



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

May 2022

Property Owner: Edward Bradley Sr

Property Address: 551 Heathrow Drive, Spring Lake, NC 28390

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 PIBC 2018 "NETC 2018 ""PGE 2017
Risk Category: II
Design Wind Speed (3-second gust): 118 MPH
Wind Exposure Category: B
Ground Snow Load: 10 PSF
Seismic Design Category: D

Existing Structure:

Roof Material: Shingle
Roofing Structure: 2x6 rafters @ 24" O.C.
Roof Slope: 4/12

PRINCIPAL ENGINEERING, INC.
1011 N. CAUSEWAY BLVD. STE 19
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NORTH CAROLINA FIRM NO. C4113

PRINCIPAL Infrastructure®

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Effect of the Solar Array on Structure Loading:

Gravity Loads:

Per IBC Section 1607.12.5.1, 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:	Edward Bradley Sr	Individual Panel Dimensions		
Project Address:	551 Heathrow Drive	Length (in)	Width (in)	Area (sf)
City, State:	Spring Lake, NC 28390	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):	55 ft.	Least Dimension:	55 ft.
	Width (w):	55 ft.		
Roof Height (h):		25 ft.	Must be less than 60	✓
Pitch:	4 on 12 =	18.4°	Must be less than 45°	✓
Roof Configuration		Gable		
Roof Structure:		2x Rafters		
Roof material:		Plywood		
Ultimate Wind Speed (mph):		118	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 :		21.21	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	5.5
2 - Roof Height x 0.4	10
3 - Least Roof Horizontal Dimension (L or W) x 0.04	2.2
4 - Lesser of (1) and (2)	5.5
5 - Greater of (3) and (4)	5.5
6 - Greater of (5) and 3 feet	a= 5.5 ft.

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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 _p	Pressure	GC _p	Pressure	
Zone 1	-0.88	16.0	0.40	16.0	Interior Roof Area, >(a) ft from edge
Zone 2	-1.53	-21.7	0.40	16.0	Strip of (a) ft wide at roof edge
Zone 3	-2.40	-32.8	0.39	16.0	Corner intersection of Zone 2 strips

Snow Load		
Ground Snow Load, p _g	10.0	From ASCE 7 or AHJ
Terrain Category:	B	Para 6.5.6.3
Exposure	Fully	
Exposure Factor C _e	0.9	Table 7-2
Thermal Factor, C _t	1.2	Table 7-3
Importance Factor, I _s	1.0	Table 1.5.2
Roof Configuration	Gable	
Roof Slope	18.4°	
Distance from Eave to Ridge	27.5	
p _m , Minimum required Snow Load	N/A	Para. 7.3.4
p _f , Calculated Snow Load	7.56	Eq. 7.3-1
p _f , Design Snow Load	7.56 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.	
Required Mount Layout		
Zone 1	2 rails, mounts @ 4'-0" o.c.	
Zone 2	2 rails, mounts @ 4'-0" o.c.	
Zone 3	2 rails, mounts @ 4'-0" o.c.	
<i>(Allowable loads are based on individual mount failure before rail failure)</i>		

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NEW PHOTOVOLTAIC SYSTEM 9.72 KW DC

551 HEATHROW DR, SPRING LAKE, NC 28390

CONTRACTOR



22171 MCH RD
MANDEVILLE, LA 70471

PHONE: 9152011490

PROJECT NAME & ADDRESS

EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

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SHEET TITLE

COVER PAGE

DRAWN DATE 5/12/2022

DRAWN BY ERK

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 - HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 360 / ENPHASE IQ7PLUS-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: EDWARD BRADLEY SR

PROJECT MANAGER
 NAME: SHAHIN HAYNES
 PHONE: 8665071461

CONTRACTOR NAME
 ADT SOLAR LLC
 PHONE: 5052180838

SCOPE OF WORK

SYSTEM SIZE: STC:27 X 360W= 9.72 KW DC
 PTC: 27 x 338.77W = 9.15 KW DC
 (27) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 360
 (27) ENPHASE IQ7PLUS-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: SOUTH RIVER EMC
 METER NO: 17414230

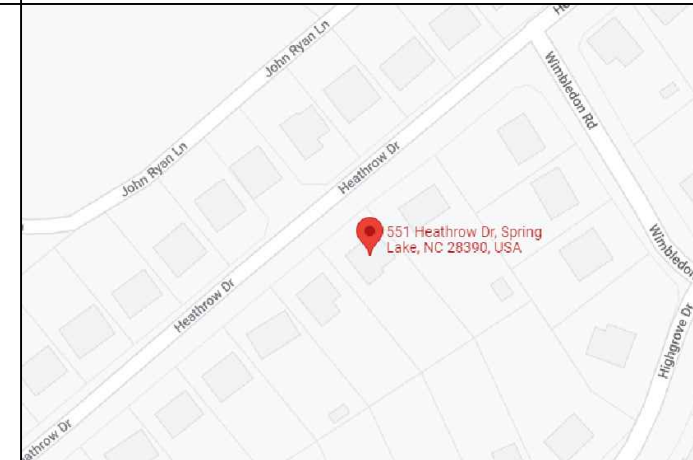
DESIGN SPECIFICATION

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

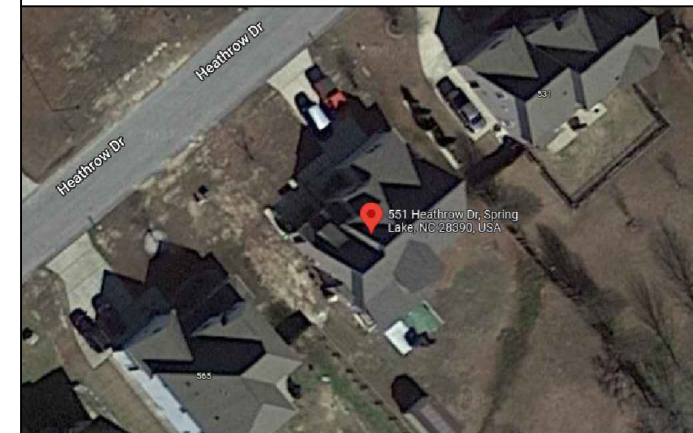
APPLICABLE CODES & STANDARDS

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

VICINITY MAP



SATELLITE VIEW



SHEET INDEX

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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

