



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

September 2022

Property Owner: Noah Bell

Property Address: 128 West Park Lane, Sanford, NC 27332

**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 is adequate 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    PEBC 2018    ""NETC 2018    """"PGE 2017  
Risk Category: II  
Design Wind Speed (3-second gust): 117 MPH  
Wind Exposure Category: C  
Ground Snow Load: 10 PSF  
Seismic Design Category: D

**Existing Structure:**

Roof Material: Shingle  
Roofing Structure: 2x4 Truss Top Chord  
Roof Slope: 5/12

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1011 N. CAUSEWAY BLVD. STE 19  
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NORTH CAROLINA FIRM NO. C4113

**PRINCIPAL Infrastructure®**

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Architecture ♦ Engineering ♦ Construction

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

Gravity Loads:

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 ( $C_s$ ) 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 engineering 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:	Noah Bell	Individual Panel Dimensions		
Project Address:	128 West Park Lane	Length (in)	Width (in)	Area (sf)
City, State:	Sanford, NC 27332	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):	33 ft.	Least Dimension:	26 ft.
	Width (w):	26 ft.		
Roof Height (h):		25 ft.	Must be less than 60	✓
Pitch:	5 on 12 =	22.6°	Must be less than 45°	✓
Roof Configuration		Gable		
Roof Structure:		2x4 Truss Top Chord		
Roof material:		Plywood		
Ultimate Wind Speed (mph):		117	From ASCE 7-10, Fig. 26.5	
Exposure Category:		C	Para 26.7.3	
Directionality Factor, $K_d$		0.85	Table 26.6-1	
Risk Category:		2	Table 1.5-2	
Exposure Coefficient, $K_z$		0.98	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), $q_h$ :		29.19	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	2.6
2 - Roof Height x 0.4	10
3 - Least Roof Horizontal Dimension (L or W) x 0.04	1.04
4 - Lesser of (1) and (2)	2.6
5 - Greater of (3) and (4)	2.6
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>-18.5</b>	0.40	<b>16.0</b>	Interior Roof Area, >(a) ft from edge
Zone 2	-1.53	<b>-29.9</b>	0.40	<b>16.0</b>	Strip of (a) ft wide at roof edge
Zone 3	-2.40	<b>-45.1</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:	C	Para 6.5.6.3
Exposure	Fully	
Exposure Factor C <sub>e</sub>	0.9	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	22.6°	
Distance from Eave to Ridge	13.0	
p <sub>m</sub> , Minimum required Snow Load	N/A	Para. 7.3.4
p <sub>f</sub> , Calculated Snow Load	6.30	Eq. 7.3-1
p <sub>f</sub> , Design Snow Load	6.30 psf	

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Mount Selection and Spacing		
Manufacturer:	Unirac	Perpendicular Panel Orientation
Mount:	Flashloc Comp Kit	Allowable Arrangement by Uplift Pressure
Substrate:	Wood Rafters/Truss Top Chord	< 37 psf : 2 rails, mounts @ 4'-0" o.c. 37 to 75 psf : 2 rails, mounts @ 2'-0" o.c. 75 to 112 psf : 3 rails, mounts @ 2'-0" o.c. 112 to 150 psf : 4 rails, mounts @ 2'-0" o.c. > 150 psf : Mount capacity exceeded
Connector:	5/16" x 4" Lag Screw	
Allowable Uplift:	480 max.	
<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 @ 2'-0" o.c.	
<i>(Allowable loads are based on individual mount failure before rail failure)</i>		

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# NEW PHOTOVOLTAIC SYSTEM 3.60 KW DC

## 128 WEST PARK LN, SANFORD, NC 27332

**CONTRACTOR**



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

NOAH BELL

**128 WEST PARK LN,  
SANFORD,  
NC 27332**

COUNTY: HARNETT COUNTY

**SYSTEM SIZE**

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

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SHEET TITLE

**COVER PAGE**

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

**G-001**

### GENERAL NOTES

**1.1.1 PROJECT NOTES:**

- 1.1.2 THIS PHOTOVOLTAIC (PV) SYSTEM SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE (NEC) ARTICLE 690, ALL MANUFACTURERS'S LISTING AND INSTALLATION INSTRUCTIONS, AND THE RELEVANT CODES AS SPECIFIED BY THE AUTHORITY HAVING JURISDICTION'S (AHJ) APPLICABLE CODES.
- 1.1.3 THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION
- 1.1.4 GROUND FAULT DETECTION AND INTERRUPTION (GFDI) DEVICE IS INTEGRATED WITH THE MICRO-INVERTER IN ACCORDANCE WITH NEC 690.41(B)
- 1.1.5 ALL PV SYSTEM COMPONENTS; MODULES, UTILITY-INTERACTIVE INVERTERS, AND SOURCE CIRCUIT COMBINER BOXES ARE IDENTIFIED AND LISTED FOR USE IN PHOTOVOLTAIC SYSTEMS AS REQUIRED BY NEC 690.4: PV MODULES: UL1703, IEC61730, AND IEC61215, AND NFPA 70 CLASS C FIRE INVERTERS: UL 1741 CERTIFIED, IEEE 1547, 929, 519 COMBINER BOX(ES): UL 1703 OR UL 1741 ACCESSORY
- 1.1.6 MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC. IF UNAVAILABLE, MAX DC VOLTAGE CALCULATED ACCORDING TO NEC 690.7.
- 1.1.7 ALL INVERTERS, PHOTOVOLTAIC MODULES, PHOTOVOLTAIC PANELS, AND SOURCE CIRCUIT COMBINERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER 690.4. SHALL BE INSTALLED ACCORDING TO ANY INSTRUCTIONS FROM LISTING OR LABELING [NEC 110.3].
- 1.1.8 ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH 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.

**1.2.1 SCOPE OF WORK:**

- 1.2.2 PRIME CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND SPECIFICATIONS OF THE GRID-TIED PHOTOVOLTAIC SYSTEM RETROFIT. PRIME CONTRACTOR WILL BE RESPONSIBLE FOR COLLECTING EXISTING ONSITE REQUIREMENTS TO DESIGN, SPECIFY, AND INSTALL THE EXTERIOR ROOF-MOUNTED PORTION OF THE PHOTOVOLTAIC SYSTEMS DETAILED IN THIS DOCUMENT

**1.3.1 WORK INCLUDES:**

- 1.3.2 PV RACKING SYSTEM INSTALLATION - UNIRAC SOLAR
- 1.3.3 PV MODULE AND INVERTER INSTALLATION - QCELLS Q.PEAK DUO BLK-G10+ 360 / ENPHASE IQ8PLUS-72-2-US INVERTER
- 1.3.4 PV EQUIPMENT ROOF MOUNT
- 1.3.5 PV SYSTEM WIRING TO A ROOF-MOUNTED JUNCTION BOX
- 1.3.6 PV LOAD CENTERS (IF INCLUDED)
- 1.3.7 PV METERING/MONITORING (IF INCLUDED)
- 1.3.8 PV DISCONNECTS
- 1.3.9 PV GROUNDING ELECTRODE & BONDING TO (E) GEC
- 1.3.10 PV FINAL COMMISSIONING
- 1.3.11 (E) ELECTRICAL EQUIPMENT RETROFIT FOR PV
- 1.3.12 SIGNAGE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE

PROJECT INFORMATION

OWNER  
NAME: NOAH BELL

PROJECT MANAGER  
NAME: SHAHIN HAYNES  
PHONE: 8665071461

CONTRACTOR NAME  
ADT SOLAR LLC  
PHONE: 5052180838

SCOPE OF WORK

SYSTEM SIZE: STC: 10 X 360W = 3.60 kW DC  
PTC: 10 x 338.77W = 3.39 kW DC  
(10) QCELLS Q.PEAK DUO BLK-G10+ 360  
(10) ENPHASE IQ8PLUS-72-2-US

ATTACHMENT TYPE: ROOF MOUNT  
MSP UPGRADE: NO  
UTILITY METER UPGRADE: NO

AUTHORITIES HAVING JURISDICTION

BUILDING: HARNETT, COUNTY OF (NC)  
ZONING: HARNETT, COUNTY OF (NC)  
UTILITY: CENTRAL ELECTRIC MEMBERSHIP CORPORATION (NC)  
METER NO: 167 630 048

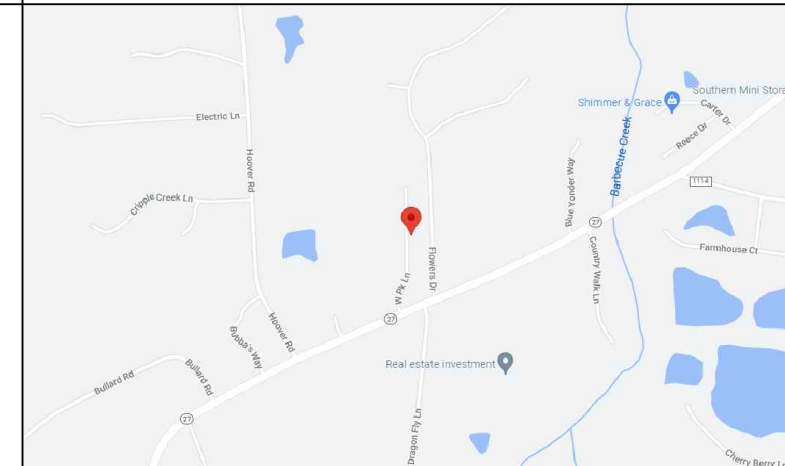
DESIGN SPECIFICATION

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

APPLICABLE CODES & STANDARDS

BUILDING: NCBC 2018, NCRC 2018  
ELECTRICAL: NEC 2017  
FIRE: NCFC 2018

### VICINITY MAP



### SATELLITE VIEW



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2.1.1 SITE NOTES:

2.1.2 A LADDER WILL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.

2.1.3 THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM WITH NO STORAGE BATTERIES.

2.1.4 THE SOLAR PV INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.

2.1.5 PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION NEC 110.26.

2.1.6 ROOF COVERINGS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED IN ACCORDANCE WITH THIS CODE AND THE APPROVED MANUFACTURER'S INSTRUCTIONS SUCH THAT THE ROOF COVERING SERVES TO PROTECT THE BUILDING OR STRUCTURE.

2.2.1 EQUIPMENT LOCATIONS:

2.2.2 ALL EQUIPMENT SHALL MEET MINIMUM SETBACKS AS REQUIRED BY NEC 110.26.

2.2.3 WIRING SYSTEMS INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC 690.31 (A),(C) AND NEC TABLES 310.15 (B)(2)(A) AND 310.15 (B)(3)(C).

2.2.4 JUNCTION AND PULL BOXES PERMITTED INSTALLED UNDER PV MODULES ACCORDING TO NEC 690.34.

2.2.5 ADDITIONAL AC DISCONNECT(S) SHALL BE PROVIDED WHERE THE INVERTER IS NOT WITHIN SIGHT OF THE AC SERVICING DISCONNECT.

2.2.6 ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES.

2.2.7 ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.

2.3.1 STRUCTURAL NOTES:

2.3.2 RACKING SYSTEM & PV ARRAY WILL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL. TOP CLAMPS REQUIRE A DESIGNATED SPACE BETWEEN MODULES, AND RAILS MUST ALSO EXTEND A MINIMUM DISTANCE BEYOND EITHER EDGE OF THE ARRAY/SUBARRAY, ACCORDING TO RAI MANUFACTURER'S INSTRUCTIONS.

