### MECHANICAL SPECIFICATIONS

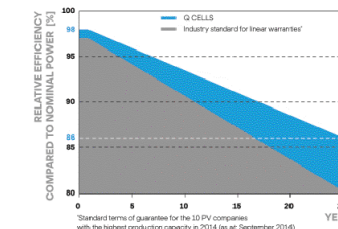


### ELECTRICAL CHARACTERISTICS

POWER CLASS		350	355	360	365	370	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC <sup>1</sup> (POWER TOLERANCE +5 W / -0 W)							
Minimum	Power at MPP <sup>1</sup>	P <sub>MPP</sub> [W]	350	355	360	365	370
	Short Circuit Current <sup>1</sup>	I <sub>SC</sub> [A]	10.97	11.00	11.04	11.07	11.10
	Open Circuit Voltage <sup>1</sup>	V <sub>OC</sub> [V]	41.11	41.14	41.18	41.21	41.24
	Current at MPP	I <sub>MPP</sub> [A]	10.37	10.43	10.49	10.56	10.62
	Voltage at MPP	V <sub>MPP</sub> [V]	33.76	34.03	34.31	34.58	34.84
Efficiency <sup>1</sup>	η [%]	≥ 19.5	≥ 19.8	≥ 20.1	≥ 20.3	≥ 20.6	
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT <sup>2</sup>							
Minimum	Power at MPP	P <sub>MPP</sub> [W]	262.6	266.3	270.1	273.8	277.6
	Short Circuit Current	I <sub>SC</sub> [A]	8.84	8.87	8.89	8.92	8.95
	Open Circuit Voltage	V <sub>OC</sub> [V]	38.77	38.80	38.83	38.86	38.90
	Current at MPP	I <sub>MPP</sub> [A]	8.14	8.20	8.26	8.31	8.37
	Voltage at MPP	V <sub>MPP</sub> [V]	32.24	32.48	32.71	32.94	33.17

<sup>1</sup> Measurement tolerances P<sub>MPP</sub> ± 3%; I<sub>SC</sub>; V<sub>OC</sub> ± 5% at STC: 1000 W/m<sup>2</sup>, 25 ± 2°C, AM 1.5 according to IEC 60904-3 • <sup>2</sup> 800 W/m<sup>2</sup>, NMOT, spectrum AM 1.5

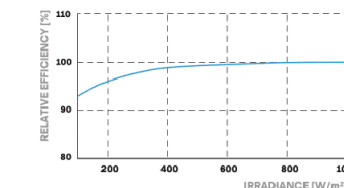
### Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

### PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25°C, 1000 W/m<sup>2</sup>).

### TEMPERATURE COEFFICIENTS

Temperature Coefficient of I <sub>SC</sub>	α	[%/K]	+0.04	Temperature Coefficient of V <sub>OC</sub>	β	[%/K]	-0.27
Temperature Coefficient of P <sub>MPP</sub>	γ	[%/K]	-0.35	Nominal Module Operating Temperature	NMOT	[°F]	109 ± 5.4 (43 ± 3°C)

### PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V <sub>sys</sub>	[V]	1000 (IEC)/1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI/UL 61730	TYPE 2
Max. Design Load, Push/Pull <sup>3</sup>	[lbs/ft <sup>2</sup> ]	75 (3600 Pa)/55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	-40°F up to +185°F (-40°C up to +85°C)
Max. Test Load, Push/Pull <sup>3</sup>	[lbs/ft <sup>2</sup> ]	113 (5400 Pa)/84 (4000 Pa)		

<sup>3</sup> See Installation Manual

### QUALIFICATIONS AND CERTIFICATES

Quality Controlled PV - TÜV Rheinland.  
IEC 61215:2016; IEC 61730:2016.  
This data sheet complies with DIN EN 50380.



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
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DATE: 09/05/2022

### PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-12

Specifications subject to technical changes © Q CELLS Q.PEAK DUO-G10+ 360-380 DA\_2022-02\_Rev01\_NA



# TRANSITIONING TO UL 61730-1 AND UL 61730-2 FROM UL 1703

## BACKGROUND

Solar panel certification for the U.S. market has transitioned from UL 1703 to UL 61703-1 and UL 61730-2. UL 61730-1 encompasses the construction evaluation of the solar module, such as the individual component evaluation utilized in construction/assembly, and design assessment, such as clearance and creepage distances. UL 61730-2 entails testing requirements for solar panels such as humidity freeze tests and how to conduct such tests. The new UL standards (UL 61730-1 and -2) harmonize with existing international standards (IEC 61730-1 and -2). The harmonization helps solar panel manufacturing companies operate in a global en-

vironment under a single certification program. Since IEC 61730 standards have been developed for the international market, this may not necessarily address specific local requirements such as for the U.S. market. However, modifications made to address the U.S. market's safety requirements have been incorporated and are called national deviations. When comparing the UL 61730 certification program against the UL 1703 certification program, UL 61730 involves more testing requirements such as more fire types alongside other key differences as tabulated below:

## KEY DIFFERENCES BETWEEN UL 1703 AND UL 61730-1 AND UL 61730-2

STANDARD REQUIREMENTS	UL 1703	UL 61730-1 & UL 61730-2
Construction and Testing	One document, UL 1703, refers to construction evaluation of the product and its testing	Two documents -UL 61730-1 refers to construction evaluation of the product and UL 61730-2 refers to its testing
Number of Test Sequences	4	8
Design Load	30 psf or 1436 Pa	50.12 psf or 2400 Pa
Fire Type	Up to Type 15	Up to Type 33
California Energy Commission	Will not accept UL 1703 certification for new products starting January 1, 2020	Accepted starting January 1, 2020
NEC 2020	Referenced	Referenced

## QUESTION AND ANSWER

**Do I need UL 1703 or UL 61730 certification? Will both or one of the two suffice?**

Certification to only one standard is required (UL 1703 or UL 61730) but will depend on the timeframe. Products with UL1703 obtained before January 2020 can continue to be used in the U.S., but new products certified after January 2020 need to have UL 61730 for CEC listing. QCELLS solar panels are UL 1703 and UL 61730 certified since the standard was adopted by the CEC.

**Which standard is better?**

Overall, UL 61730 is a better standard for modules since the requirements and test cycles are more stringent in UL 61730 compared to UL 1703. It is more beneficial for the market and addresses challenges such as new construction types for fire ratings that were not addressed before in UL 1703.

**Are these new standards adopted or referenced in the 2020 National Electric Code?**

UL 61730-1/-2 is referenced in Appendix A of the latest NEC 2020 edition. This is also helpful to point out to building inspectors if they have questions about UL 61730 certification.

**Whom should we reach out to in case building officials have any questions?**

Please reach out to Q CELLS at [pti@us.q-cells.com](mailto:pti@us.q-cells.com); an engineer from Q CELLS will assist you with your needs.

Specifications subject to technical changes © Q CELLS White Paper Transitioning to UL61730\_2021-01\_Rev01\_NA



22171 MCH RD  
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DATE: 09/05/2022

PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE

385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-13





## IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to the IQ8 Series Microinverters that has integrated MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

### Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

### High productivity and reliability

- Produce power even when the grid is down\*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

### Microgrid-forming

- Complies with the latest advanced grid support\*\*
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SB) requirements

\* Only when installed with IQ System Controller 2, meets UL 1741.

\*\* IQ8 and IQ8Plus support split phase, 240V installations only.

## IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-M-US	IQ8PLUS-72-M-US
Commonly used module pairings <sup>1</sup>	W	235 – 350	235 – 440
Module compatibility		60-cell / 120 half-cell	60-cell / 120 half-cell, 66-cell / 132 half-cell and 72-cell / 144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min / Max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current <sup>2</sup> [module I <sub>m</sub> ]	A		15
Overvoltage class DC port			II
DC port backfeed current	mA		0
PV array configuration		1x 1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		IQ8-60-M-US	IQ8PLUS-72-M-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage / range <sup>3</sup>	V		240 / 211 – 264
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz		60
Extended frequency range	Hz		50 – 68
AC short circuit fault current over 3 cycles	Arms		2
Max units per 20 A (L-L) branch circuit <sup>4</sup>		16	13
Total harmonic distortion			<5%
Overvoltage class AC port			III
AC port backfeed current	mA		30
Power factor setting			1.0
Grid-tied power factor (adjustable)			0.85 leading – 0.85 lagging
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW		60
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		Stäubli MC4	
Dimensions (H x W x D)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.1 kg (2.43 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SB), UL 62109-1, UL1741 / IEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN / CSA-C22.2 NO. 1071-01	

(1) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility>.