EDWARD BRADLEY SR

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COUNTY: HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

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NOTES

DRAWN DATE 5/12/2022

DRAWN BY ERK

SHEET NUMBER







G-002

(27) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 360
 (27) ENPHASE IQ7PLUS-72-2-US

ADDRESS : 551 HEATHROW DR
 CITY ZIP : SPRING LAKE, NC 28390

METER NO: 17414230

LEGEND

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

DC SIZE 27 X 360W = 9.720 kW DC-STC
 AC SIZE 27 X 290W = 7.830 kW AC

TOTAL HOME SQUARE FOOTAGE IS: 2669.25 FT²
 TOTAL ARRAY SQUARE FOOTAGE IS: 521.37 FT²
 % COVERED BY SOLAR IS: 19.53%

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PROJECT NAME & ADDRESS
 EDWARD BRADLEY SR

**551 HEATHROW DR,
 SPRING LAKE,
 NC 28390**
 COUNTY: -HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 9.720 KW DC-(STC)
 AC SIZE: 7.830 KW AC

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

SHEET TITLE

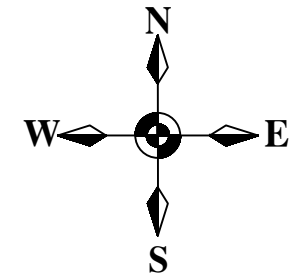
SITE PLAN

DRAWN DATE	5/12/2022
DRAWN BY	ERK

SHEET NUMBER

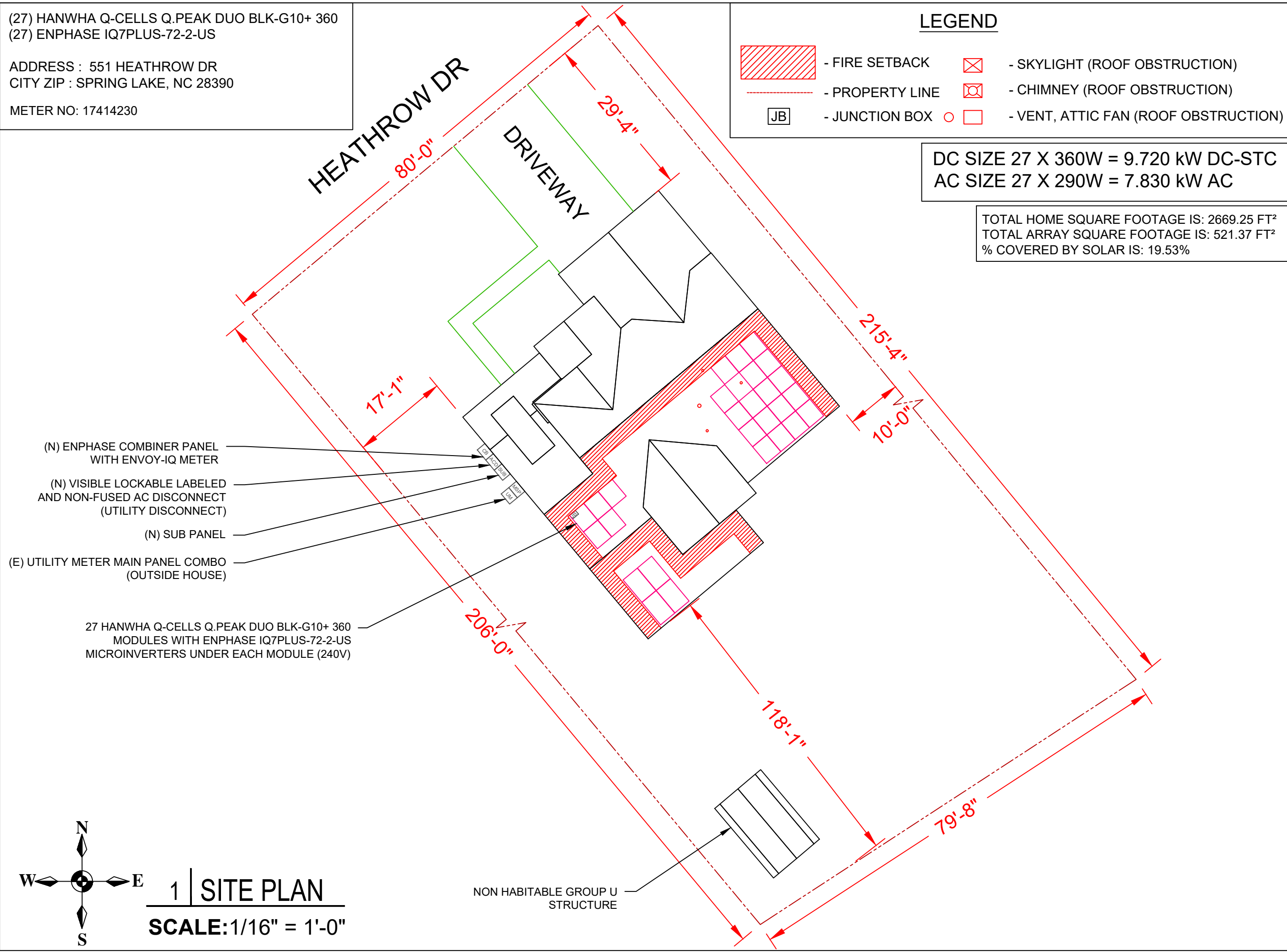
A-101

- (N) ENPHASE COMBINER PANEL WITH ENVOY-IQ METER
- (N) VISIBLE LOCKABLE LABELED AND NON-FUSED AC DISCONNECT (UTILITY DISCONNECT)
- (N) SUB PANEL
- (E) UTILITY METER MAIN PANEL COMBO (OUTSIDE HOUSE)
- 27 HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 360 MODULES WITH ENPHASE IQ7PLUS-72-2-US MICROINVERTERS UNDER EACH MODULE (240V)