2.3.3 JUNCTION BOX WILL BE INSTALLED PER MANUFACTURERS' SPECIFICATIONS. IF ROOF-PENETRATING TYPE, IT SHALL BE FLASHED & SEALED PER LOCAL REQUIREMENTS.

2.3.4 ROOFTOP PENETRATIONS FOR PV RACEWAY WILL BE COMPLETED AND SEALED W/ APPROVED CHEMICAL SEALANT PER CODE BY A LICENSED CONTRACTOR.

2.3.5 ALL PV RELATED ROOF ATTACHMENTS TO BE SPACED NO GREATER THAN THE SPAN DISTANCE SPECIFIED BY THE RACKING MANUFACTURER.

2.3.6 WHEN POSSIBLE, ALL PV RELATED RACKING ATTACHMENTS WILL BE STAGGERED AMONGST THE ROOF FRAMING MEMBERS.

2.4.1 WIRING & CONDUIT NOTES:

2.4.2 ALL CONDUIT AND WIRE WILL BE LISTED AND APPROVED FOR THEIR PURPOSE. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING.

2.4.3 CONDUCTORS SIZED ACCORDING TO NEC 690.8, NEC 690.7.

2.4.4 VOLTAGE DROP LIMITED TO 1.5%.

2.4.5 DC WIRING LIMITED TO MODULE FOOTPRINT.

MICROINVERTER WIRING SYSTEMS SHALL BE LOCATED AND SECURED UNDER THE ARRAY W/ SUITABLE WIRING CLIPS.

2.4.6 AC CONDUCTORS COLORED OR MARKED AS FOLLOWS: PHASE A OR L1- BLACK PHASE B OR L2- RED, OR OTHER CONVENTION IF THREE PHASE PHASE C OR L3- BLUE, YELLOW, ORANGE\*\*, OR OTHER CONVENTION NEUTRAL- WHITE OR GREY IN 4-WIRE DELTA CONNECTED SYSTEMS THE PHASE WITH HIGHER VOLTAGE TO BE MARKED ORANGE [NEC 110.15].

2.5.1 GROUNDING NOTES:

2.5.2 GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR SUCH USE.

2.5.3 PV EQUIPMENT SHALL BE GROUNDED ACCORDING TO NEC 690.43 AND MINIMUM NEC TABLE 250.122.

2.5.4 METAL PARTS OF MODULE FRAMES, MODULE RACKING, AND ENCLOSURES CONSIDERED GROUNDED IN ACCORD WITH 250.134 AND 250.136(A).

2.5.5 EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45 AND MICROINVERTER MANUFACTURERS' INSTRUCTIONS.

2.5.6 EACH MODULE WILL BE GROUNDED USING WEEB GROUNDING CLIPS AS SHOWN IN

MANUFACTURER DOCUMENTATION AND APPROVED BY THE AHJ. IF WEEBS ARE NOT USED, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE SPECIFIED GROUNDING LUG HOLES PER THE MANUFACTURERS' INSTALLATION REQUIREMENTS.

2.5.7 THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OF A MODULE DOES NOT INTERRUPT A GROUNDING CONDUCTOR TO ANOTHER MODULE.

2.5.8 GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLORED GREEN OR MARKED GREEN IF #4 AWG OR LARGER [NEC 250.119]

2.5.9 THE GROUNDING ELECTRODE SYSTEM COMPLIES WITH NEC 690.47 AND NEC 250.50 THROUGH 250.106. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, A GROUNDING ELECTRODE SYSTEM PROVIDED ACCORDING TO NEC 250, NEC 690.47 AND AHJ.

2.5.10 GROUND-FAULT DETECTION SHALL COMPLY WITH NEC 690.41(B)(1) AND (2) TO REDUCE FIRE HAZARDS

2.6.1 DISCONNECTION AND OVER-CURRENT PROTECTION NOTES:

2.6.2 DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING ENERGIZED ARE RECONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS).

2.6.3 DISCONNECTS TO BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH

2.6.4 PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION TO REDUCE SHOCK HAZARD FOR EMERGENCY RESPONDERS IN ACCORDANCE WITH 690.12(A) THROUGH (D).

2.6.5 ALL OCPD RATINGS AND TYPES SPECIFIED ACCORDING TO NEC 690.8, 690.9, AND 240.

2.6.6 MICROINVERTER BRANCHES CONNECTED TO A SINGLE BREAKER OR GROUPED FUSES IN ACCORDANCE WITH NEC 110.3(B).

2.6.7 IF REQUIRED BY AHJ, SYSTEM WILL INCLUDE ARC-FAULT CIRCUIT PROTECTION ACCORDING TO NEC 690.11 AND UL1699B.

2.7.1 INTERCONNECTION NOTES:

2.7.2 LOAD-SIDE INTERCONNECTION SHALL BE IN ACCORDANCE WITH [NEC 705.12 (B)]

2.7.3 THE SUM OF THE UTILITY OCPD AND INVERTER CONTINUOUS OUTPUT MAY NOT EXCEED 120% OF BUSBAR RATING [NEC 705.12(B)(2)(3)(b)].

2.7.4 THE SUM OF 125 PERCENT OF THE POWER SOURCE(S) OUTPUT CIRCUIT CURRENT AND THE RATING OF THE OVERCURRENT DEVICE PROTECTING THE BUSBAR SHALL NOT EXCEED 120 PERCENT OF THE AMPACITY OF THE BUSBAR, PV DEDICATED BACKFEED BREAKERS MUST BE LOCATED OPPOSITE END OF THE BUS FROM THE UTILITY SOURCE OCPD [NEC 705.12(B)(2)(3)].

2.7.5 AT MULTIPLE ELECTRIC POWER SOURCES OUTPUT COMBINER PANEL, TOTAL RATING OF ALL OVERCURRENT DEVICES SHALL NOT EXCEED AMPACITY OF BUSBAR. HOWEVER, THE COMBINED OVERCURRENT DEVICE MAY BE EXCLUDED ACCORDING TO NEC 705.12 (B)(2)(3)(C).

2.7.6 FEEDER TAP INTERCONNECTION (LOADSIDE) ACCORDING TO NEC 705.12 (B)(2)(1)

2.7.7 SUPPLY SIDE TAP INTERCONNECTION ACCORDING TO NEC 705.12 (A) WITH SERVICE ENTRANCE CONDUCTORS IN ACCORDANCE WITH NEC 230.42

2.7.8 BACKFEEDING BREAKER FOR ELECTRIC POWER SOURCES OUTPUT IS EXEMPT FROM ADDITIONAL FASTENING [NEC 705.12 (B)(5)].

**CONTRACTOR**



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PROJECT NAME & ADDRESS

NOAH BELL

**128 WEST PARK LN,  
SANFORD,  
NC 27332**

COUNTY: HARNETT COUNTY

**SYSTEM SIZE**

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

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**NOTES**

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**G-002**



(10) QCELLS Q.PEAK DUO BLK-G10+ 360  
 (10) ENPHASE IQ8PLUS-72-2-US

ADDRESS : 128 WEST PARK LN  
 CITY ZIP : SANFORD, NC 27332

METER NO: 167 630 048

TOTAL ROOF SQUARE FOOTAGE IS: 1027.08 FT<sup>2</sup>  
 TOTAL ARRAY SQUARE FOOTAGE IS: 193.10 FT<sup>2</sup>  
 % COVERED BY SOLAR IS: 18.80%

DC SIZE 10 X 360W = 3.600 kW DC-STC  
 AC SIZE 10X 290W = 2.900 kW AC

CONTRACTOR



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

PROJECT NAME & ADDRESS

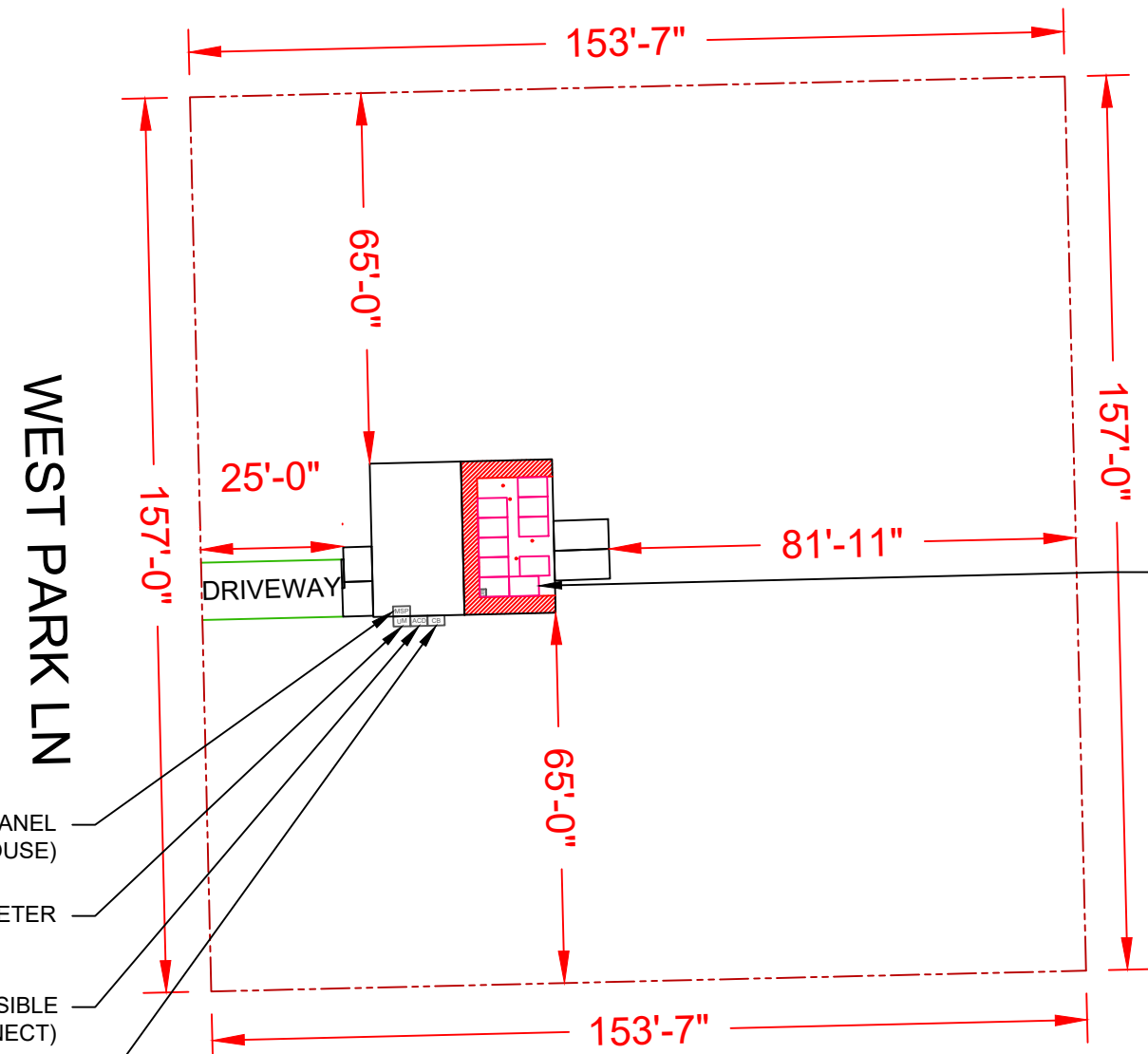
NOAH BELL

**128 WEST PARK LN,  
 SANFORD,  
 NC 27332**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
 AC SIZE: 2.900 KW AC



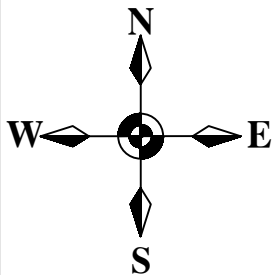
10 QCELLS Q.PEAK DUO BLK-G10+ 360 MODULES WITH  
 ENPHASE IQ8PLUS-72-2-US MICROINVERTERS  
 UNDER EACH MODULE (240V)