(2) Maximum continuous input DC current is 10.6A. (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

DATE: 09/05/2022

### PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-14



# Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4  
X-IQ-AM1-240-4C



X-IQ-AM1-240-4C

X-IQ-AM1-240-4

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters 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 Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

### Simple

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

### Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed



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

## Enphase IQ Combiner 4/4C

### MODEL NUMBER

IQ Combiner 4 (X-IQ-AM1-240-4)

IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.

IQ Combiner 4C (X-IQ-AM1-240-4C)

IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem 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.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.

### ACCESSORIES AND REPLACEMENT PARTS

(not included, order separately)

Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	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 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.

### ELECTRICAL SPECIFICATIONS

Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 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. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Envoy breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers

### MECHANICAL DATA

Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" 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	• 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
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)

### COMPLIANCE

Compliance, IQ 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) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

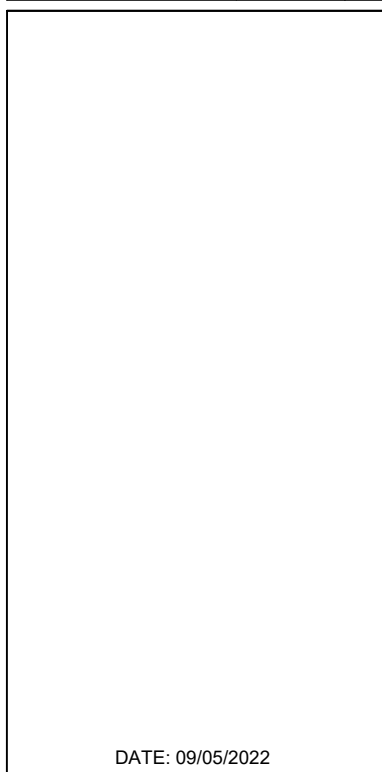
To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)

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22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A



DATE: 09/05/2022

### PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-15



## Enphase Encharge 10

The **Enphase Encharge 10™** all-in-one AC-coupled storage system is **reliable, smart, simple, and safe**. It is comprised of three base Encharge 3™ storage units, has a total usable energy capacity of 10.08 kWh and twelve embedded grid-forming microinverters with 3.84 kW power rating. It provides backup capability and installers can quickly design the right system size to meet the needs of both new and retrofit solar customers.



### Reliable

- Proven high reliability IQ Series Microinverters
- Ten-year limited warranty
- Three independent Encharge storage base units
- Twelve embedded IQ 8X-BAT Microinverters
- Passive cooling (no moving parts/fans)

### Smart

- Grid-forming capability for backup operation
- Remote software and firmware upgrade
- Mobile app-based monitoring and control
- Support for self consumption
- Utility time of use (TOU) optimization

### Simple

- Fully integrated AC battery system
- Quick and easy plug-and-play installation
- Interconnects with standard household AC wiring

### Safe

- Cells safety tested
- Lithium iron phosphate (LFP) chemistry for maximum safety and longevity

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



## Enphase Encharge 10

MODEL NUMBER	
ENCHARGE-10-1P-NA	Encharge 10 battery storage system with integrated Enphase Microinverters and battery management unit (BMU). Includes: - Three Encharge 3.36 kWh base units (B03-A01-US00-1-3) - One Encharge 10 cover kit with cover, wall mounting bracket, watertight conduit hubs, and interconnect kit for wiring between batteries (B10-C-1050-0)
ACCESSORIES	
ENCHARGE-HNDL-R1	One set of Encharge base unit installation handles
OUTPUT (AC) @ 240 VAC <sup>1</sup>	
Rated (continuous) output power	3.84 kVA
Peak output power	5.7 kVA (10 seconds)
Nominal voltage / range	240 / 211 – 264 VAC
Nominal frequency / range	60 / 57 – 61 Hz
Rated output current	16 A
Peak output current	24.6A (10 seconds)
Power factor (adjustable)	0.85 leading ... 0.85 lagging
Maximum units per 20 A branch circuit	1 unit (single phase)
Interconnection	Single-phase
Maximum AC short circuit fault current over 3 cycles	69.6 Arms
Round trip efficiency <sup>2</sup>	89%
BATTERY	
Total capacity	10.5 kWh
Usable capacity	10.08 kWh
Round trip efficiency	96%
Nominal DC voltage	67.2 V
Maximum DC voltage	73.5 V
Ambient operating temperature range	-15° C to 55° C (5° F to 131° F) non-condensing
Optimum operating temperature range	0° C to 30° C (32° F to 86° F)
Chemistry	Lithium iron phosphate (LFP)
MECHANICAL DATA	
Dimensions (WxHxD)	1070 mm x 664 mm x 319 mm (42.13 in x 26.14 in x 12.56 in)
Weight	Three individual 44.2 kg (97.4 lbs) base units plus 21.1 kg (48.7 lbs) cover and mounting bracket; total 154.7 kg (341 lbs)
Enclosure	Outdoor – NEMA type 3R
IQ 8X-BAT microinverter enclosure	NEMA type 6
Cooling	Natural convection – No fans
Altitude	Up to 2500 meters (8200 feet)
Mounting	Wall mount
FEATURES AND COMPLIANCE	
Compatibility	Compatible with grid-tied PV systems. Compatible with Enphase M215/M250 and IQ Series Micros, Enphase Enpower, and Enphase IQ Envoy for backup operation.
Communication	Wireless 2.4 GHz
Services	Backup, self-consumption, TOU, Demand Charge, NEM Integrity
Monitoring	Enlighten Manager and MyEnlighten monitoring options; API integration
Compliance	UL 9540, UN 38.3, UL 9540A, UL 1998, UL 991, NEMA Type 3R, AC156 EMI: 47 CFR, Part 15, Class B, ICES 003 Cell Module: UL 1973, UN 38.3 Inverters: UL 62109-1, IEC 62109-2, UL 1741SA, CAN/CSA C22.2 No. 107.1-16, and IEEE 1547
LIMITED WARRANTY	
Limited Warranty <sup>3</sup>	>70% capacity, up to 10 years or 4000 cycles

1. Supported in backup/off grid operations
2. AC to Battery to AC at 50% power rating.
3. Whichever occurs first. Restrictions apply.

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

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22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

DATE: 09/05/2022

### PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE

385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-16

# Enphase IQ System Controller 2

The **Enphase IQ System Controller 2** connects the home to grid power, the IQ Battery system, and solar PV. It provides microgrid interconnection device (MID) functionality by automatically detecting and seamlessly transitioning the home energy system from grid power to backup power in the event of a grid failure. It consolidates interconnection equipment into a single enclosure and streamlines grid independent capabilities of PV and storage installations by providing a consistent, pre-wired solution for residential applications.

### Reliable

- Durable NEMA type 3R enclosure
- Ten-year limited warranty

### Smart

- Controls safe connectivity to the grid
- Automatically detects grid outages
- Provides seamless transition to backup

### Simple

- Connects to the load or service equipment<sup>1</sup> side of the main load panel
- Centered mounting brackets support single stud mounting
- Supports conduit entry from the bottom, bottom left side, and bottom right side
- Supports whole home and partial home backup and subpanel backup
- Up to 200A main breaker support
- Includes neutral-forming transformer for split phase 120/240V backup operation
- IQ System Controller supports backward compatibility with older generation of PV microinverters (M215, M250 and S series), making it simple for home owners to upgrade their systems
- Easy integration with generator from major manufacturers

1. IQ System Controller 2 is not suitable for use as service equipment in Canada.

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



## Enphase IQ System Controller 2

MODEL NUMBER	
EP200G101-M240US01	Enphase IQ System Controller 2 with neutral-forming transformer (NFT), Microgrid Interconnect Device (MID), breakers, and screws. Streamlines grid-independent capabilities of PV and battery installations.