1 | SITE PLAN
SCALE: 1/16" = 1'-0"

NON HABITABLE GROUP U STRUCTURE



HEATHROW DR

DRIVEWAY

ROOF SECTION(S)

ROOF 1	TILT - 45° AZIMUTH - 140° MODULE - 23 SYSTEM SIZE (KW)- 8.28
ROOF 2	TILT - 18° AZIMUTH - 140° MODULE - 4 SYSTEM SIZE (KW)- 1.44

CONTRACTOR



22171 MCH RD
MANDEVILLE, LA 70471
PHONE: 9152011490

PROJECT NAME & ADDRESS
EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

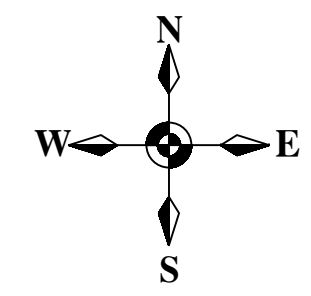
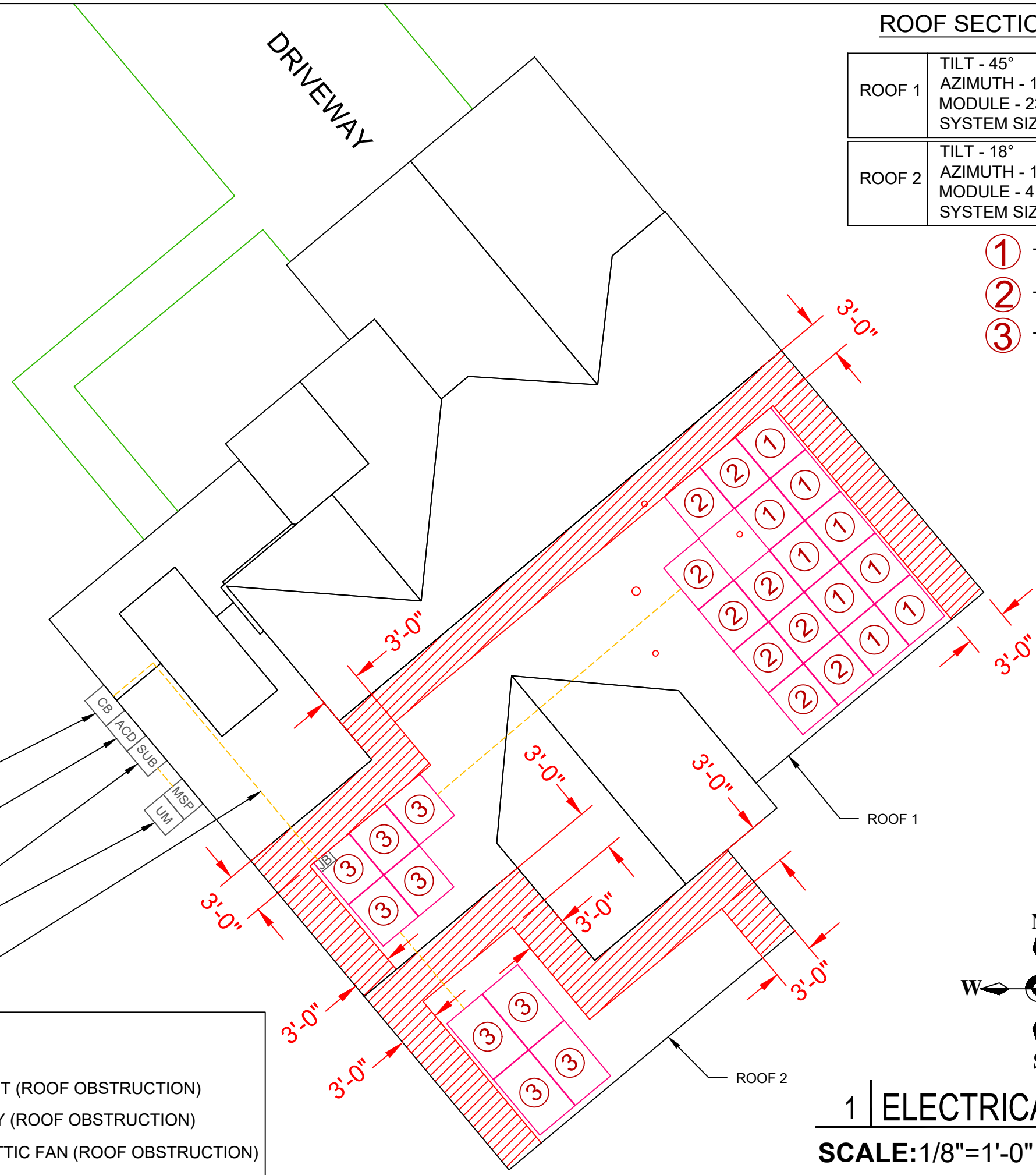
DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

- ① - MODULE STRING
- ② - MODULE STRING
- ③ - MODULE STRING

- (N) ENPHASE COMBINER PANEL WITH ENVOY-IQ METER
- (N) VISIBLE LOCKABLE LABELED AND NON-FUSED AC DISCONNECT (UTILITY DISCONNECT)
- (N) SUB PANEL
- (E) UTILITY METER MAIN PANEL COMBO (OUTSIDE HOUSE)
- (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: 1/8" = 1'-0"

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NORTH CAROLINA FIRM NO. C4113