(E) MAIN SERVICE PANEL  
 (INSIDE HOUSE)

(E) UTILITY METER







(N) VISIBLE LOCKABLE LABELED AND NON- FUSIBLE  
 AC DISCONNECT (UTILITY DISCONNECT)

(N) ENPHASE IQ COMBINER 4/4C  
 PANEL WITH ENPHASE IQ GATEWAY



1 | SITE PLAN  
 SCALE: 1/32" = 1'-0"

LEGEND

-  - FIRE SETBACK
-  - PROPERTY LINE
-  - JUNCTION BOX
-  - SKYLIGHT (ROOF OBSTRUCTION)
-  - CHIMNEY (ROOF OBSTRUCTION)
-  - VENT, ATTIC FAN (ROOF OBSTRUCTION)

This item has been digitally  
 signed and sealed by  
 Henry I. DiFranco, Jr., P.E.  
 on **September 8, 2022**  
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 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

SHEET TITLE

**SITE PLAN**

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

**A-101**

① - MODULE STRING

### ROOF SECTION(S)

ROOF 1	TILT - 23° AZIMUTH - 89° MODULE - 10 SYSTEM SIZE (KW)- 3.60
--------	--

### CONTRACTOR



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

### PROJECT NAME & ADDRESS

NOAH BELL

**128 WEST PARK LN,  
SANFORD,  
NC 27332**

COUNTY:-HARNETT COUNTY

### SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

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NORTH CAROLINA FIRM NO. C4113

### SHEET TITLE

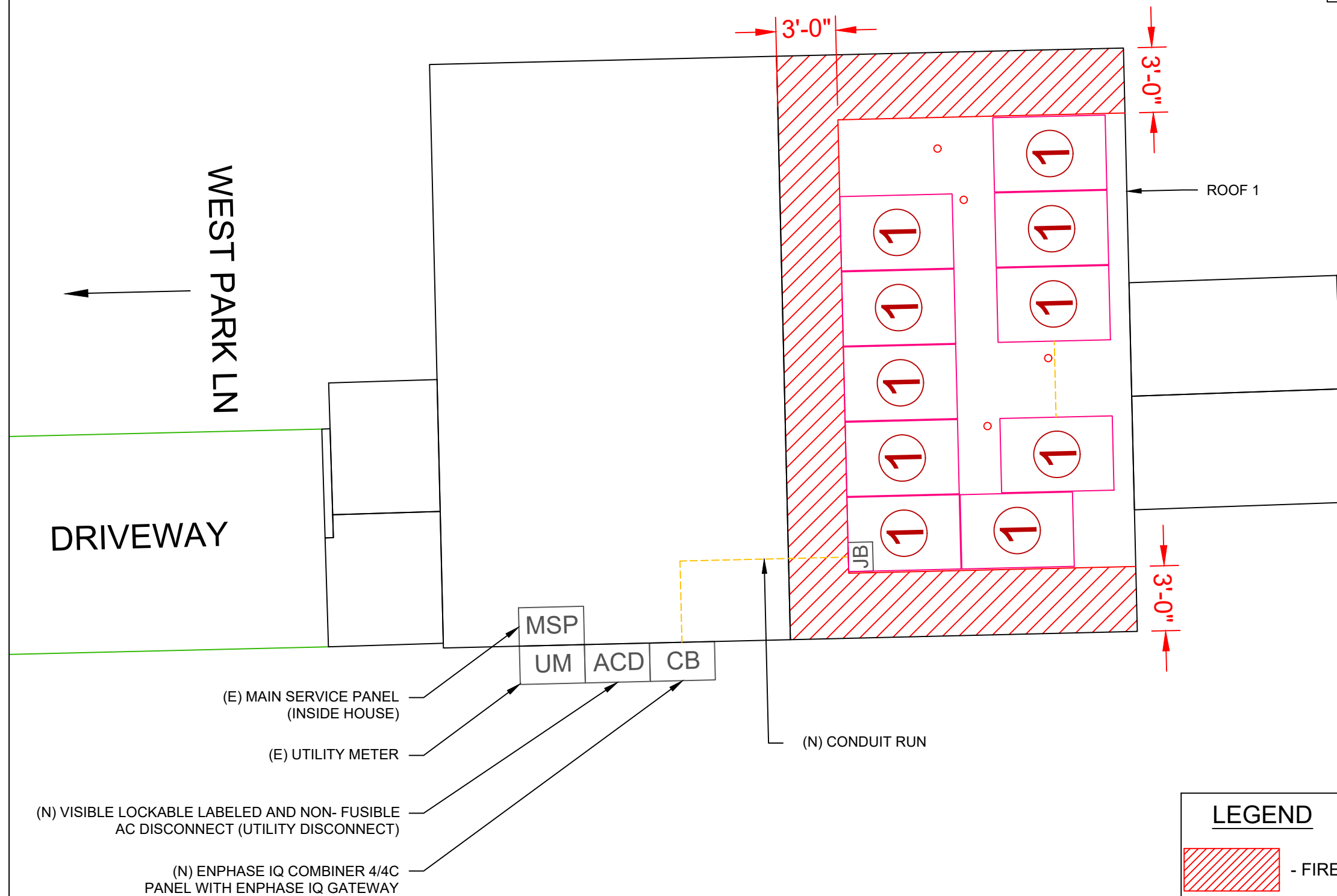
**ELECTRICAL PLAN**

DRAWN DATE 9/2/2022

DRAWN BY NSS

### SHEET NUMBER

**A-102**



DRIVEWAY

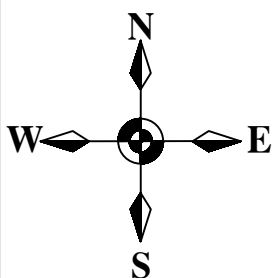
WEST PARK LN

- (E) MAIN SERVICE PANEL (INSIDE HOUSE)
- (E) UTILITY METER
- (N) VISIBLE LOCKABLE LABELED AND NON-FUSIBLE AC DISCONNECT (UTILITY DISCONNECT)
- (N) ENPHASE IQ COMBINER 4/4C PANEL WITH ENPHASE IQ GATEWAY

(N) CONDUIT RUN

### LEGEND

- FIRE SETBACK
- PROPERTY LINE
- JUNCTION BOX
- SKYLIGHT (ROOF OBSTRUCTION)
- CHIMNEY (ROOF OBSTRUCTION)
- VENT, ATTIC FAN (ROOF OBSTRUCTION)

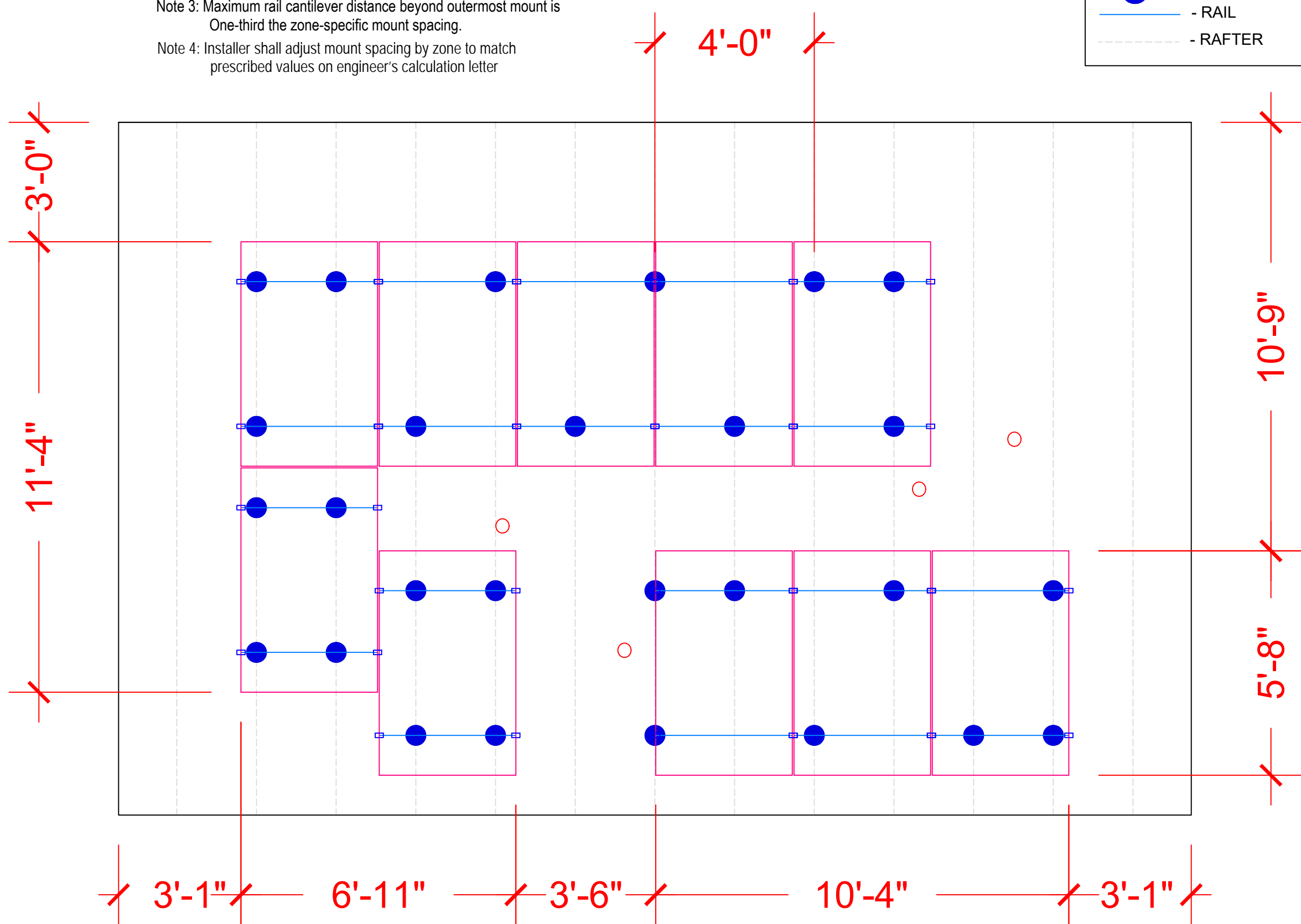
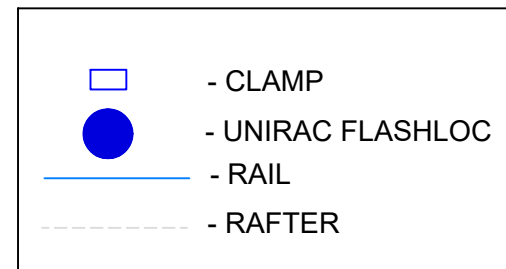


## 1 | ELECTRICAL PLAN

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

TOTAL MOUNT COUNT - 27

- Note 1: Windspeed value is in accordance with ASCE 7-10, Risk Cat II  
 Note 2: a) Lag bolt shall be mounted 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 PLAN  
 SCALE: 3/8" = 1'-0"

ARRAY 1  
 TILT- 23 DEG  
 AZIMUTH - 89 DEG

CONTRACTOR



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

PROJECT NAME & ADDRESS

NOAH BELL

128 WEST PARK LN,  
 SANFORD,  
 NC 27332

COUNTY: -HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
 AC SIZE: 2.900 KW AC

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 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

SHEET TITLE

ATTACHMENT PLAN

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

A-103

All dimensions and information provided by ADT Solar inspection.