ACCESSORIES and REPLACEMENT PARTS	
EP200G-NA-XA-E3	Replacement IQ System Controller 2 printed circuit board
EP200G-NA-HD-200A	Eaton type BR circuit breaker hold-down screw kit, BRHDK125
CT-200-SPLIT	200 A split core current transformers for Generator metering (+/- 2.5%)
Circuit breakers (as needed) <sup>2,3</sup>	Not included, must order separately:
• BRK-100A-2P-240V: Main breaker, 2 pole, 100A, 25kAIC, CSR2100	• BRK-20A-2P-240V-B: Circuit breaker, 2 pole, 20A, 10kAIC, BR220B
• BRK-125A-2P-240V: Main breaker, 2 pole, 125A, 25kAIC, CSR2125N	• BRK-30A-2P-240V: Circuit breaker, 2 pole, 30A, 10kAIC, BR230B
• BRK-150A-2P-240V: Main breaker, 2 pole, 150A, 25kAIC, CSR2150N	• BRK-40A-2P-240V: Circuit breaker, 2 pole, 40A, 10kAIC, BR240B
• BRK-175A-2P-240V: Main breaker, 2 pole, 175A, 25kAIC, CSR2175N	• BRK-60A-2P-240V: Circuit breaker, 2 pole, 60A, 10kAIC, BR260
• BRK-200A-2P-240V: Main breaker, 2 pole, 200A, 25kAIC, CSR2200N	• BRK-80A-2P-240V: Circuit breaker, 2 pole, 80A, 10kAIC, BR280
EP200G-HNDL-R1	IQ System Controller 2 installation handle kit (order separately)
EP200G-LITKIT	IQ System Controller 2 literature kit, including labels, feed-through headers, screws, filler plates, and QIG
BRK-20A40A-2P-240V	2 pole, 20A/40A, 10kAIC, BQC220240

ELECTRICAL SPECIFICATIONS	
Assembly rating	Continuous operation at 100% of its rating
Nominal voltage / range (L-L)	240 VAC / 100 - 310 VAC
Voltage measurement accuracy	±1% V nominal (±1.2V L-N and ±2.4V L-L)
Auxiliary contact for load control, excess PV control, and generator two-wire control	24V, 1A
Nominal frequency / range	60 Hz / 56 - 63 Hz
Frequency measurement accuracy	±0.1 Hz
Maximum continuous current rating	160A
Maximum input overcurrent protection device	200A
Maximum output overcurrent protection device	200A
Maximum overcurrent protection device rating for Generator circuit <sup>4</sup>	80A
Maximum overcurrent protection device rating for storage branch circuit <sup>4</sup> (the storage branch circuit can be replaced with PV)	80A
Maximum overcurrent protection device rating for IQ8 PV combiner branch circuit <sup>4</sup>	80A
Neutral Forming Transformer (NFT)	<ul style="list-style-type: none"> <li>• Breaker rating (pre-installed): 40A between L1 and Neutral; 40A between L2 and Neutral</li> <li>• Continuous rated power: 3600VA</li> <li>• Maximum continuous unbalance current: 30A @ 120V</li> <li>• Peak rated power: 8800VA for 30 seconds</li> <li>• Peak unbalanced current: 80A @ 120V for 30 seconds</li> </ul>

MECHANICAL DATA	
Dimensions (WxHxD)	50cm x 91.6cm x 24.6cm (19.7 in x 36 in x 9.7 in)
Weight	39.4 kg (87 lbs)
Ambient temperature range	-40° C to +50° C (-40° F to 122° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NEMA type 3R, polycarbonate construction
Altitude	To 2500 meters (8200 feet)

WIRE SIZES		
Connections (All lugs are rated to 90C)	<ul style="list-style-type: none"> <li>• Main lugs and backup load lugs</li> <li>• CSR breaker bottom wiring lugs</li> <li>• BR breakers (wire provided)</li> <li>• AC combiner lugs, Encharge lugs, and generator lugs</li> <li>• Neutral (large lugs)</li> </ul>	Cu/Al: 1 AWG - 300 KCMIL Cu/Al: 2 AWG - 300 KCMIL 6 AWG 14 AWG - 2 AWG Cu/Al: 6 AWG - 300 KCMIL
Neutral and ground bars	Large holes (5/16-24 UNF) Small holes (10-32 UNF)	14 AWG - 1/0 AWG 14 AWG - 6 AWG

COMPLIANCE	
Compliance	UL 1741, UL 1741 SA, UL 1741 PCS, UL1998, UL869A <sup>5</sup> , UL67 <sup>5</sup> , UL508 <sup>5</sup> , UL50E <sup>5</sup> , CSA 22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003, AG156. IQ System Controller 2 is approved for Use as Service Equipment in the United States <sup>5</sup> .

2. Compatible with BRHDK125 Hold-Down Kit to comply with 2017 NEC 7.10.1.5E for back-fed circuit breakers.  
 3. The IQ System Controller 2 is rated 22 kAIC  
 4. Not included. Installer must provide properly rated breaker per circuit breaker list above.  
 5. Sections from these standards were used during the safety evaluation and included in the UL 1741 listing.

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

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22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

PROJECT NAME & ADDRESS	
NATHAN LANE RESIDENCE	385 PAPOOSE TRAIL, LILLINGTON, NC 27546
DATE: 09/05/2022	

SHEET NAME	
EQUIPMENT SPECIFICATION	
SHEET SIZE	
ANSI B 11" X 17"	
SHEET NUMBER	
PV-17	



REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

DATE: 09/05/2022

PROJECT NAME & ADDRESS

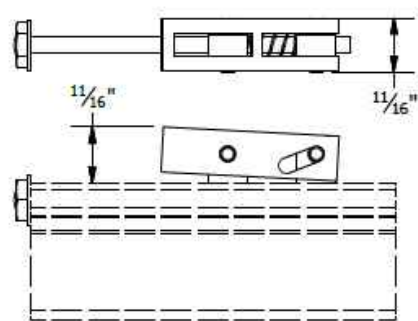
NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

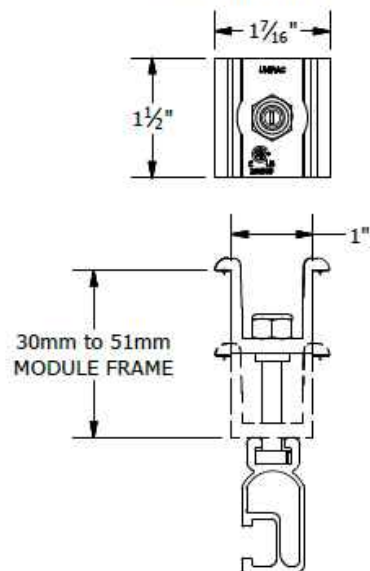
SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-18