SHEET TITLE

ELECTRICAL PLAN

DRAWN DATE 5/12/2022

DRAWN BY ERK

SHEET NUMBER

A-102

CONTRACTOR



22171 MCH RD
MANDEVILLE, LA 70471
PHONE: 9152011490

PROJECT NAME & ADDRESS
EDWARD BRADLEY SR

551 HEATHROW DR,
SPRING LAKE,
NC 28390

COUNTY:-HARNETT COUNTY

SYSTEM SIZE
DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

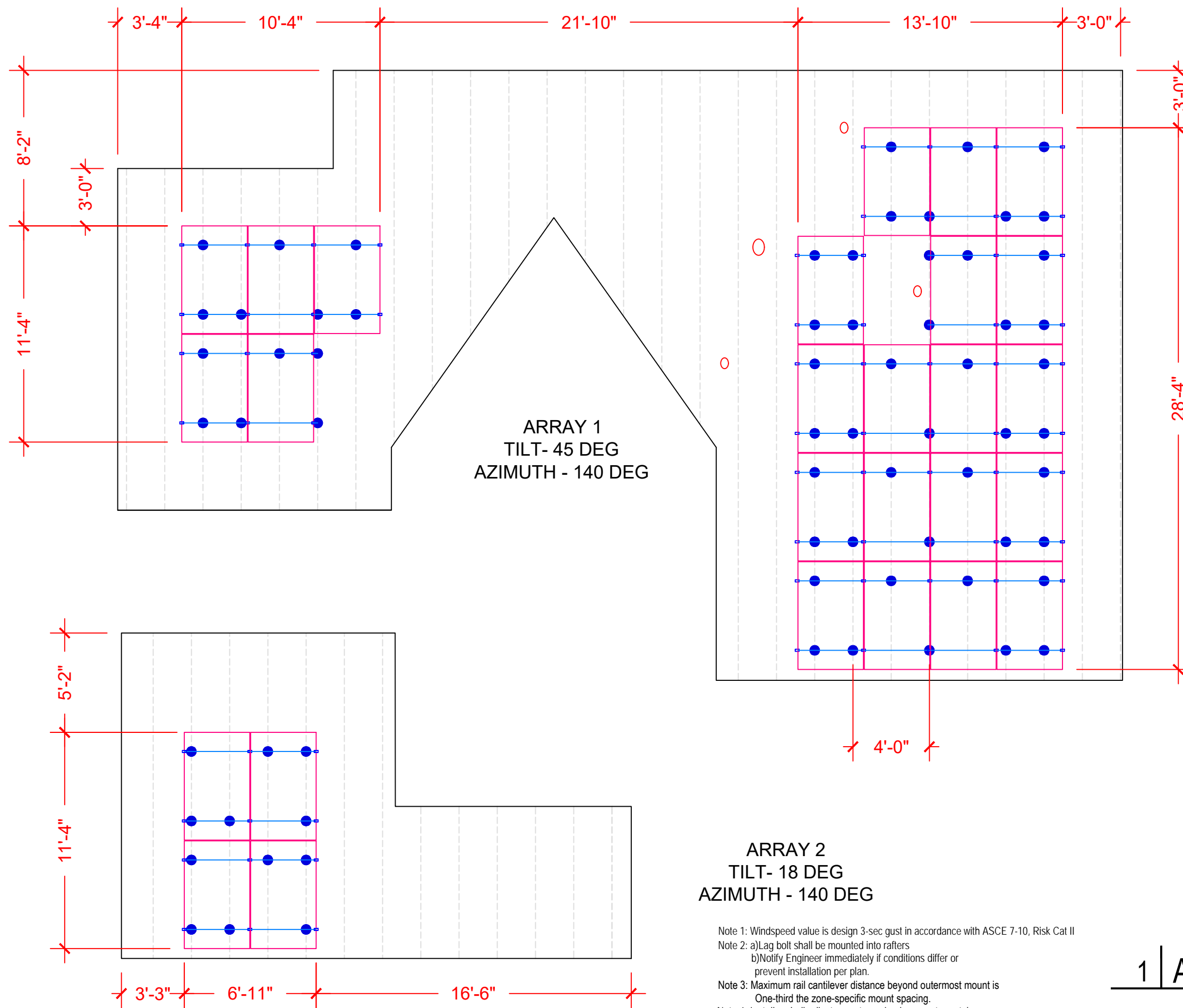
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NORTH CAROLINA FIRM NO. C4113

SHEET TITLE
ATTACHMENT PLAN

DRAWN DATE 5/12/2022
DRAWN BY ERK

SHEET NUMBER
A-103



ARRAY 1
TILT- 45 DEG
AZIMUTH - 140 DEG

ARRAY 2
TILT- 18 DEG
AZIMUTH - 140 DEG

- CLAMP
- UNIRAC FASHLOC
- RAIL
- RAFTER

69 - TOTAL MOUNT

- Note 1: Windspeed value is design 3-sec gust 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: 3/16" = 1'-0"

ROOF SECTION(S)

ROOF 1	ROOF MATERIAL - COMPOSITE SHINGLE RAFTER SIZE - 2"X6" O.C. SPACING - 24"
ROOF 2	ROOF MATERIAL - COMPOSITE SHINGLE RAFTER SIZE - 2"X6" O.C. SPACING - 24"

CONTRACTOR



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MANDEVILLE, LA 70471
PHONE: 9152011490