**ROOF SECTION(S)**

ROOF 1	ROOF MATERIAL - COMPOSITE SHINGLE TRUSS SIZE - 2"X4" O.C. SPACING - 24"
--------	--

**CONTRACTOR**



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

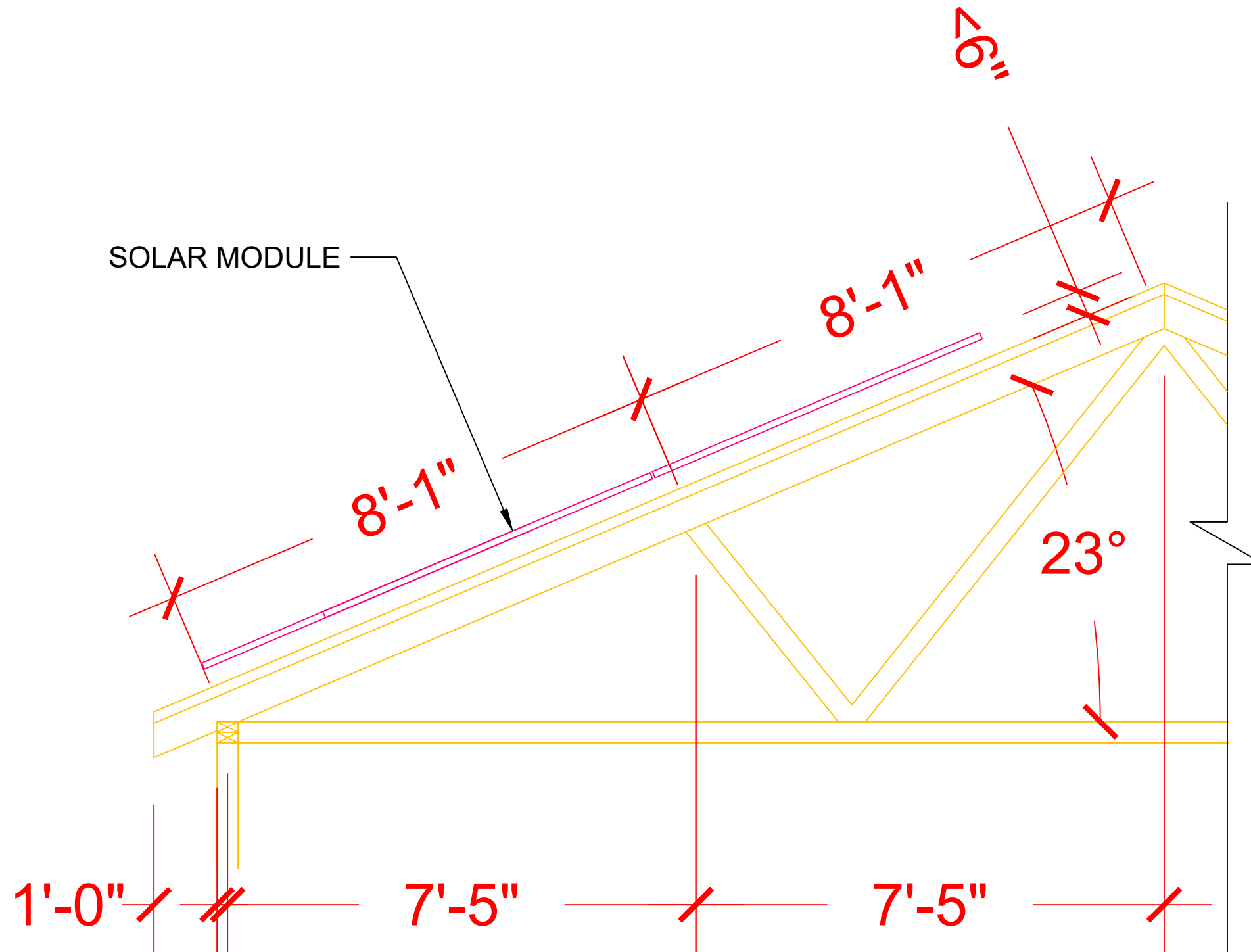
NOAH BELL

**128 WEST PARK LN,  
SANFORD,  
NC 27332**

COUNTY:-HARNETT COUNTY

**SYSTEM SIZE**

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC



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SHEET TITLE

**STRUCTURAL PLAN**

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

**A-104**

**1 | STRUCTURAL PLAN**

**SCALE: 1/2"=1'-0"**

**ROOF 1**

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	QCELLS Q.PEAK DUO BLK-G10+ 360
VMP	34.31V
IMP	10.49A
VOC	41.18V
ISC	11.04A
TEMP. COEFF. VOC	-0.27%/K
MODULE DIMENSION	67.59"L x 41.14"W x 1.26"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ8PLUS-72-2-US MICROINVERTER
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 STRING	13 (SINGLE PHASE)
MAX OUTPUT POWER	290 VA

WIRE /CONDUIT SCHEDULE	
TAG	DESCRIPTION
1	(1)#12/2 ROMEX IN ATTIC/ (2)#12 THWN-2 ON EXTERIOR & (1)#10 THWN-2 GROUND / (GN)
2	(3)#10 THWN-2 & (1)#10 THWN-2 GROUND / (GN)
3	(3)#10 THWN-2 & (1)#10 THWN-2 GROUND / (GN)
4	(1)#6 BARE GROUND

DC SIZE 10 X 360W = 3.600 kW DC-STC  
AC SIZE 10X 290W = 2.900 kW AC

(GN) GENERAL CONDUIT NOTE :  
CONDUIT TO BE UL LISTED FOR WET LOCATIONS AND UV PROTECTED (EX. -EMT,SCH 80 PVC OR RMC)\*FMC MAYBE USED IN INDOOR APPLICATIONS WHERE PERMITTED BY NEC ART .348

**CONTRACTOR**  
**ADT Solar**

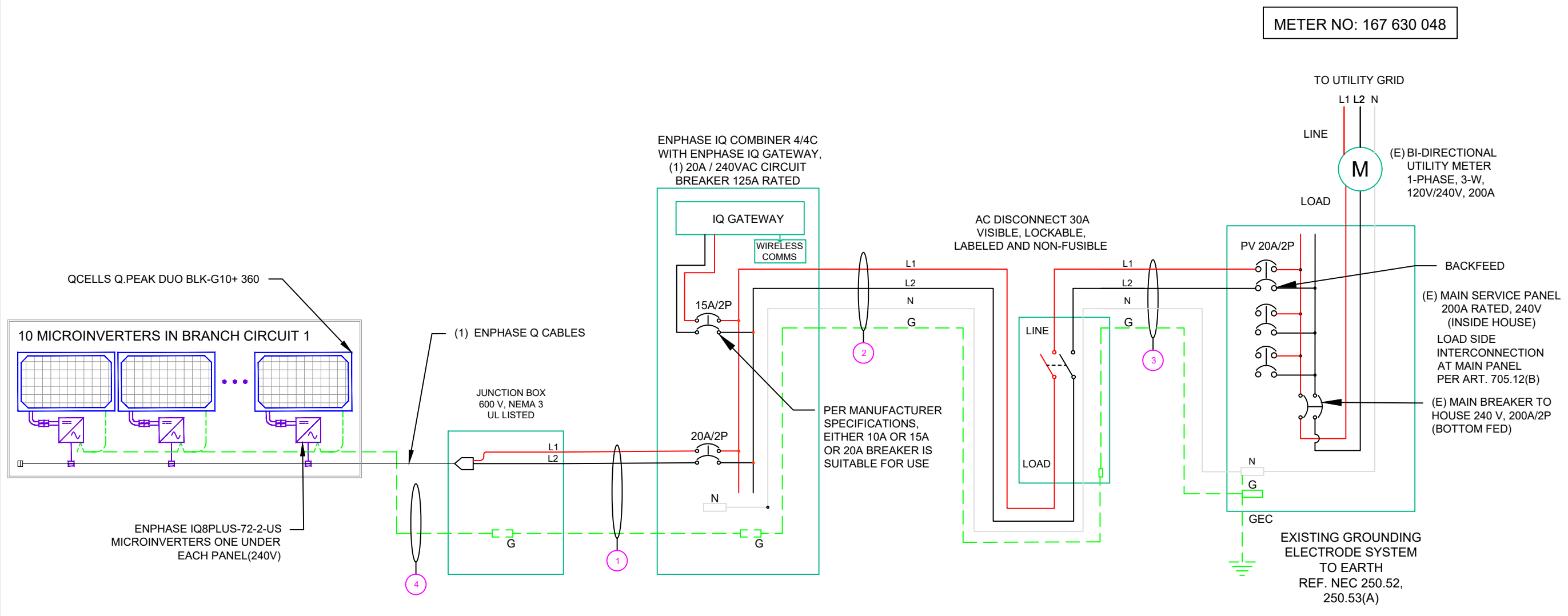
22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS  
NOAH BELL

**128 WEST PARK LN,  
SANFORD,  
NC 27332**

COUNTY:-HARNETT COUNTY

**SYSTEM SIZE**  
DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC



SOLAR BREAKER LOCATED AT THE FURTHEST END OF BUSBAR FROM THE MAIN BREAKER OR FEEDER UNIT

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NORTH CAROLINA FIRM NO. C4113

SHEET TITLE  
**LINE DIAGRAM**

DRAWN DATE 9/2/2022  
DRAWN BY NSS

SHEET NUMBER  
**E-601**

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-10°
AMBIENT TEMP (HIGH TEMP 2%)	36°
CONDUIT HEIGHT	0.5"
CONDUCTOR TEMPERATURE RATE	90°

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

### CALCULATIONS:

#### 1. CURRENT CARRYING CONDUCTOR

##### (A) BEFORE IQ COMBINER PANEL

AMBIENT TEMPERATURE - (36)°C ...NEC 310.15(B)(3)(c)

TEMPERATURE DERATE FACTOR - 0.91 ...NEC

310.15(B)(2)(a)

GROUPING FACTOR - 1...NEC 310.15(B)(3)(a)

##### CONDUCTOR AMPACITY

= (INV O/P CURRENT ) x 1.25 / A.T.F / G.F ...NEC 690.8(B)

= [(10 x 1.21) x 1.25] / [0.91 x 1]

= 16.62A

SELECTED CONDUCTOR - #12 THWN-2 ...NEC 310.15(B)(16)

##### (B) AFTER IQ COMBINER PANEL

TEMPERATURE DERATE FACTOR - 0.91

GROUPING FACTOR - 1

##### CONDUCTOR AMPACITY

= (TOTAL INV O/P CURRENT) x 1.25 / 0.91/ 1 ...NEC 690.8(B)

= [(10 x 1.21) x 1.25] / [0.91 x 1]

= 16.62 A

SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.15(B)(16)

#### 2. PV OVER CURRENT PROTECTION ...NEC 690.9(B)

= TOTAL INVERTER O/P CURRENT x 1.25

= (10 x 1.21) x 1.25 = 15.13 A

SELECTED OCPD = 20A ...NEC 240.6

#### 3. 120% RULE FOR BACKFEED BREAKER

...NEC 705.12(B)(2)(3)(b)