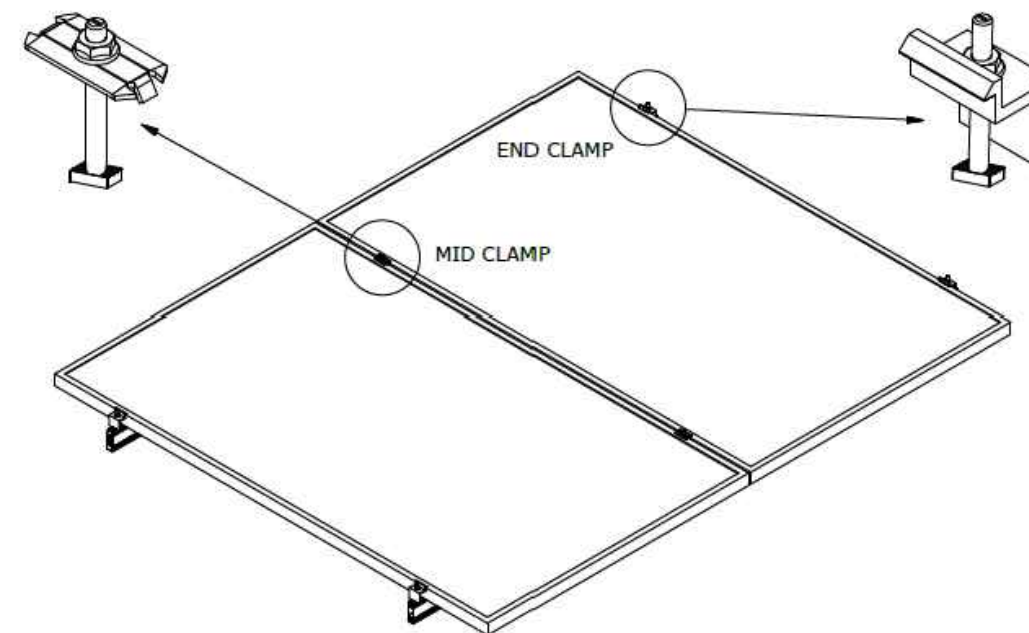
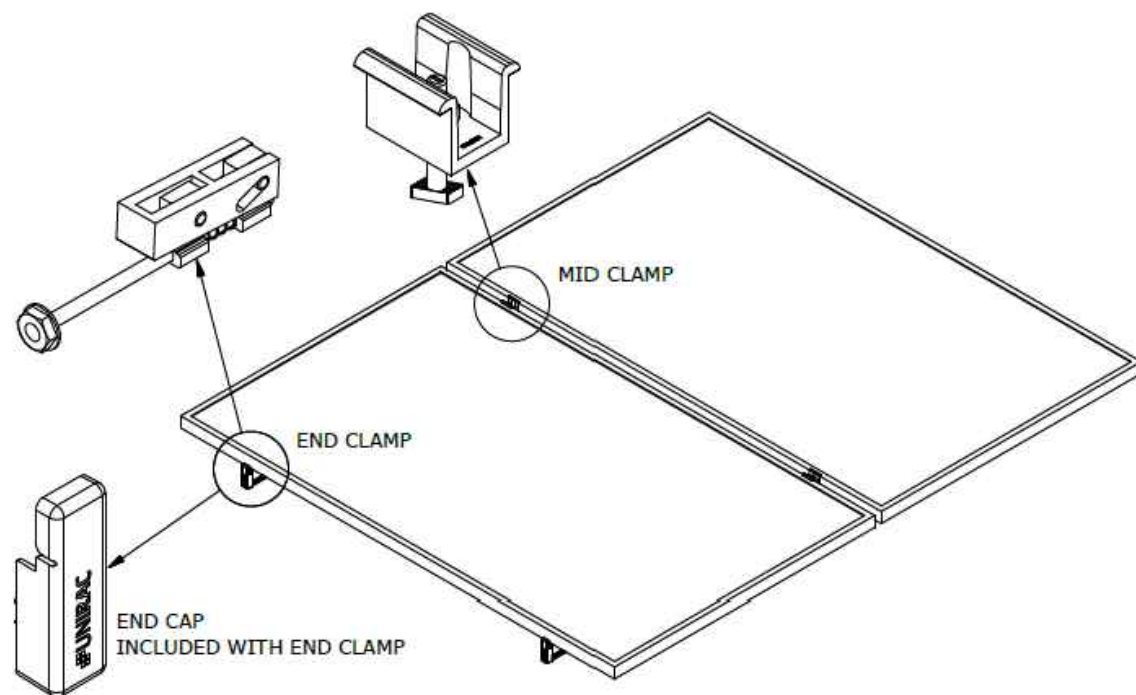
PRO SERIES END CLAMP



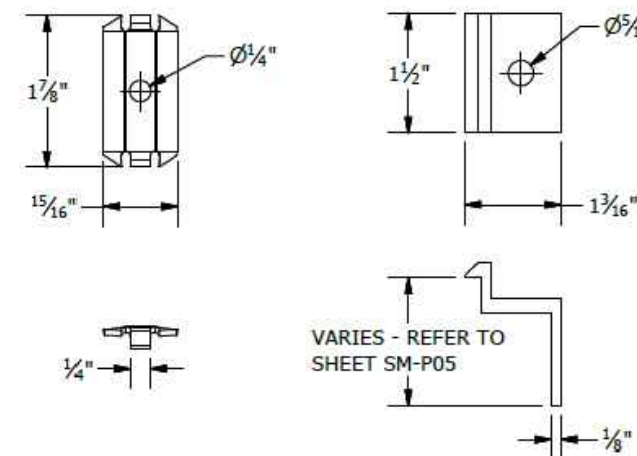
PRO SERIES MID CLAMP



PART # TABLE	
P/N	DESCRIPTION
302035M	ENDCLAMP PRO
302030M	MIDCLAMP PRO - MILL
302030D	MIDCLAMP PRO - DRK



PART # TABLE	
P/N	DESCRIPTION
302027C	SM BND MIDCLAMP BC SS
302027D	SM BND MIDCLAMP BC DRK SS
302028C	SM BND MIDCLAMP EF SS
302028D	SM BND MIDCLAMP EF DRK SS
302029C	SM BND MIDCLAMP DK SS
302029D	SM BND MIDCLAMP DK DRK SS
FOR BONDING END CLAMP REFER TO SHEET SM-P05	



BONDING SM MID CLAMP    BONDING SM END CLAMP

1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	PRO SERIES BONDING CLAMPS
REVISION DATE:	10/26/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

SM-A01  
SHEET

1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	BONDING TOP CLAMPS
REVISION DATE:	10/26/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

SM-A01A  
SHEET

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

DATE: 09/05/2022

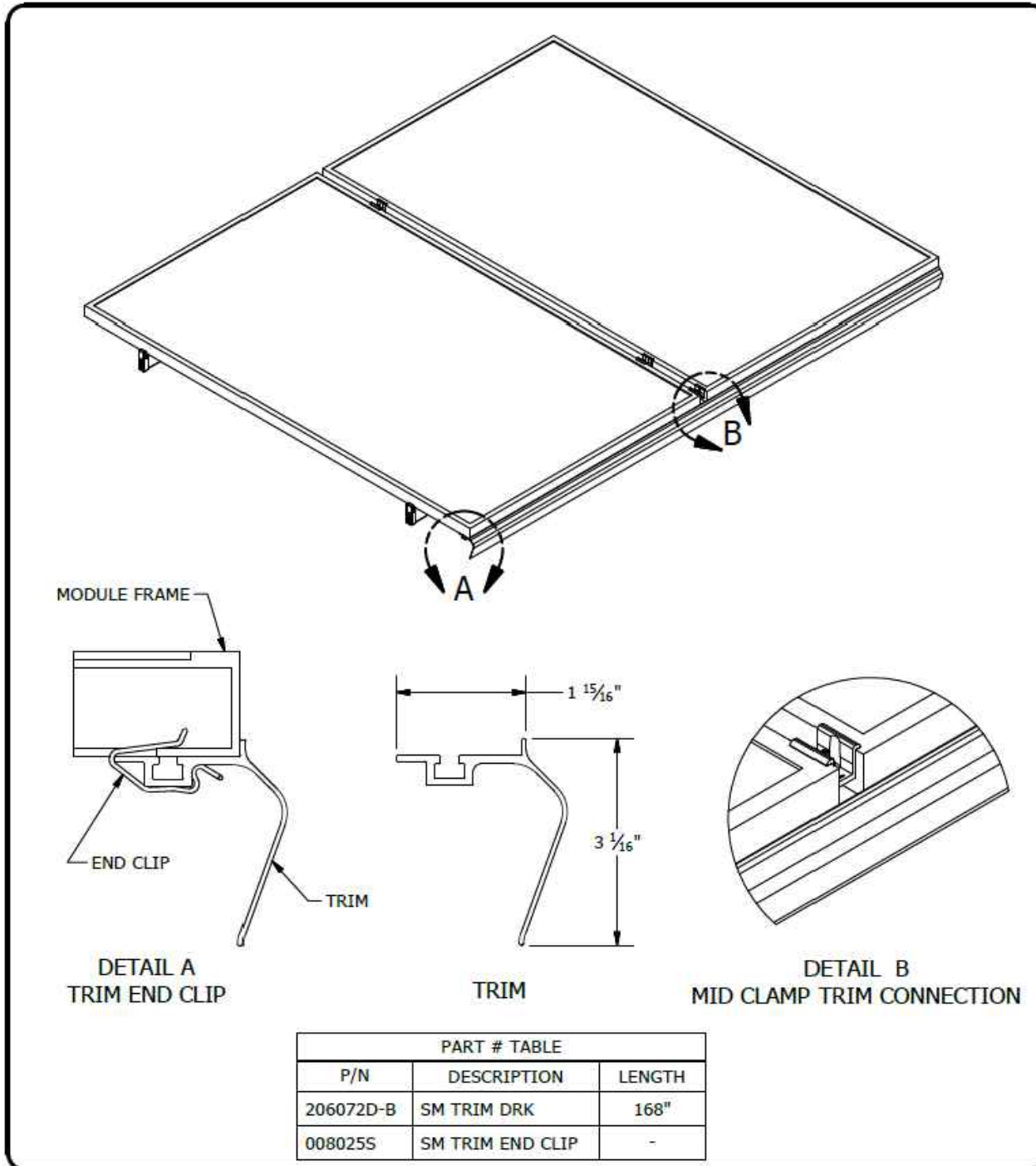
PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-19