PROJECT NAME & ADDRESS
EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

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SHEET TITLE

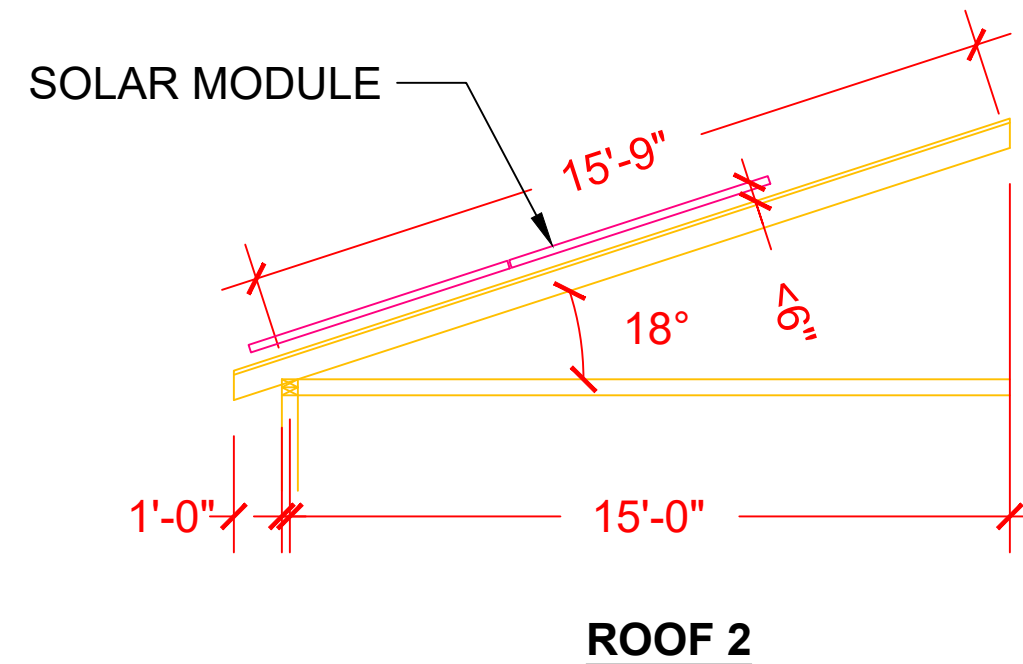
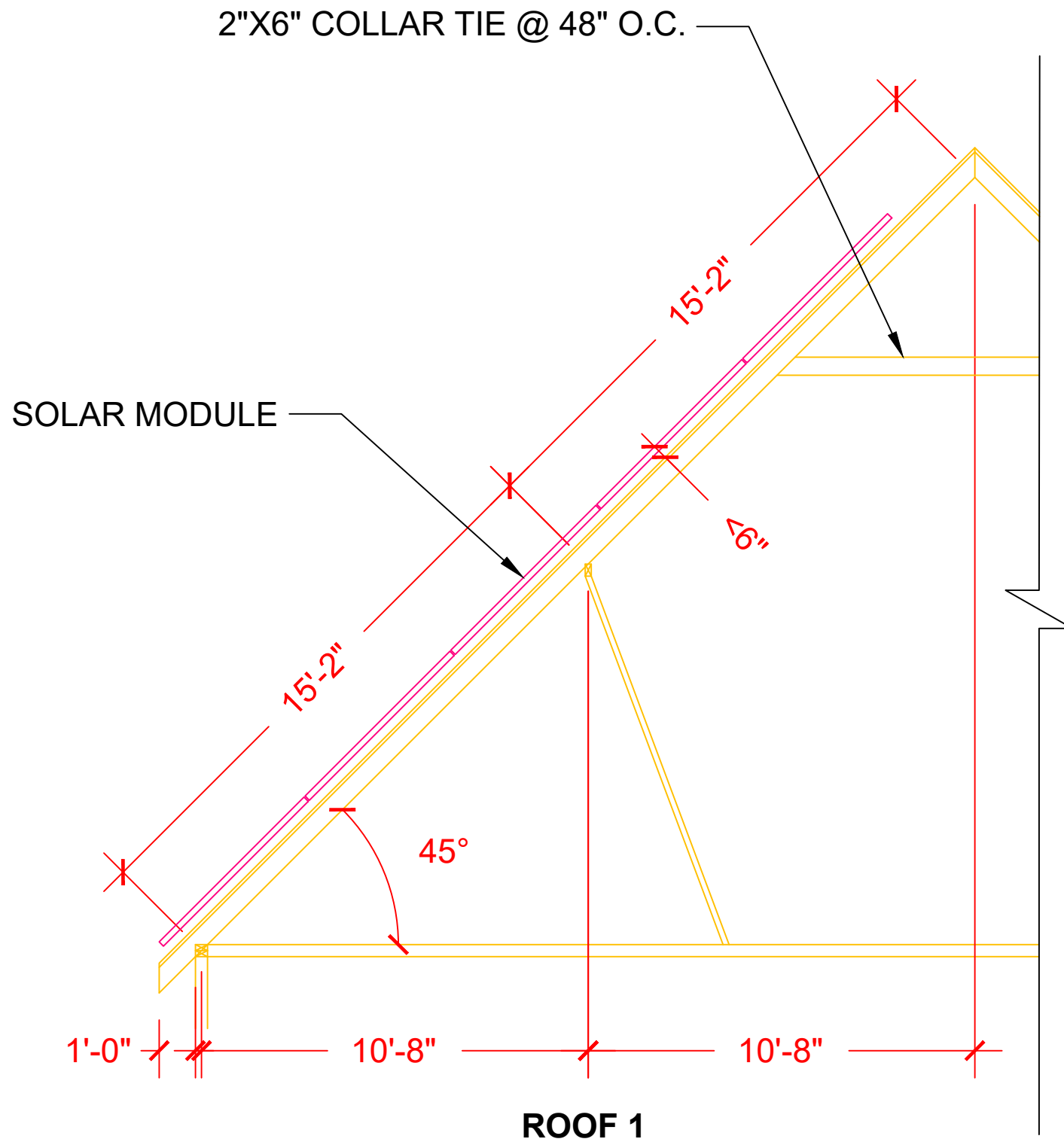
STRUCTURAL PLAN

DRAWN DATE 5/12/2022

DRAWN BY ERK

SHEET NUMBER

A-104



1 | STRUCTURAL PLAN


SCALE: 1/4" = 1'-0"

All dimensions and information provided by Sunpro inspection.