MCB + PV BREAKER <= (1.2 x BUS BAR  
RATING RATING RATING)

(200 + 20) <= 1.2 x 200A

220.00 <= 240.00 HENCE OK

### CONTRACTOR



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

### PROJECT NAME & ADDRESS

NOAH BELL

128 WEST PARK LN,  
SANFORD,  
NC 27332

COUNTY:-HARNETT COUNTY

### SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

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

SHEET TITLE  
**ELECTRICAL  
CALCULATIONS**

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

**E-602**

**WARNING:  
PHOTOVOLTAIC  
POWER SOURCE**

**LABEL 1**  
ON ALL CONDUITS SPACED AT MAX 10FT

**! WARNING !**  
ELECTRIC SHOCK HAZARD  
DO NOT TOUCH TERMINALS.  
TERMINALS ON BOTH LINE AND LOAD SIDES  
MAY BE ENERGIZED IN THE OPEN POSITION

**LABEL 5**  
AT EACH AC DISCONNECT

**! CAUTION !**  
SOLAR POINT OF  
INTERCONNECTION

**LABEL 9**  
AT UTILITY METER

**! CAUTION !**  
SOLAR ELECTRIC  
SYSTEM CONNECTED  
AND ENERGIZED

**LABEL 2**  
AT INVERTER

**PHOTOVOLTAIC  
AC DISCONNECT**

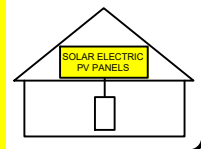
**LABEL 6**  
AT EACH AC DISCONNECT

**! WARNING !**  
THE SERVICE METER IS ALSO SERVED  
BY A PHOTOVOLTAIC SYSTEM

**LABEL 10**  
AT UTILITY METER

**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 3**  
AT INVERTER

**! WARNING !**  
DUAL POWER SOURCES  
SECOND SOURCE IS PV SYSTEM

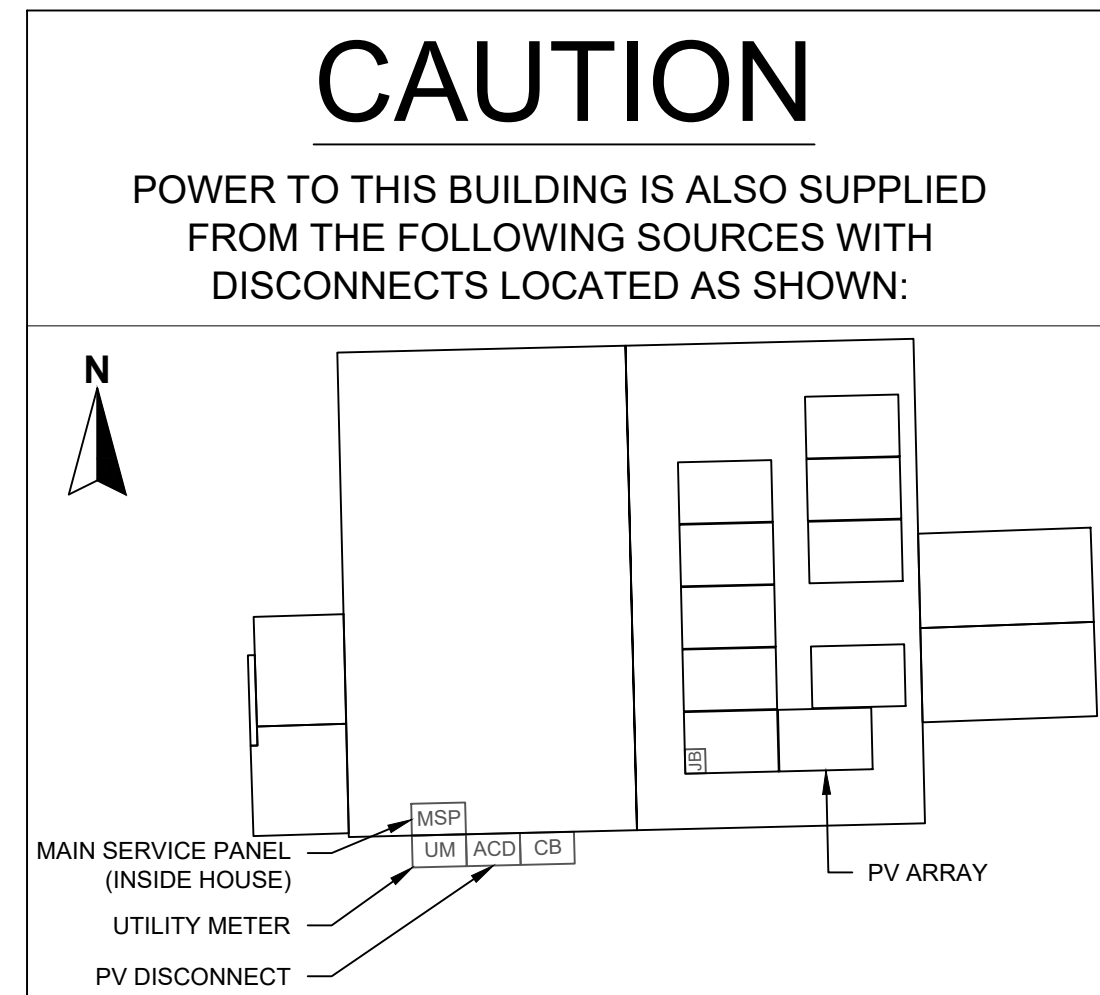
**LABEL 7**  
AT MEP

**PHOTOVOLTAIC  
DC DISCONNECT**

**LABEL 4**  
AT DC DISCONNECT

**! WARNING !**  
SOLAR SYSTEM CONNECTED  
AND ENERGIZED

**LABEL 8**  
AT MEP



**CONTRACTOR**



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

NOAH BELL

**128 WEST PARK LN,  
SANFORD,  
NC 27332**

COUNTY:-HARNETT COUNTY

**SYSTEM SIZE**

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

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NORTH CAROLINA FIRM NO. C4113

SHEET TITLE

**PLACARD**

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

**E-603**

powered by  
**Q.ANTUM DUO Z**

PRELIMINARY

# Q.PEAK DUO BLK-G10+

## 350-370

ENDURING HIGH PERFORMANCE



Quality Controlled PV

www.tuv.com  
ID: 1111232615



### BREAKING THE 20% 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 (5400 Pa) and wind loads (4000 Pa).



### 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 (~1500 V, 96 h)  
<sup>2</sup> See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:



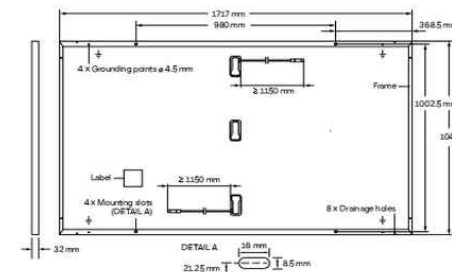
Rooftop arrays on residential buildings

Engineered in Germany



## MECHANICAL SPECIFICATION

Format	1717 mm × 1045 mm × 32 mm (including frame)
Weight	19.9 kg
Front Cover	3.2 mm thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodised aluminium
Cell	6 × 20 monocrystalline Q.ANTUM solar half cells
Junction box	53-101 mm × 32-60 mm × 15-18 mm Protection class IP67, with bypass diodes
Cable	4 mm <sup>2</sup> Solar cable; (+) ≥ 1150 mm, (-) ≥ 1150 mm
Connector	Stäubli MC4; IP68

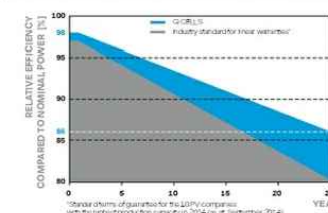


## ELECTRICAL CHARACTERISTICS

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>2</sup>	I <sub>SC</sub> [A]	10.97	11.00	11.04	11.07	11.10
	Open Circuit Voltage <sup>3</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>4</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> ± 5% at STC; 1000 W/m<sup>2</sup>, 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • 800 W/m<sup>2</sup>, NMOT, spectrum AM 1.5

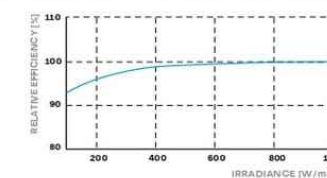
### Q CELLS PERFORMANCE WARRANTY



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]	-0.34	Nominal Module Operating Temperature	NMOT [°C]	43 ± 3

### PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage	V <sub>sys</sub> [V]	1000	PV module classification	Class II
Maximum Reverse Current	I <sub>r</sub> [A]	20	Fire Rating based on ANSI / UL 61730	C / TYPE 2
Max. Design Load, Push / Pull	[Pa]	3600 / 2660	Permitted Module Temperature on Continuous Duty	-40 °C - +85 °C
Max. Test Load, Push / Pull	[Pa]	5400 / 4000		

### QUALIFICATIONS AND CERTIFICATES

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



**Note:** Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS GmbH

Sonnenallee 17-21, 06766 Bitterfeld-Wolfen, Germany | TEL +49 (0)3494 66 99-23444 | FAX +49 (0)3494 66 99-23000 | EMAIL sales@q-cells.com | WEB www.q-cells.com

Engineered in Germany



CONTRACTOR



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

NOAH BELL

128 WEST PARK LN,  
SANFORD,  
NC 27332

COUNTY: HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

SHEET TITLE  
**RESOURCE DOCUMENT**

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

R-001

Specifications subject to technical changes © Q CELLS Q-PEAK DUO BLK-G10+ 350-370\_2021-08\_Rev01\_EN



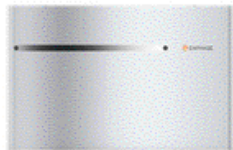


DATA SHEET



## 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 IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play 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.

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IQ8SP-DS-0002-01-EN-US-2021-10-19

### 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-SA) requirements

## IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-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 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 Isc)	A		15
Overtoltage class DC port			II
DC port backfeed current	mA		0
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-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	10	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
Max units per 20 A (L-L) branch circuit <sup>4</sup>		16	13
Total harmonic distortion		<5%	
Overtoltage 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		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Acoustic noise at 1m		<60 dBA	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01	
Certifications		This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

(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.