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

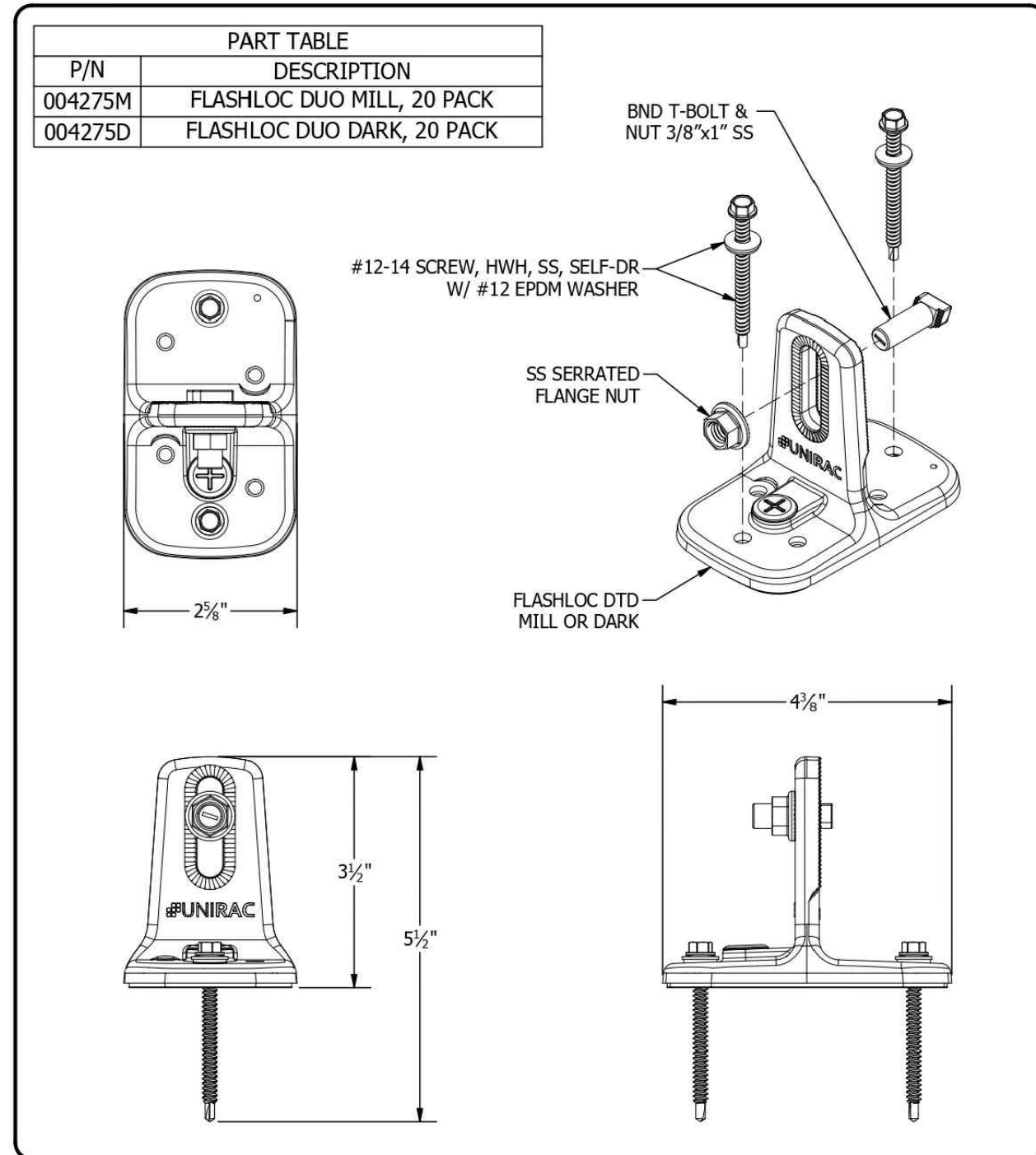
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DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	SM TRIM END CLIP
REVISION DATE:	9/27/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

SM-A02  
SHEET



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	ASSEMBLY DETAIL
DESCRIPTION:	FLASHLOC DUO KIT
REVISION DATE:	4/29/2021

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

FL-A04  
SHEET



# FLASHLOC™ DUO

THE MOST VERSATILE DIRECT TO DECK ATTACHMENT



# FLASHLOC™ DUO

INSTALLATION GUIDE



**FLASHLOC™ DUO** is the most versatile direct to deck and rafter attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the required number of screws to secure the mount and inject sealant into the base. **FLASHLOC's** patented **TRIPLE SEAL** technology preserves the roof and protects the penetration with a permanent pressure seal. Kitted with two rafter screws, sealant and hardware for maximum convenience (deck screws sold separately). Don't just divert water, **LOC it out!**



**PROTECT THE ROOF**  
Install a high-strength waterproof attachment without lifting, prying or damaging shingles.

APRIL2021\_FLASHLOC2DUO\_V1



**LOC OUT WATER**  
With an outer shield **1** contour-conforming gasket **2** and pressurized sealant chamber **3** the Triple Seal technology delivers a 100% waterproof connection.



**HIGH-SPEED INSTALL**  
Simply drive the required number of screws and inject sealant into the port **4** to create a permanent pressure seal.



## PRE-INSTALL: CLEAN SURFACE AND MARK LOCATION

Ensure existing roof structure is capable of supporting loads prescribed in Flashloc Duo D&E Guide. Clean roof surface of dirt, debris, snow and ice.

Snap chalk lines for attachment rows. On shingle roofs, snap lines 1/4" below upslope edge of shingle course. This line will be used to align the upper edge of the mount.

**NOTE:** Space mounts per span charts found in Flashloc Duo D&E Guide.

## STEP ONE: SECURE



**ATTACHING TO A RAFTER:** Place FLASHLOC DUO over rafter location and align upper edge of mount with horizontal chalk line. Secure mount with the two (2) provided rafter screws. **BACKFILL ALL PILOT HOLES WITH SEALANT.**



**ATTACHING TO SHEATHING:** Place FLASHLOC DUO over desired location and align upper edge of mount with horizontal chalk line. Secure mount with the two (2) provided rafter screws. Next, secure mount with four (4) deck screws by drilling through the FLASHLOC DUO deck mount hole locations. Unirac recommends using a drill as opposed to an impact gun to prevent over-tightening or stripping roof sheathing.

**IMPORTANT:** SECURELY ATTACH MOUNT BUT DO NOT OVERTIGHTEN SCREWS.

## STEP TWO: SEAL

Insert tip of UNIRAC approved sealant into port and inject until sealant exits vent. Continue array installation, attaching rails to mounts with provided T-bolts.

**NOTE:** When FLASHLOC DUO is installed over gap between shingle tabs or vertical joints, fill gap/joint with sealant between mount and upslope edge of shingle course.

**CUT SHINGLES AS REQUIRED: DO NOT INSTALL THE FLASHLOC SLIDER ACCROSS THICKNESS VARIATIONS GREATER THAN 1/8" SUCH AS THOSE FOUND IN HIGH DEFINITION SHINGLES.**

**NOTE:** When installing included rail attachment hardware, torque T-bolt nut to 30 ft-lbs.

**NOTE:** If an exploratory hole falls outside of the area covered by the sealant, flash hole accordingly.

USE ONLY UNIRAC APPROVED SEALANTS. PLEASE CONTACT UNIRAC FOR FULL LIST OF COMPATIBLE SEALANTS.