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	HANWHA Q-CELLS 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	67.6"L x 41.14"W x 1.26"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ7PLUS-72-2-US MICROINVERTER
MIN/MAX DC VOLT RATING	22V MIN/ 60V 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	(3) #12/2 ROMEX IN ATTIC / (6) #12 THWN-2 ON EXTERIOR & (1) #6 THWN -2 GROUND / (GN)
2	(3) #6 THWN-2 & (1) #6 THWN-2 GROUND / (GN)
3	(3) #6 THWN-2 & (1) #6 THWN-2 GROUND / (GN)
4	(1) #6 BARE GROUND

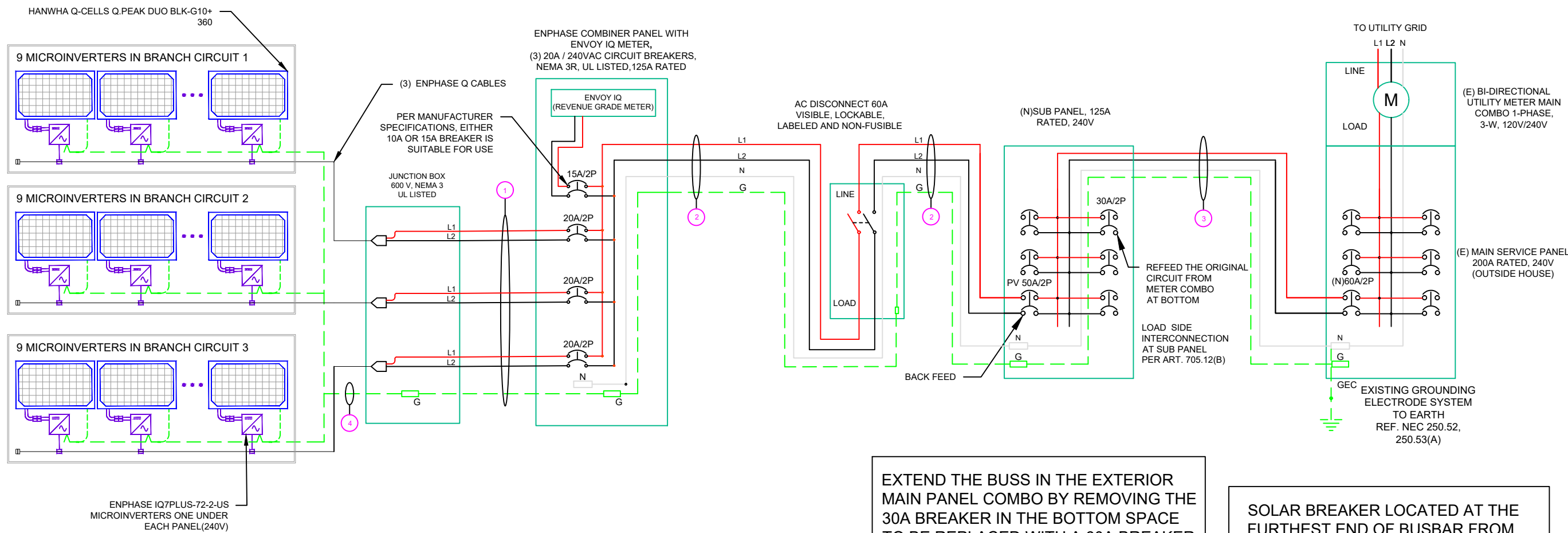
CONTRACTOR

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 MANDEVILLE, LA 70471
 PHONE: 9152011490
 PROJECT NAME & ADDRESS
 EDWARD BRADLEY SR
**551 HEATHROW DR,
 SPRING LAKE,
 NC 28390**
 COUNTY:-HARNETT COUNTY

(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

DC SIZE 27 X 360W = 9.720 kW DC-STC
 AC SIZE 27 X 290W = 7.830 kW AC

METER NO: 17414230

SYSTEM SIZE
 DC SIZE: 9.720 KW DC-(STC)
 AC SIZE: 7.830 KW AC



EXTEND THE BUSS IN THE EXTERIOR MAIN PANEL COMBO BY REMOVING THE 30A BREAKER IN THE BOTTOM SPACE TO BE REPLACED WITH A 60A BREAKER TO FEED A NEW 125A SUB PANEL

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 5/12/2022
 DRAWN BY ERK

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 - 0.8...NEC 310.15(B)(3)(A)

CONDUCTOR AMPACITY

= (INV O/P CURRENT) X 1.25 / A.T.F / G.F ...NEC 690.8(B)
 = [(9 X 1.21) X 1.25] / [0.91 X 0.8]
 = 18.70A

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)
 = [(27 X 1.21) X 1.25] / [0.91 X 1]
 = 44.88 A

SELECTED CONDUCTOR - #6 THWN-2 ...NEC 310.15(B)(16)

2. PV OVER CURRENT PROTECTION ...NEC 690.9(B)
 = TOTAL INVERTER O/P CURRENT x 1.25
 = (27 x 1.21) x 1.25 = 40.84 A
 SELECTED OCPD = 50 A ...NEC 240.6

CONTRACTOR	
	
22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490	
PROJECT NAME & ADDRESS EDWARD BRADLEY SR	
551 HEATHROW DR, SPRING LAKE, NC 28390 COUNTY:-HARNETT COUNTY	
SYSTEM SIZE DC SIZE: 9.720 KW DC-(STC) AC SIZE: 7.830 KW AC	
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SHEET TITLE ELECTRICAL CALCULATIONS	
DRAWN DATE	5/12/2022
DRAWN BY	ERK
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**