IQ8SP-DS-0002-01-EN-US-2021-10-19

CONTRACTOR



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

NOAH BELL

128 WEST PARK LN,  
SANFORD,  
NC 27332

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

SHEET TITLE  
**RESOURCE  
DOCUMENT**

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

R-002

# 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



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

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



## 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 BR2 10 Circuit breaker, 2 pole, 15A, Eaton BR2 15 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR2 15B 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
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](http://enphase.com)

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## CONTRACTOR



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

### PROJECT NAME & ADDRESS

NOAH BELL

**128 WEST PARK LN,  
SANFORD,  
NC 27332**

COUNTY:-HARNETT COUNTY

### SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

## SHEET TITLE RESOURCE DOCUMENT

DRAWN DATE	9/2/2022
DRAWN BY	NSS

SHEET NUMBER  
**R-003**

CONTRACTOR



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

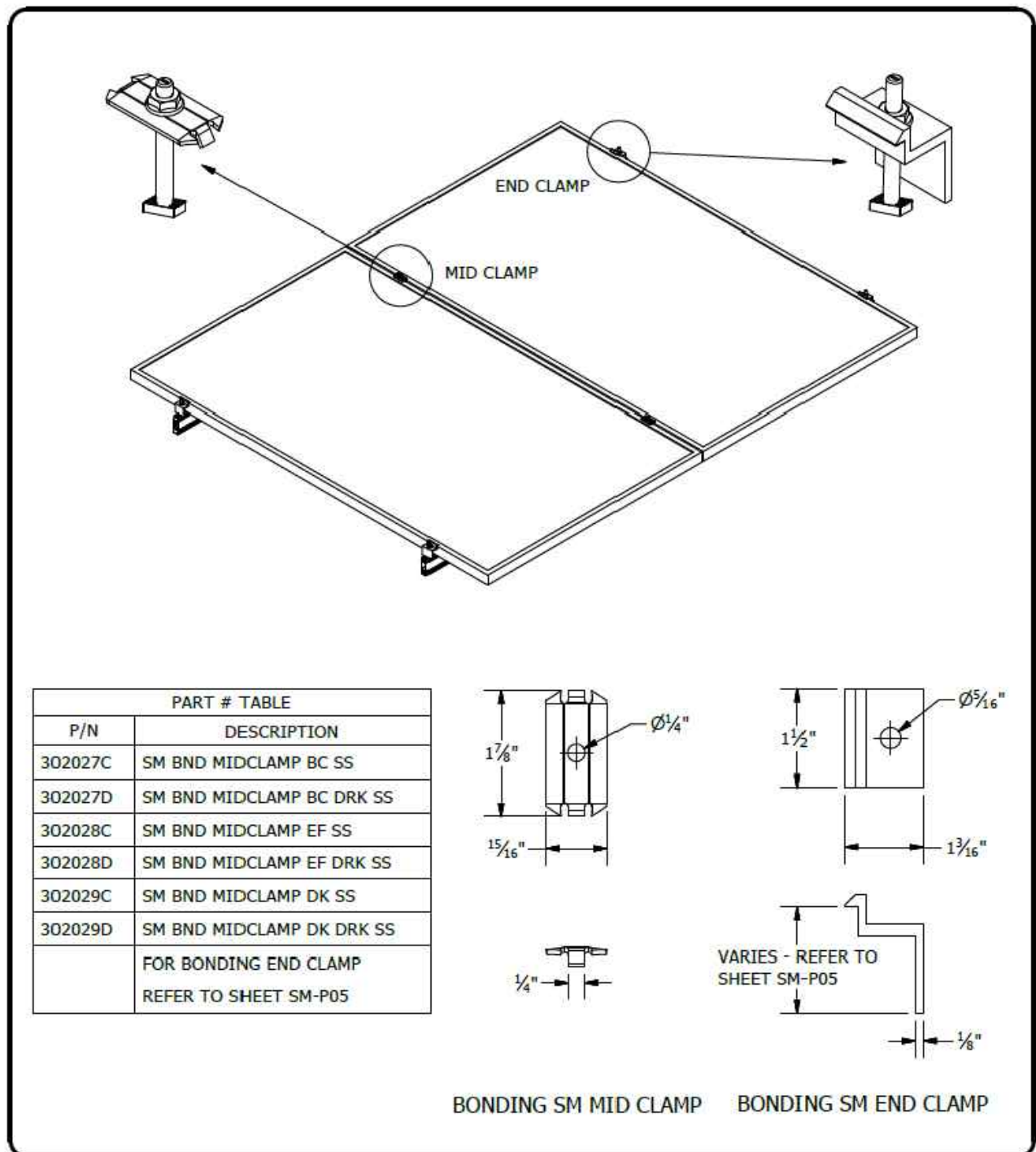
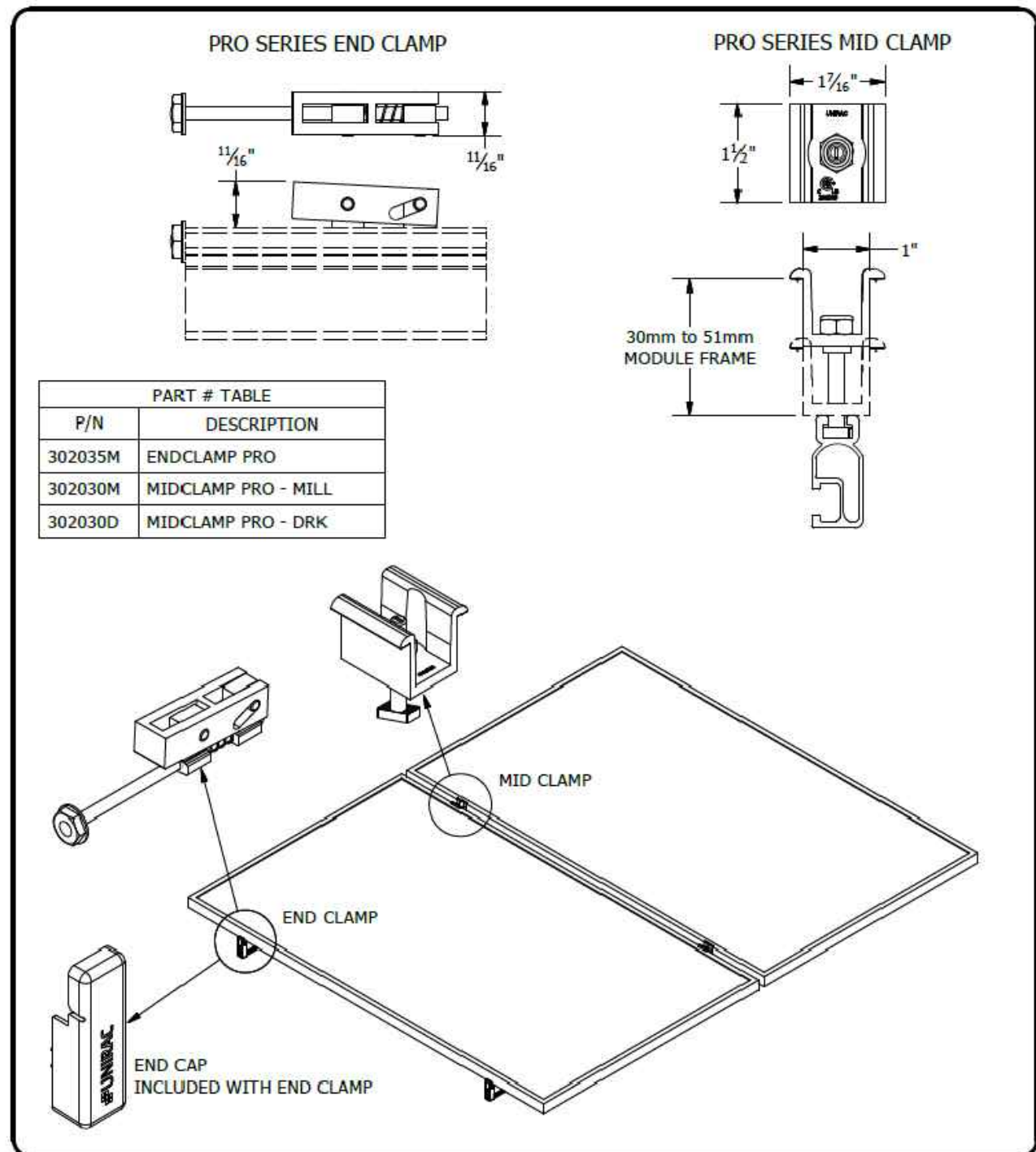
NOAH BELL

128 WEST PARK LN,  
SANFORD,  
NC 27332

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC



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

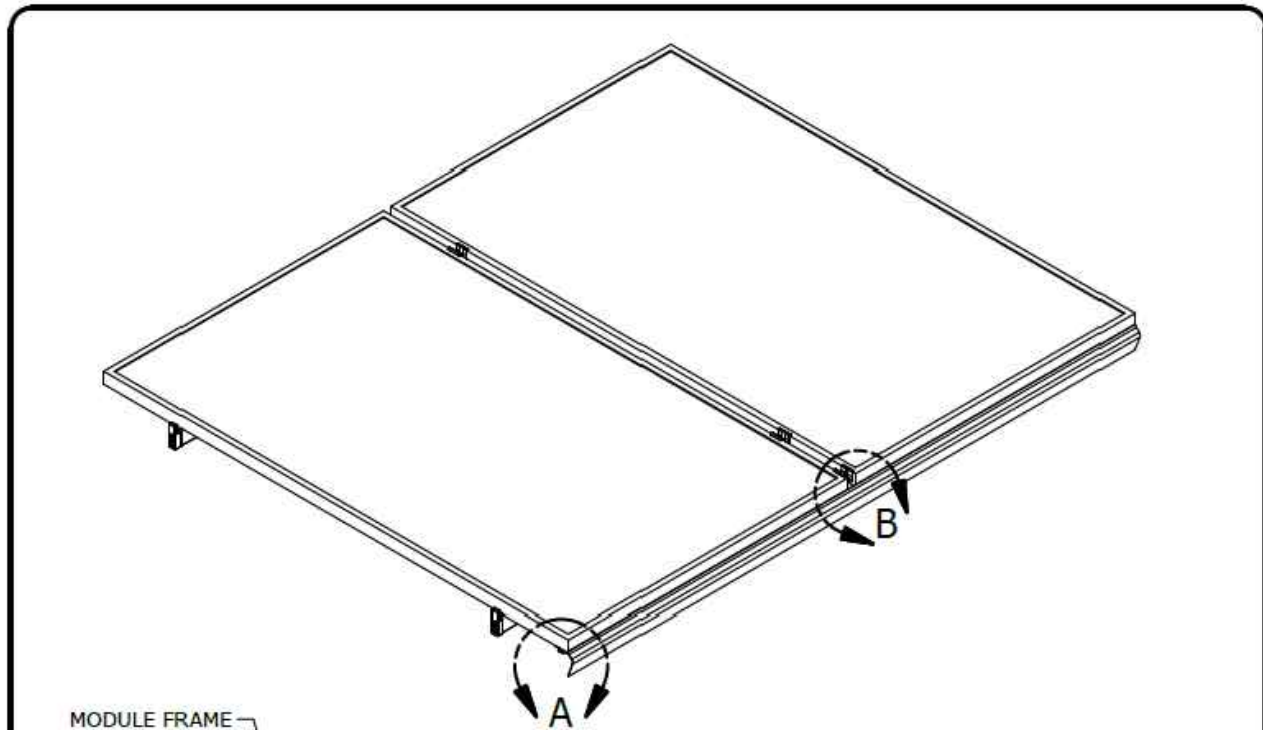
LEGAL NOTICE

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SHEET

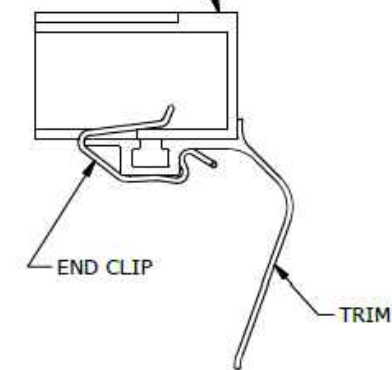
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**RESOURCE DOCUMENT**

DRAWN DATE	9/2/2022
DRAWN BY	NSS

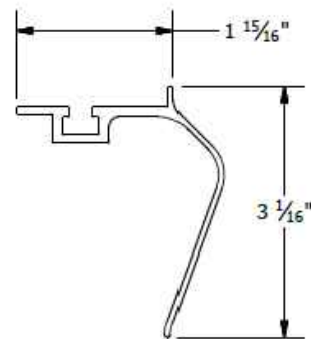
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**R-004**