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

DATE: 09/05/2022		

PROJECT NAME & ADDRESS	
NATHAN LANE RESIDENCE	385 PAPOOSE TRAIL, LILLINGTON, NC 27546

SHEET NAME EQUIPMENT SPECIFICATION
---------------------------------------

SHEET SIZE ANSI B 11" X 17"
-----------------------------------

SHEET NUMBER PV-20
-----------------------

**FASTER INSTALLATION. 25-YEAR WARRANTY.**

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

**FASTER INSTALLATION. 25-YEAR WARRANTY.**

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702



REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

DATE: 09/05/2022

PROJECT NAME & ADDRESS

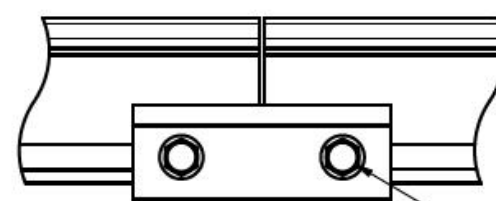
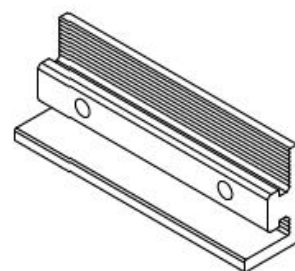
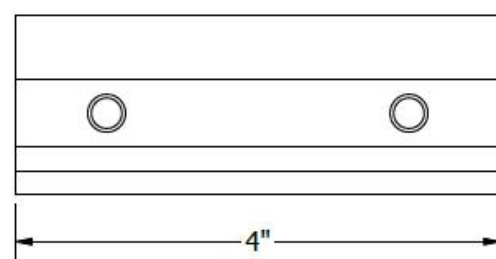
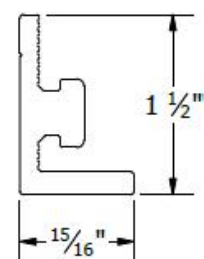
NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

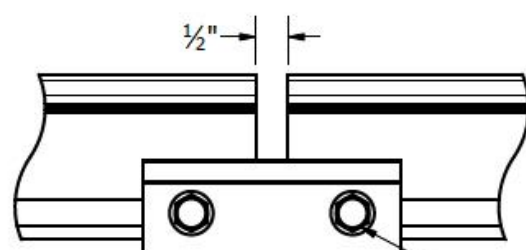
SHEET NUMBER  
PV-21

BONDING SPLICE BAR



TYPICAL SPLICE BAR DETAIL

5/16"-18 TYPE F THREAD CUTTING SCREWS INCLUDED



TYPICAL EXPANSION JOINT DETAIL

NOTE THAT ONLY 2 SCREWS ARE USED AT AN EXPANSION JOINT. THE SPLICE BAR DOES NOT BOND ACROSS AN EXPANSION JOINT. SEE INSTALLATION GUIDE FOR INSTRUCTION.

PART # TABLE

P/N	DESCRIPTION
303019M	BND SPLICE BAR PRO SERIES MILL
303019D	BND SPLICE BAR PRO SERIES DRK



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE: SOLARMOUNT  
DRAWING TYPE: PART & ASSEMBLY  
DESCRIPTION: BONDING SPLICE BAR PRO SERIES  
REVISION DATE: 8/23/2018

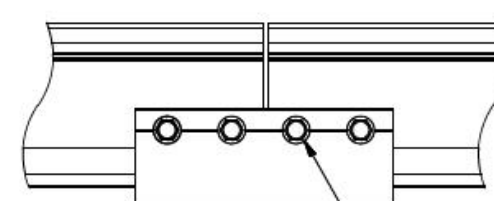
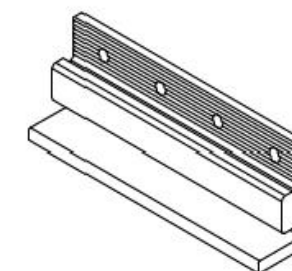
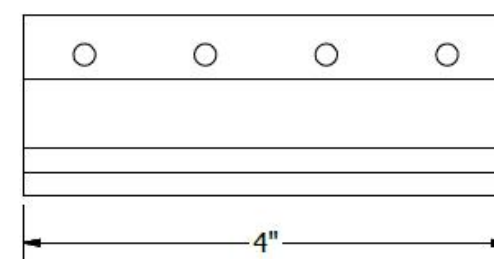
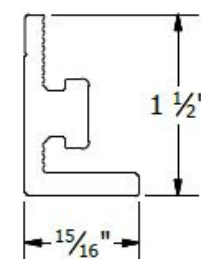
DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE NOMINAL

PRODUCT PROTECTED BY ONE OR MORE US PATENTS  
LEGAL NOTICE

SM-A05

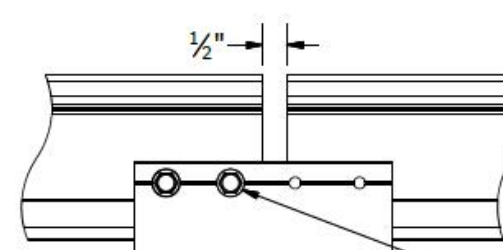
SHEET

BONDING SPLICE BAR



TYPICAL SPLICE BAR DETAIL

#12 X 3/4" SELF DRILLING SS SCREWS INCLUDED



TYPICAL EXPANSION JOINT DETAIL

NOTE THAT ONLY 2 SCREWS ARE USED AT AN EXPANSION JOINT. THE SPLICE BAR DOES NOT BOND ACROSS AN EXPANSION JOINT. SEE INSTALLATION GUIDE FOR INSTRUCTION.

PART # TABLE

P/N	DESCRIPTION
303018C	BND SPLICE BAR SERRATED CLR
303018D	BND SPLICE BAR SERRATED DRK



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE: SOLARMOUNT  
DRAWING TYPE: PART & ASSEMBLY  
DESCRIPTION: BONDING SPLICE BAR  
REVISION DATE: 9/27/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE NOMINAL

PRODUCT PROTECTED BY ONE OR MORE US PATENTS  
LEGAL NOTICE

SM-A05

SHEET



REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

DATE: 09/05/2022

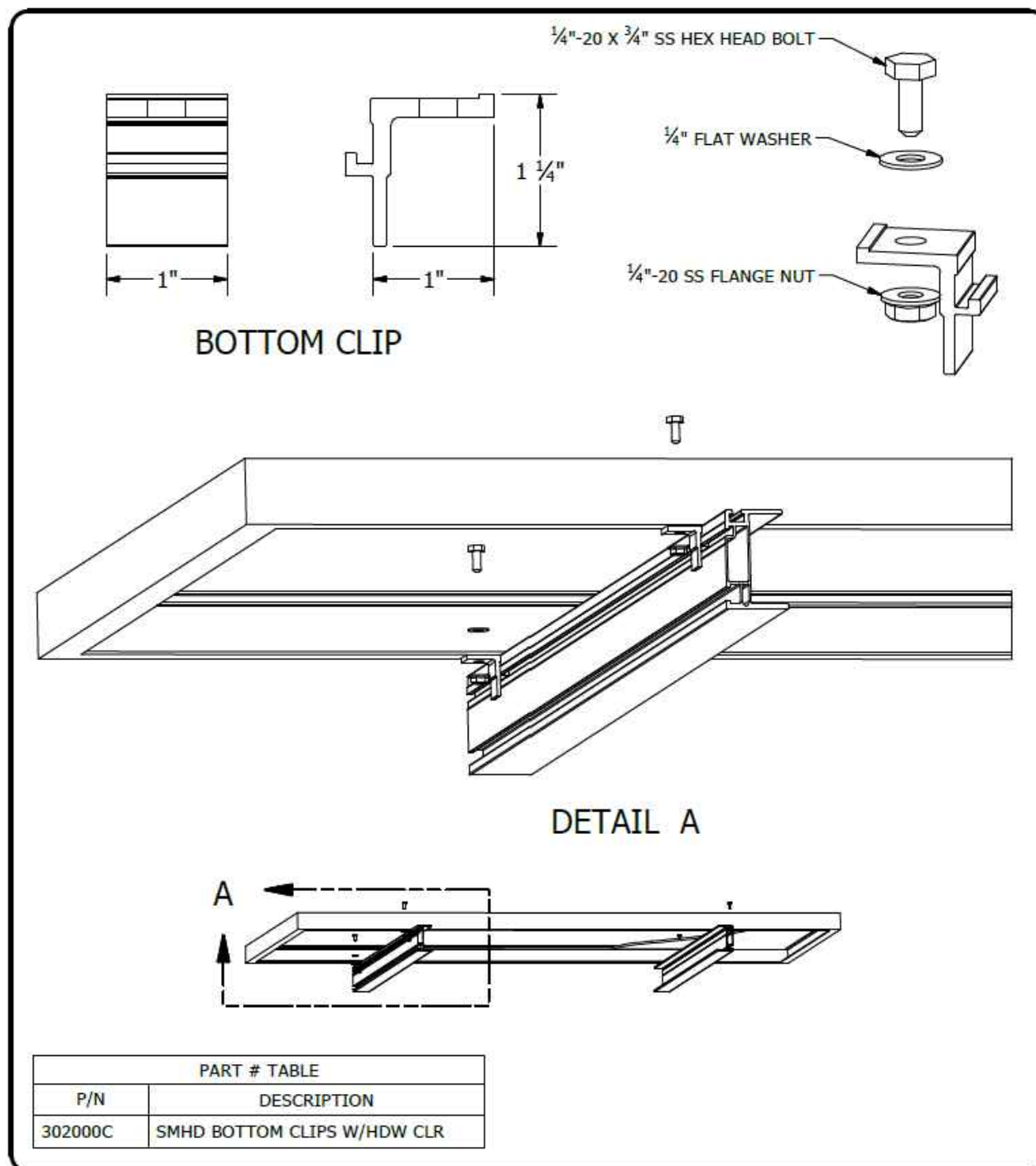
PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-22