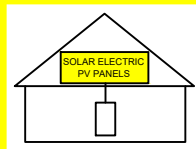
LABEL 6
AT EACH AC DISCONNECT

! 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

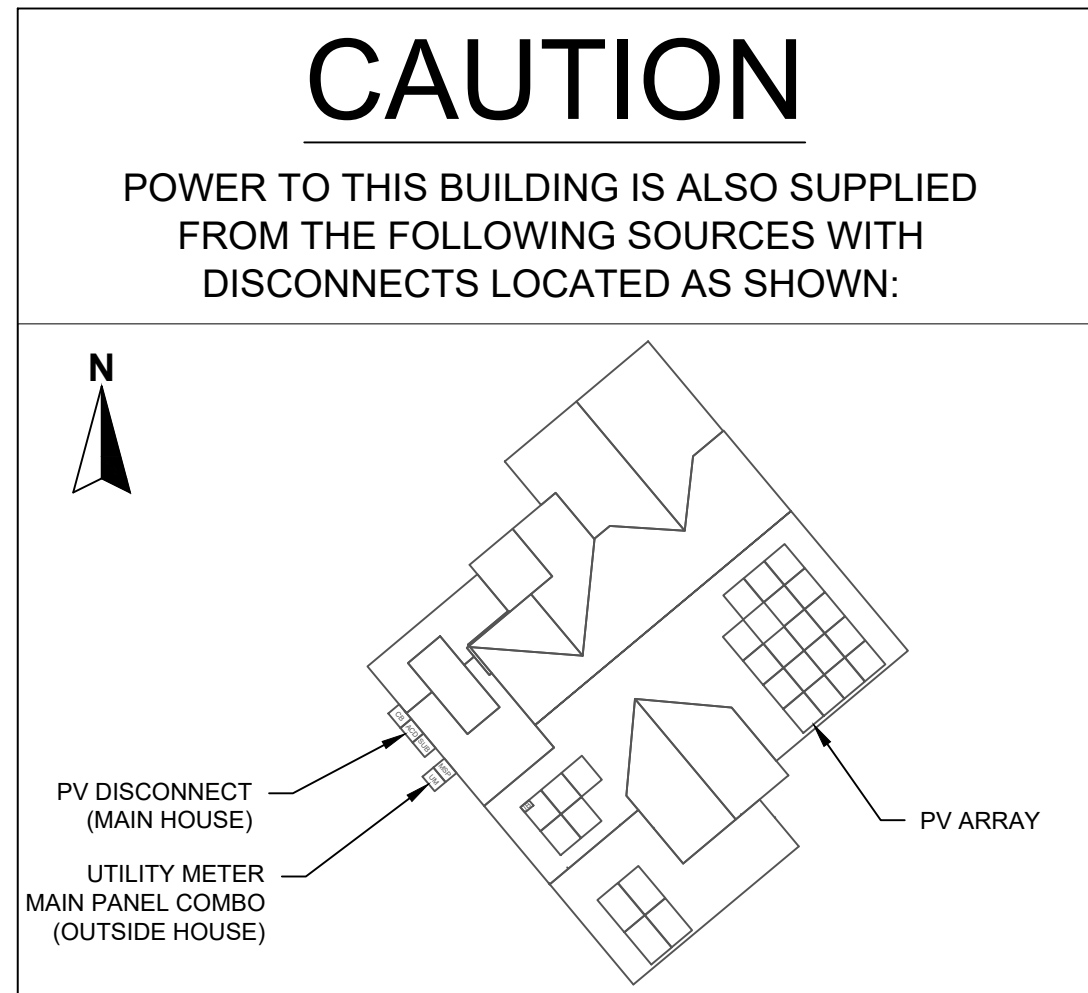
LABEL 7
AT MEP

**PHOTOVOLTAIC
DC DISCONNECT**

LABEL 4
AT DC DISCONNECT

! WARNING !
SOLAR SYSTEM CONNECTED
AND ENERGIZED

LABEL 8
AT MEP



CONTRACTOR



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PROJECT NAME & ADDRESS
EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE
DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

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MANDEVILLE, LA 70471
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NORTH CAROLINA FIRM NO. C4113

SHEET TITLE

PLACARD

DRAWN DATE 5/12/2022

DRAWN BY ERK

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 Technology¹, 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 warranty².

¹ APT test conditions according to IEC/TS 62804-1:2015, method A (-1500V, 96h)
² See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:



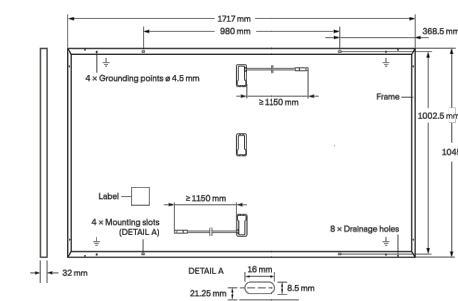
Rooftop arrays on residential buildings

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 ² Solar cable; (+) ≥ 1150 mm, (-) ≥ 1150 mm
Connector	Stäubli MC4; IP68

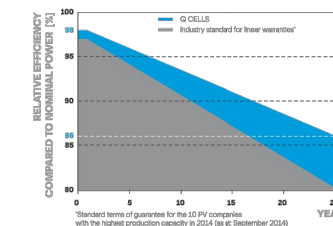


ELECTRICAL CHARACTERISTICS

POWER CLASS		350	355	360	365	370	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC¹ (POWER TOLERANCE +5 W / -0 W)							
Minimum	Power at MPP ¹	P _{MPP} [W]	350	355	360	365	370
	Short Circuit Current ¹	I _{SC} [A]	10.97	11.00	11.04	11.07	11.10
	Open Circuit Voltage ¹	V _{OC} [V]	41.11	41.14	41.18	41.21	41.24
	Current at MPP	I _{MPP} [A]	10.37	10.43	10.49	10.56	10.62
	Voltage at MPP	V _{MPP} [V]	33.76	34.03	34.31	34.58	34.84
	Efficiency ¹	η [%]	≥ 19.5	≥ 19.8	≥ 20.1	≥ 20.3	≥ 20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT²							
Minimum	Power at MPP	P _{MPP} [W]	262.6	266.3	270.1	273.8	277.6
	Short Circuit Current	I _{SC} [A]	8.84	8.87	8.89	8.92	8.95
	Open Circuit Voltage	V _{OC} [V]	38.77	38.80	38.83	38.86	38.90
	Current at MPP	I _{MPP} [A]	8.14	8.20	8.26	8.31	8.37
	Voltage at MPP	V _{MPP} [V]	32.24	32.48	32.71	32.94	33.17

¹ Measurement tolerances P_{MPP} ± 3%; I_{SC}; V_{OC} ± 5% at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • *800 W/m², NMOT, spectrum AM 1.5

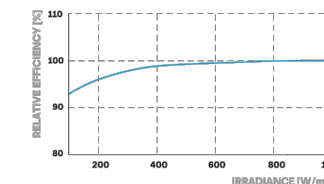
Q CELLS PERFORMANCE WARRANTY



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/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I _{SC}	α	[%/K]	+0.04	Temperature Coefficient of V _{OC}	β	[%/K]	-0.27
Temperature Coefficient of P _{MPP}	γ	[%/K]	-0.34	Nominal Module Operating Temperature	NMOT	[°C]	43 ± 3