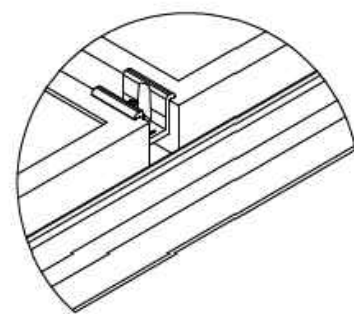
MODULE FRAME



DETAIL A  
TRIM END CLIP



TRIM



DETAIL B  
MID CLAMP TRIM CONNECTION

PART # TABLE		
P/N	DESCRIPTION	LENGTH
206072D-B	SM TRIM DRK	168"
008025S	SM TRIM END CLIP	-



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

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

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

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SM-A02

SHEET



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

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DRAWING
DESCRIPTION:	FLASHLOC COMP KIT
REVISION DATE:	10/3/2019

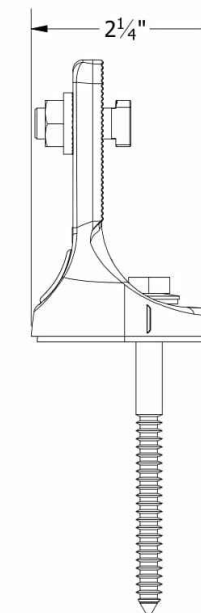
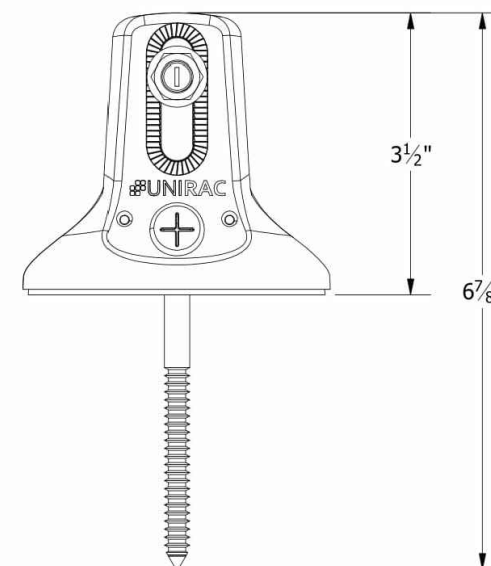
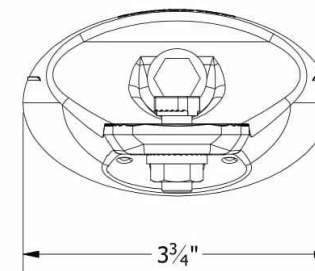
DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS  
LEGAL NOTICE

FL-A01

SHEET

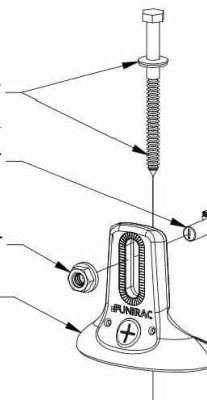
PART TABLE	
P/N	DESCRIPTION
004085M	FLASHLOC COMP KIT MILL, 20 PACK
004085D	FLASHLOC COMP KIT DARK, 20 PACK



SS LAG BOLT  
W/ SS EPDM BONDED WASHER  
SS SERRATED T-BOLT

SS SERRATED FLANGE NUT

FLASHLOC BASE  
MILL OR DARK



CONTRACTOR



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

NOAH BELL

128 WEST PARK LN,  
SANFORD,  
NC 27332

COUNTY: HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

SHEET TITLE  
RESOURCE  
DOCUMENT

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

R-005

**CONTRACTOR**



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

NOAH BELL

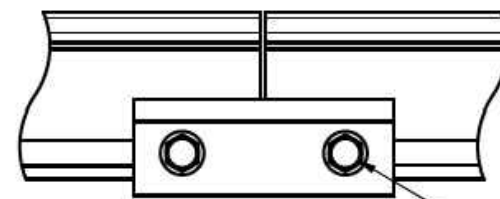
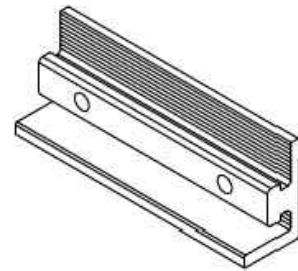
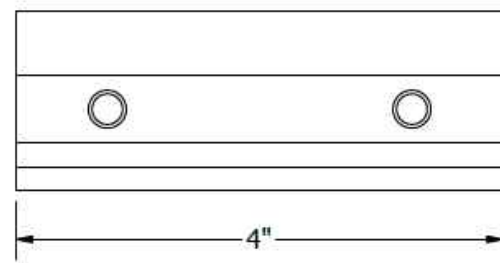
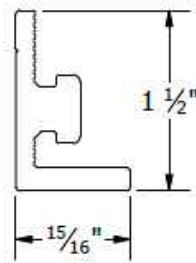
**128 WEST PARK LN,  
SANFORD,  
NC 27332**

COUNTY:-HARNETT COUNTY

**SYSTEM SIZE**

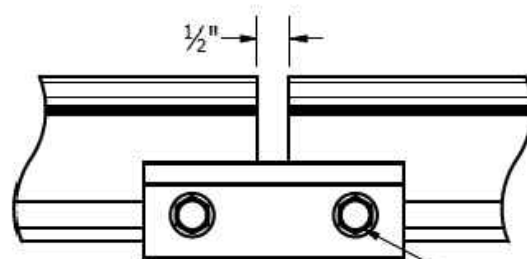
DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

**BONDING SPLICE BAR**



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

TYPICAL SPLICE BAR DETAIL



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

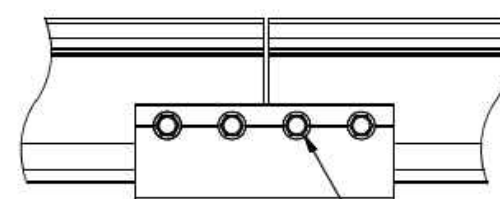
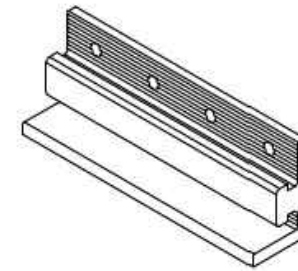
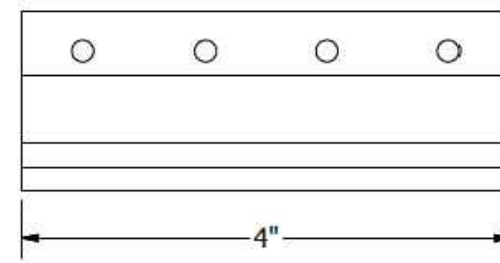
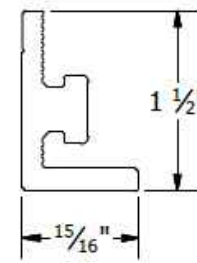
PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**SM-A05**

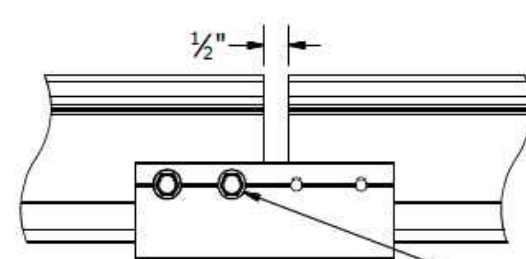
SHEET

**BONDING SPLICE BAR**



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

TYPICAL SPLICE BAR DETAIL



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

SHEET TITLE  
**RESOURCE  
DOCUMENT**

DRAWN DATE 9/2/2022

DRAWN BY NSS

SHEET NUMBER

**R-006**

CONTRACTOR



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

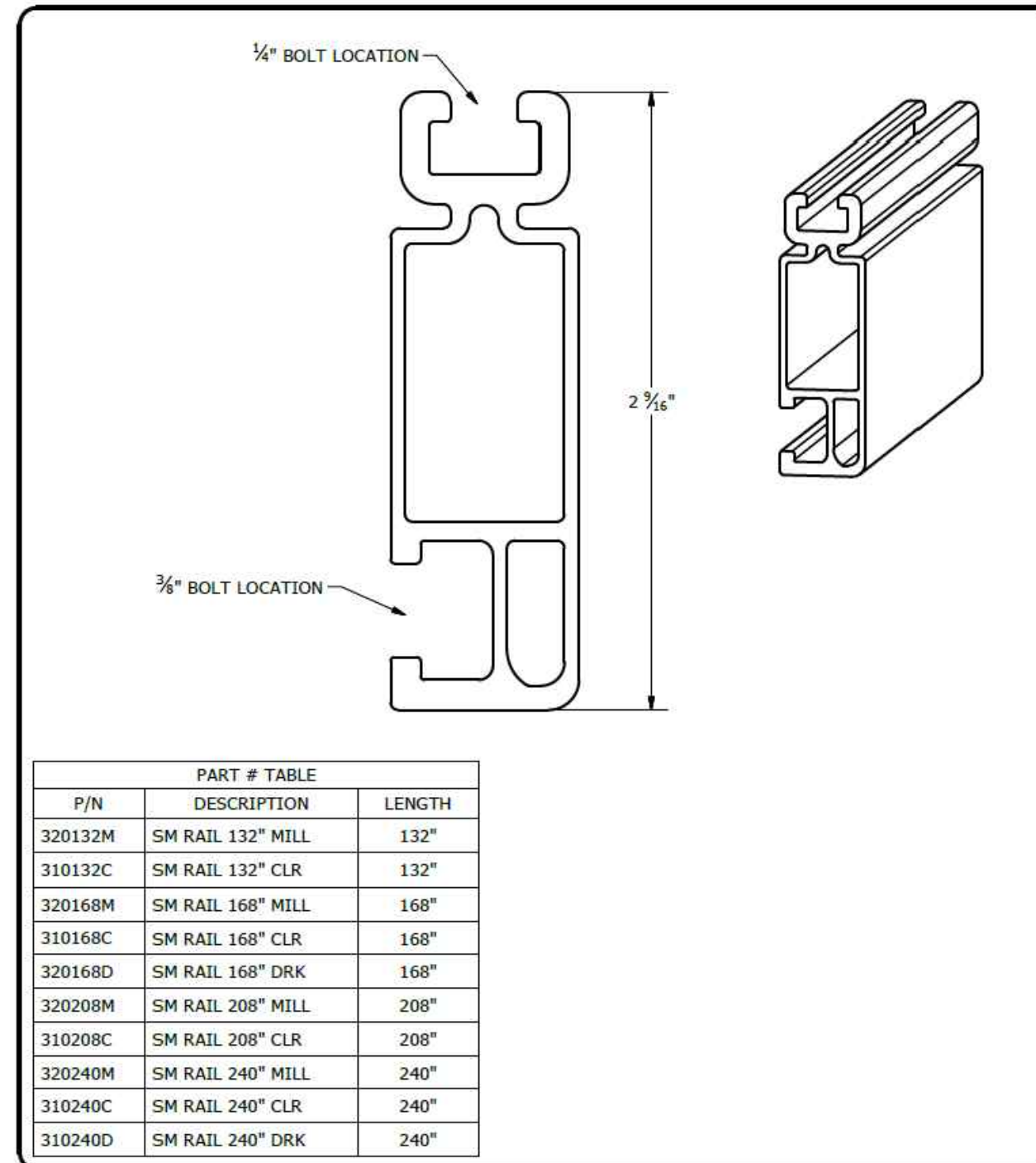
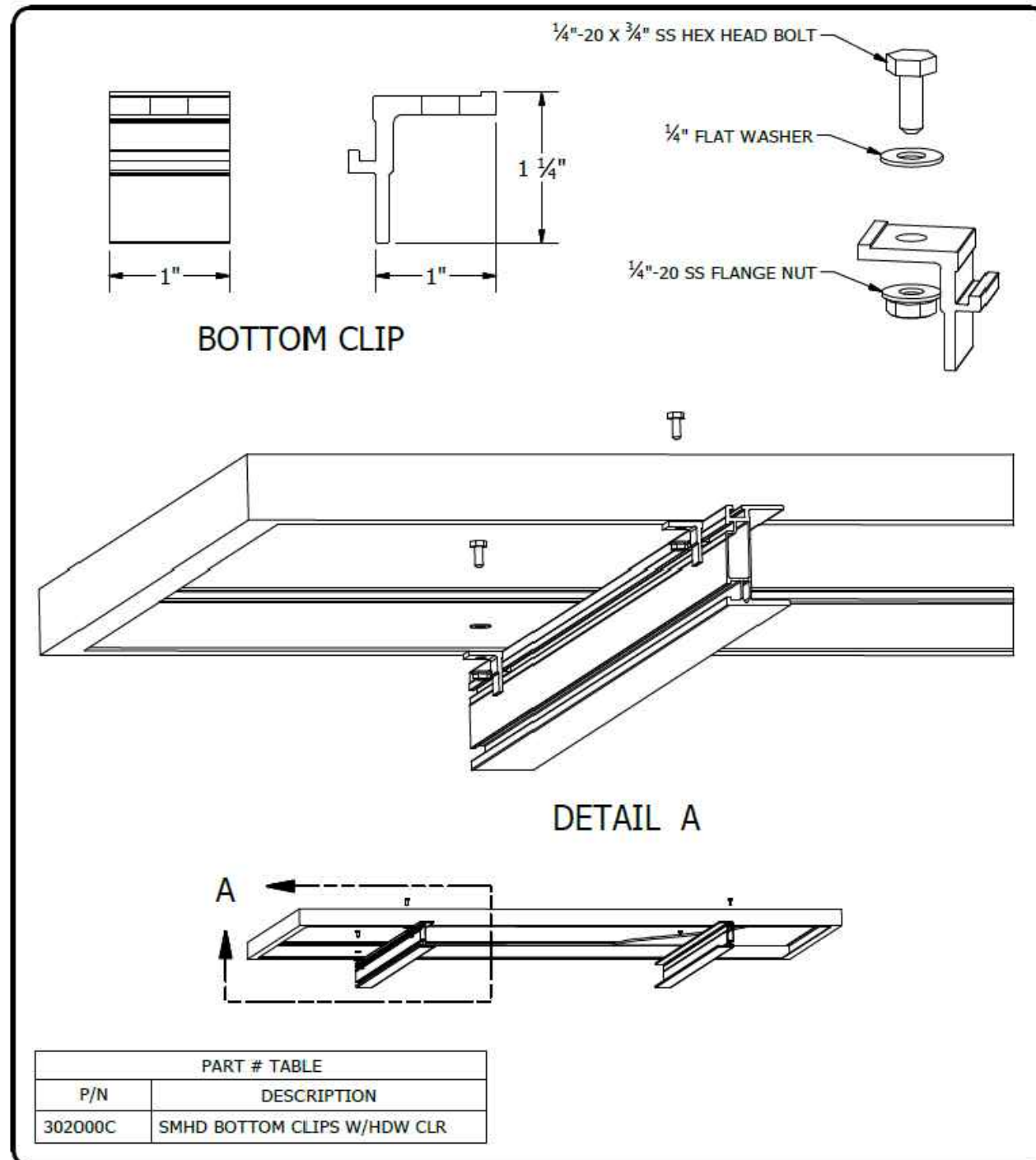
NOAH BELL