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

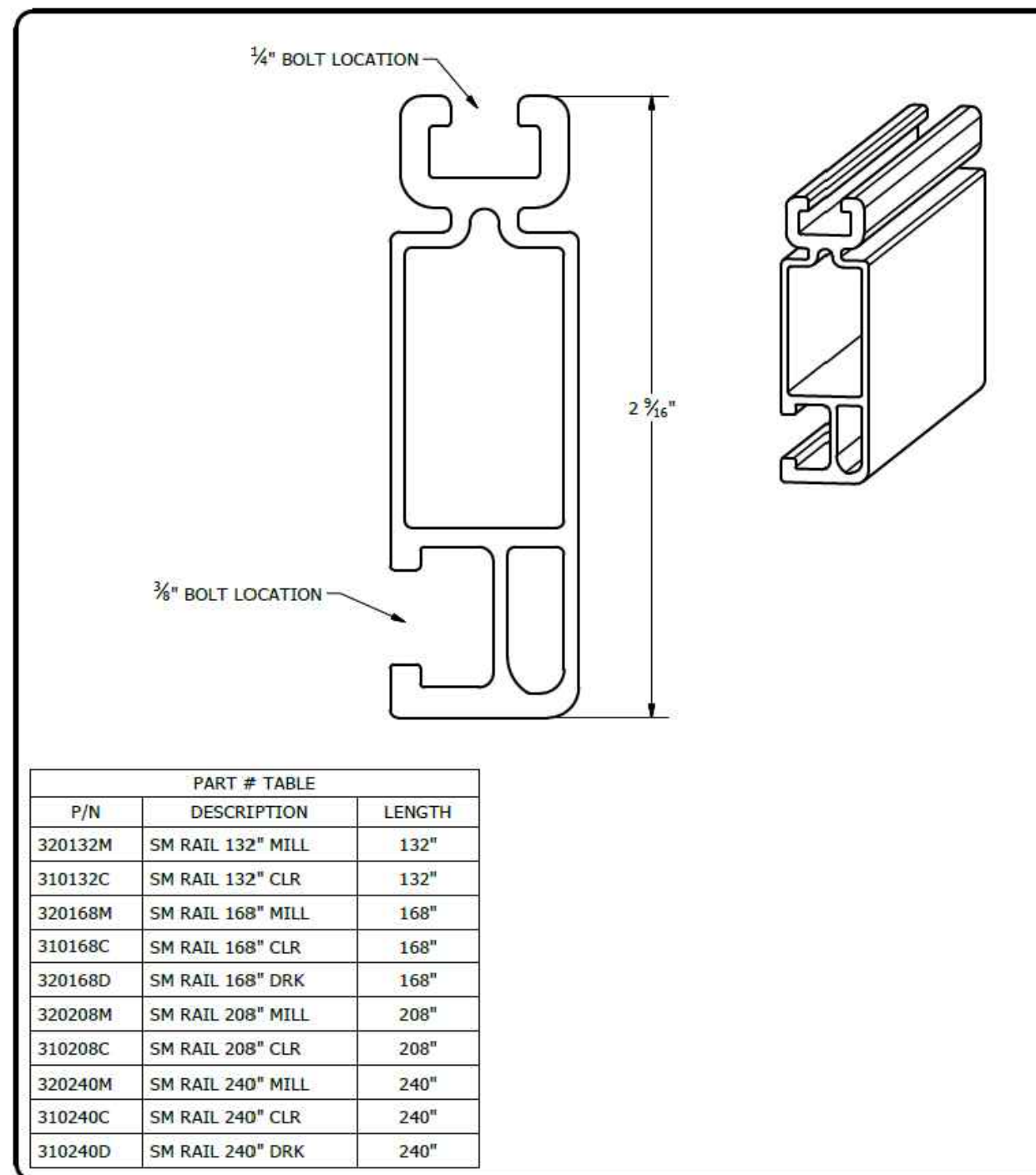
PRODUCT LINE:	SOLARMOUNT HD
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	BOTTOM CLIP
REVISION DATE:	9/27/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**SM-A10**  
SHEET



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	STANDARD RAIL
REVISION DATE:	9/11/2017

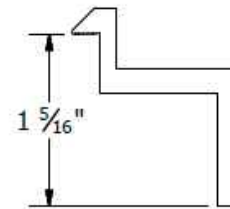
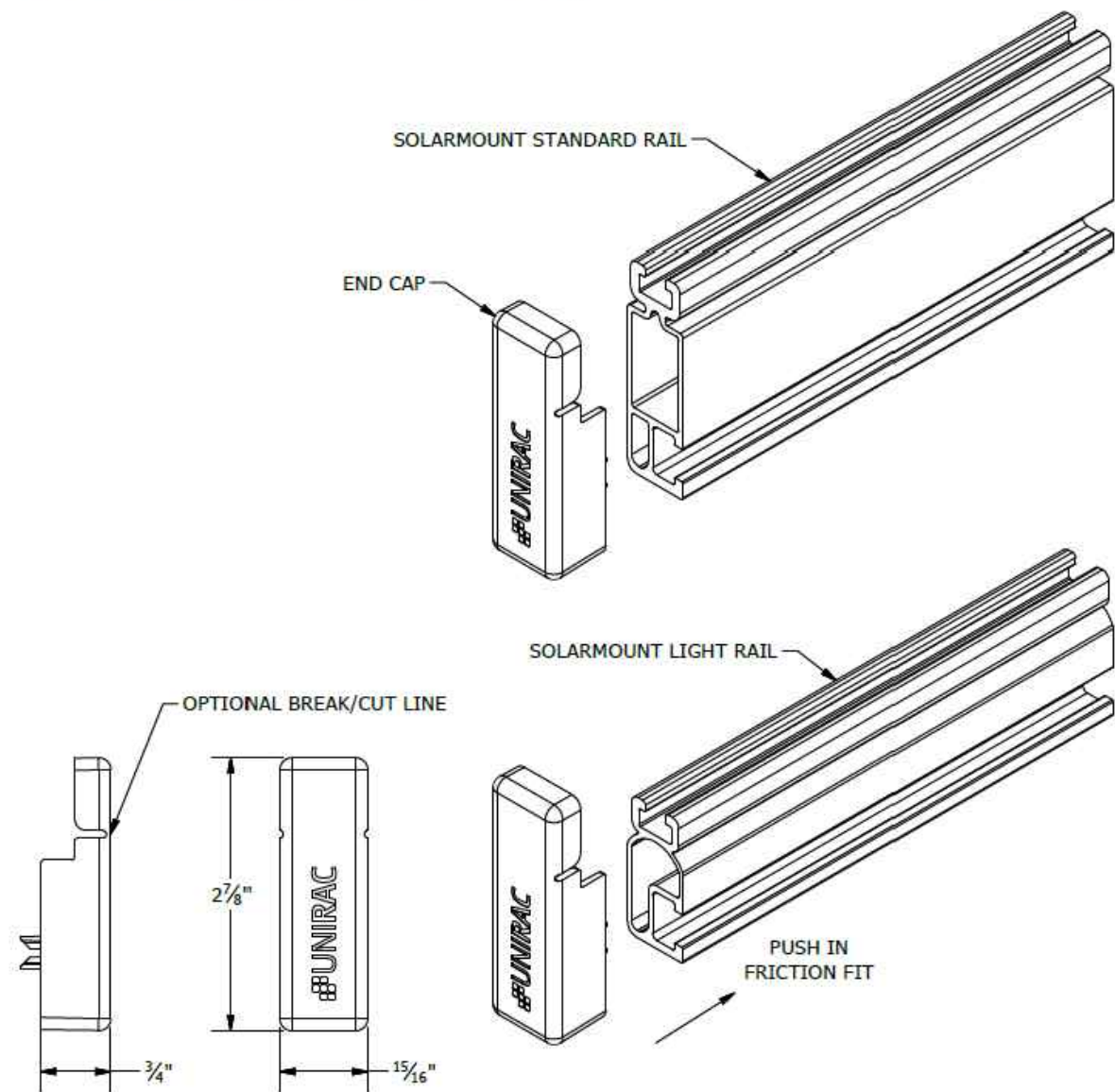
DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