128 WEST PARK LN,  
SANFORD,  
NC 27332

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC



 1411 BROADWAY BLVD. NE ALBUQUERQUE, NM 87102 USA PHONE: 505.242.6411 WWW.UNIRAC.COM	PRODUCT LINE:	SOLARMOUNT HD	DRAWING NOT TO SCALE ALL DIMENSIONS ARE NOMINAL	SM-A10
	DRAWING TYPE:	PART & ASSEMBLY		
	DESCRIPTION:	BOTTOM CLIP	PRODUCT PROTECTED BY ONE OR MORE US PATENTS LEGAL NOTICE	SHEET
	REVISION DATE:	9/27/2017		

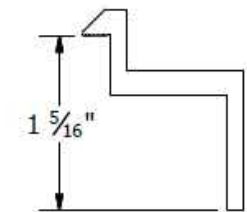
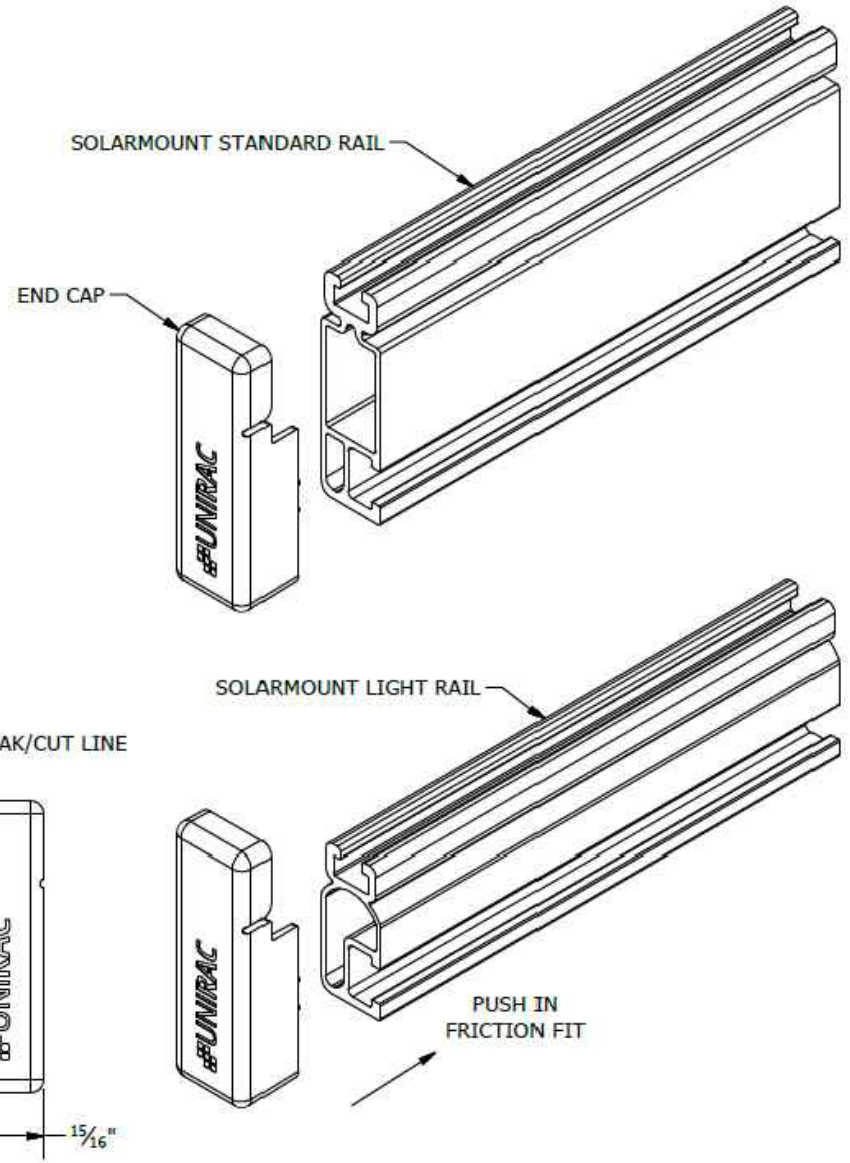
 1411 BROADWAY BLVD. NE ALBUQUERQUE, NM 87102 USA PHONE: 505.242.6411 WWW.UNIRAC.COM	PRODUCT LINE:	SOLARMOUNT	DRAWING NOT TO SCALE ALL DIMENSIONS ARE NOMINAL	SM-P01
	DRAWING TYPE:	PART DETAIL		
	DESCRIPTION:	STANDARD RAIL	PRODUCT PROTECTED BY ONE OR MORE US PATENTS LEGAL NOTICE	SHEET
	REVISION DATE:	9/11/2017		

SHEET TITLE <b>RESOURCE DOCUMENT</b>	
DRAWN DATE	9/2/2022
DRAWN BY	NSS

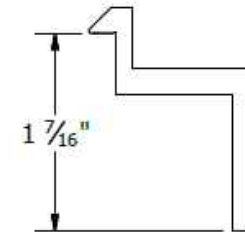
SHEET NUMBER <b>R-007</b>
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**NOTES:**

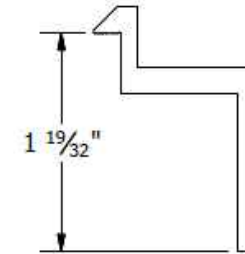
1. END CAP INCLUDED WITH EVERY END CLAMP.
2. END CAP FITS SOLARMOUNT LIGHT AND STANDARD RAIL PROFILES.



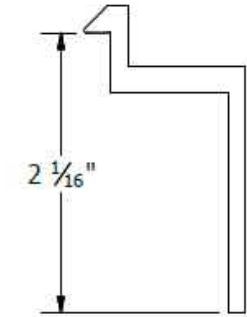
**B CLAMP**  
30mm to 32mm Module Thickness  
(1.18" to 1.26")



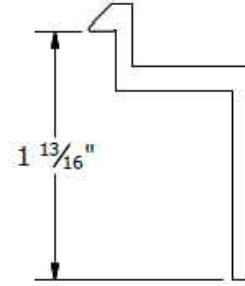
**C CLAMP**  
33mm to 36mm Module Thickness  
(1.30" to 1.42")



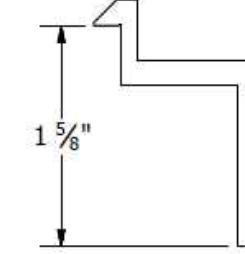
**D CLAMP**  
38mm to 40mm Module Thickness  
(1.50" to 1.57")



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

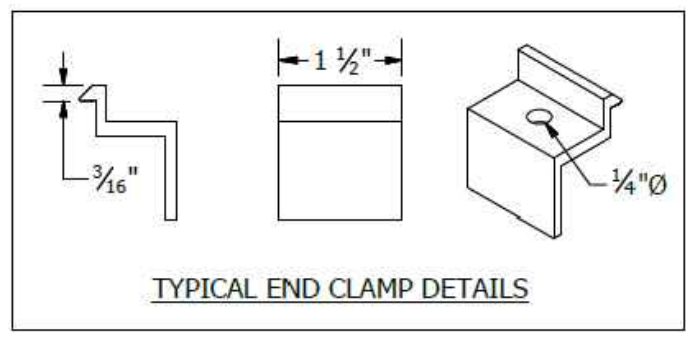


**F CLAMP**  
45mm to 47mm Module Thickness  
(1.77" to 1.85")



**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



**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

**CONTRACTOR**



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

PROJECT NAME & ADDRESS

NOAH BELL

**128 WEST PARK LN,  
SANFORD,  
NC 27332**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 3.600 KW DC-(STC)  
AC SIZE: 2.900 KW AC

SHEET TITLE  
**RESOURCE  
DOCUMENT**

DRAWN DATE	9/2/2022
DRAWN BY	NSS

SHEET NUMBER

**R-008**