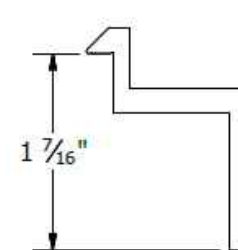
LEGAL NOTICE

**SM-P01**  
SHEET

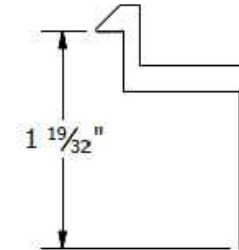
- NOTES:  
 1. END CAP INCLUDED WITH EVERY END CLAMP.  
 2. END CAP FITS SOLARMOUNT LIGHT AND STANDARD RAIL PROFILES.



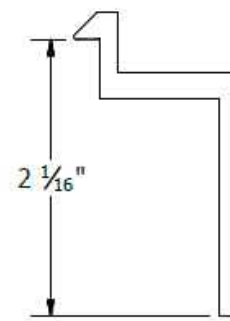
**B CLAMP**  
 30mm to 32mm Module Thickness  
 (1.18" to 1.26")



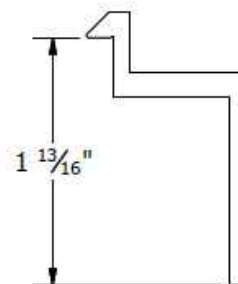
**C CLAMP**  
 33mm to 36mm Module Thickness  
 (1.30" to 1.42")



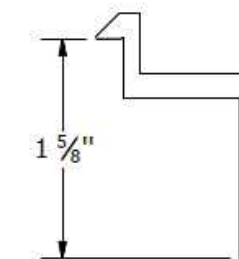
**D CLAMP**  
 38mm to 40mm Module Thickness  
 (1.50" to 1.57")



**E CLAMP**  
 50mm to 51mm Module Thickness  
 (1.97" to 2.00")

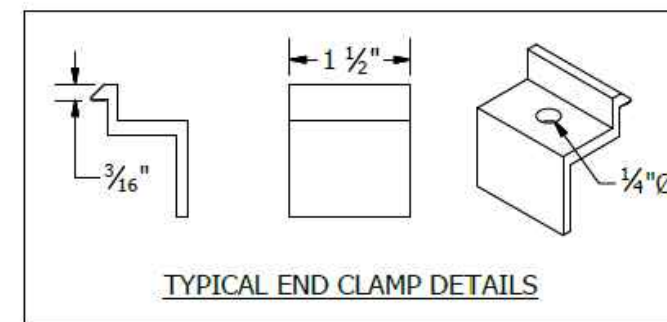


**F CLAMP**  
 45mm to 47mm Module Thickness  
 (1.77" to 1.85")



**K CLAMP**  
 39mm to 41mm Module Thickness  
 (1.54" to 1.61")

PART # TABLE	
P/N	DESCRIPTION
302021C	SM ENDCLAMP B CLR AL
302021D	SM ENDCLAMP B DRK AL
302022C	SM ENDCLAMP C CLR AL
302022D	SM ENDCLAMP C DRK AL
302023C	SM ENDCLAMP D CLR AL
302023D	SM ENDCLAMP D DRK AL
303024C	SM ENDCLAMP E CLR AL
302024D	SM ENDCLAMP E DRK AL
302025C	SM ENDCLAMP F CLR AL
302025D	SM ENDCLAMP F DRK AL
302026C	SM ENDCLAMP K CLR AL
302026D	SM ENDCLAMP K DRK AL



TYPICAL END CLAMP DETAILS



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/05/2022	
REVISION	02/22/2023	A

DATE: 09/05/2022

PROJECT NAME & ADDRESS

NATHAN LANE  
 RESIDENCE  
 385 PAPOOSE TRAIL,  
 LILLINGTON, NC 27546

SHEET NAME  
 EQUIPMENT  
 SPECIFICATION

SHEET SIZE  
 ANSI B  
 11" X 17"

SHEET NUMBER  
 PV-23

**UNIRAC**  
 1411 BROADWAY BLVD. NE  
 ALBUQUERQUE, NM 87102 USA  
 PHONE: 505.242.6411  
 WWW.UNIRAC.COM

PRODUCT LINE: SOLARMOUNT  
 DRAWING TYPE: PART DETAIL  
 DESCRIPTION: END CAPS  
 REVISION DATE: 9/27/2017

DRAWING NOT TO SCALE  
 ALL DIMENSIONS ARE  
 NOMINAL  
 PRODUCT PROTECTED BY  
 ONE OR MORE US PATENTS  
 LEGAL NOTICE

**SM-P04**  
 SHEET

**UNIRAC**  
 1411 BROADWAY BLVD. NE  
 ALBUQUERQUE, NM 87102 USA  
 PHONE: 505.242.6411  
 WWW.UNIRAC.COM

PRODUCT LINE: SOLARMOUNT  
 DRAWING TYPE: PART DETAIL  
 DESCRIPTION: END CLAMPS -  
 TOP MOUNTING  
 REVISION DATE: 9/27/2017

DRAWING NOT TO SCALE  
 ALL DIMENSIONS ARE  
 NOMINAL  
 PRODUCT PROTECTED BY  
 ONE OR MORE US PATENTS  
 LEGAL NOTICE

**SM-P05**  
 SHEET



# SolaDeck

FLASHED PV ROOF-MOUNT COMBINER/ENCLOSURE

## Basic Features

- Stamped Seamless Construction
- 18 Gauge Galvanized Steel
- Powder Coated Surfaces
- Flashes into the roof deck
- 3 Roof deck knockouts .5", .75", 1"
- 5 Centering dimples for entry/exit fittings or conduit
- 2 Position Ground lug installed
- Mounting Hardware Included



SolaDeck Model SD 0783



## SolaDeck UL50 Type 3R Enclosures

Available Models:

- Model SD 0783 - (3" fixed Din Rail)
- Model SD 0786 - (6" slotted Din Rail)



## SolaDeck UL 1741 Combiner/Enclosures

Models SD 0783-41 and SD 0786-41 are labeled and ETL listed UL STD 1741 according to the UL STD 1741 for photovoltaic combiner enclosures.

Max Rated - 600VDC, 120AMPS

**Model SD 0783-41** 3" Fixed Din Rail fastened using Norlock System

### \*\*Typical System Configuration

- 4- Din Rail Mounted Fuse Holders 600VDC 30 AMP
- 1- Power Distribution Block 600VDC 175AMP
- 1- Bus Bar with UL lug

**Model SD 0786-41** 6" Slotted Din Rail fastened using steel studs

### \*\*Typical System Configuration

- 4- Din Rail Mounted Fuse Holders 600VDC 30 AMP
- 4- Din Rail Mounted Terminal Blocks
- Bus Bars with UL lug

\*\*Fuse holders and terminal blocks added in the field must be UL listed or recognized and meet 600 VDC 30 AMP 110C for fuse holders, 600V 50 AMP 90C for rail mounted terminal blocks and 600 V 175 AMP 90C for Power Distribution Blocks. Use Copper Wire Conductors.



Cover is trimmed to allow conduit or fittings. base is center dimpled for fitting locations.



Model SD 0783-41, wired with Din Rail mounted fuse holders, bus bar and power distribution block.



Model SD 0786-41, wired with Din Rail mounted fuse holders, terminal blocks and bus bars.

RSTC Enterprises, Inc • 2219 Heimstead Road • Eau Claire, WI 54703  
For product information call 1(866) 367-7782



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

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DATE: 09/05/2022

PROJECT NAME & ADDRESS

NATHAN LANE  
RESIDENCE  
385 PAPOOSE TRAIL,  
LILLINGTON, NC 27546

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-24