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage	V _{sys} [V]	1000	PV module classification	Class II
Maximum Reverse Current	I _R [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
EDWARD BRADLEY SR

551 HEATHROW DR,
SPRING LAKE,
NC 28390

COUNTY: HARNETT COUNTY

SYSTEM SIZE
DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

SHEET TITLE
**RESOURCE
DOCUMENT**

DRAWN DATE 5/12/2022

DRAWN BY ERK

SHEET NUMBER
R-001

Specifications subject to technical change © Q CELLS Q.PEAK DUO BLK-G10+-350-370-2021-08_Rev01.EN

Enphase IQ 7 and IQ 7+ Microinverters

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

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

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



Easy to Install

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

Productive and Reliable

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

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

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



To learn more about Enphase offerings, visit enphase.com



Enphase IQ 7 and IQ 7+ Microinverters

INPUT DATA (DC)	IQ7-60-2-US		IQ7PLUS-72-2-US	
Commonly used module pairings ¹	235 W - 350 W +		235 W - 440 W +	
Module compatibility	60-cell PV modules only		60-cell and 72-cell PV modules	
Maximum input DC voltage	48 V		60 V	
Peak power tracking voltage	27 V - 37 V		27 V - 45 V	
Operating range	16 V - 48 V		16 V - 60 V	
Min/Max start voltage	22 V / 48 V		22 V / 60 V	
Max DC short circuit current (module Isc)	15 A		15 A	
Overvoltage class DC port	II		II	
DC port backfeed current	0 A		0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit			
OUTPUT DATA (AC)	IQ 7 Microinverter		IQ 7+ Microinverter	
Peak output power	250 VA		295 VA	
Maximum continuous output power	240 VA		290 VA	
Nominal (L-L) voltage/range ²	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)
Nominal frequency	60 Hz		60 Hz	
Extended frequency range	47 - 68 Hz		47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms	
Maximum units per 20 A (L-L) branch circuit ³	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III		III	
AC port backfeed current	0 A		0 A	
Power factor setting	1.0		1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging		0.85 leading ... 0.85 lagging	
EFFICIENCY	@240 V	@208 V	@240 V	@208 V
Peak efficiency	97.6 %	97.6 %	97.5 %	97.3 %
CEC weighted efficiency	97.0 %	97.0 %	97.0 %	97.0 %

MECHANICAL DATA

Ambient temperature range	-40°C to +65°C
Relative humidity range	4% to 100% (condensing)
Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US)	MC4 (or Amphenol H4-UTX with additional Q-DCC-5 adapter)
Dimensions (WxHxD)	212 mm x 175 mm x 30.2 mm (without bracket)
Weight	1.08 kg (2.38 lbs)
Cooling	Natural convection - No fans
Approved for wet locations	Yes
Pollution degree	PD3
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure
Environmental category / UV exposure rating	NEMA Type 6 / outdoor

FEATURES

Communication	Power Line Communication (PLC)
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.

1. No enforced DC/AC ratio. See the compatibility calculator at <https://enphase.com/en-us/support/module-compatibility>.
2. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit enphase.com

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CONTRACTOR



22171 MCH RD
MANDEVILLE, LA 70471

PHONE: 9152011490

PROJECT NAME & ADDRESS

EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

SHEET TITLE RESOURCE DOCUMENT

DRAWN DATE 5/12/2022

DRAWN BY ERK

SHEET NUMBER

R-002

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

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



Smart

- Includes IQ Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring
- Supports Ensemble Communications Kit for communication with Enphase Encharge™ storage and Enphase Enpower™ smart switch

Simple

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

Reliable

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

Enphase IQ Combiner 3

MODEL NUMBER	
IQ Combiner 3 X-IQ-AM1-240-3	IQ Combiner 3 with Enphase IQ Envoy™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%).
ACCESSORIES and REPLACEMENT PARTS (not included, order separately)	
Enphase Mobile Connect™ CELLMODEM-03 (4G/12-year data plan) CELLMODEM-01 (3G/5-year data plan) CELLMODEM-M1 (4G based LTE-M/5-year data plan)	Plug and play industrial grade cellular modem with data plan for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.)
Consumption Monitoring* CT CT-200-SPLIT	Split core current transformers enable whole home consumption metering (+/- 2.5%).
* Consumption monitoring is required for Enphase Storage Systems	
Ensemble Communications Kit COMMS-KIT-01	Installed at the IQ Envoy. For communications with Enphase Encharge™ storage and Enphase Enpower™ smart switch. Includes USB cable for connection to IQ Envoy or Enphase IQ Combiner™ and allows wireless communication with Encharge and Enpower.
Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replace the default solar shield with this Ensemble Combiner Solar Shield to match the look and feel of the Enphase Enpower™ smart switch and the Enphase Encharge™ storage system
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Envoy printed circuit board (PCB) for Combiner 3
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating (output to grid)	65 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. continuous current rating (input from PV)	64 A
Max. total branch circuit breaker rating (input)	80 A of distributed generation / 95 A with IQ Envoy breaker included
Envoy breaker	10A or 15A rating GE Q-line/Siemens Type QP /Eaton BR series included
Production Metering CT	200 A solid core pre-installed and wired to IQ Envoy
MECHANICAL DATA	
Dimensions (WxHxD)	49.5 x 37.5 x 16.8 cm (19.5" x 14.75" x 6.63"). Height is 21.06" (53.5 cm with mounting brackets).
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Cellular	CELLMODEM-M1 4G based LTE-M cellular modem (not included). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
COMPLIANCE	
Compliance, Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
Compliance, IQ Envoy	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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CONTRACTOR



22171 MCH RD
MANDEVILLE, LA 70471

PHONE: 9152011490

PROJECT NAME & ADDRESS

EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE

DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

SHEET TITLE RESOURCE DOCUMENT

DRAWN DATE 5/12/2022

DRAWN BY ERK

SHEET NUMBER

R-003



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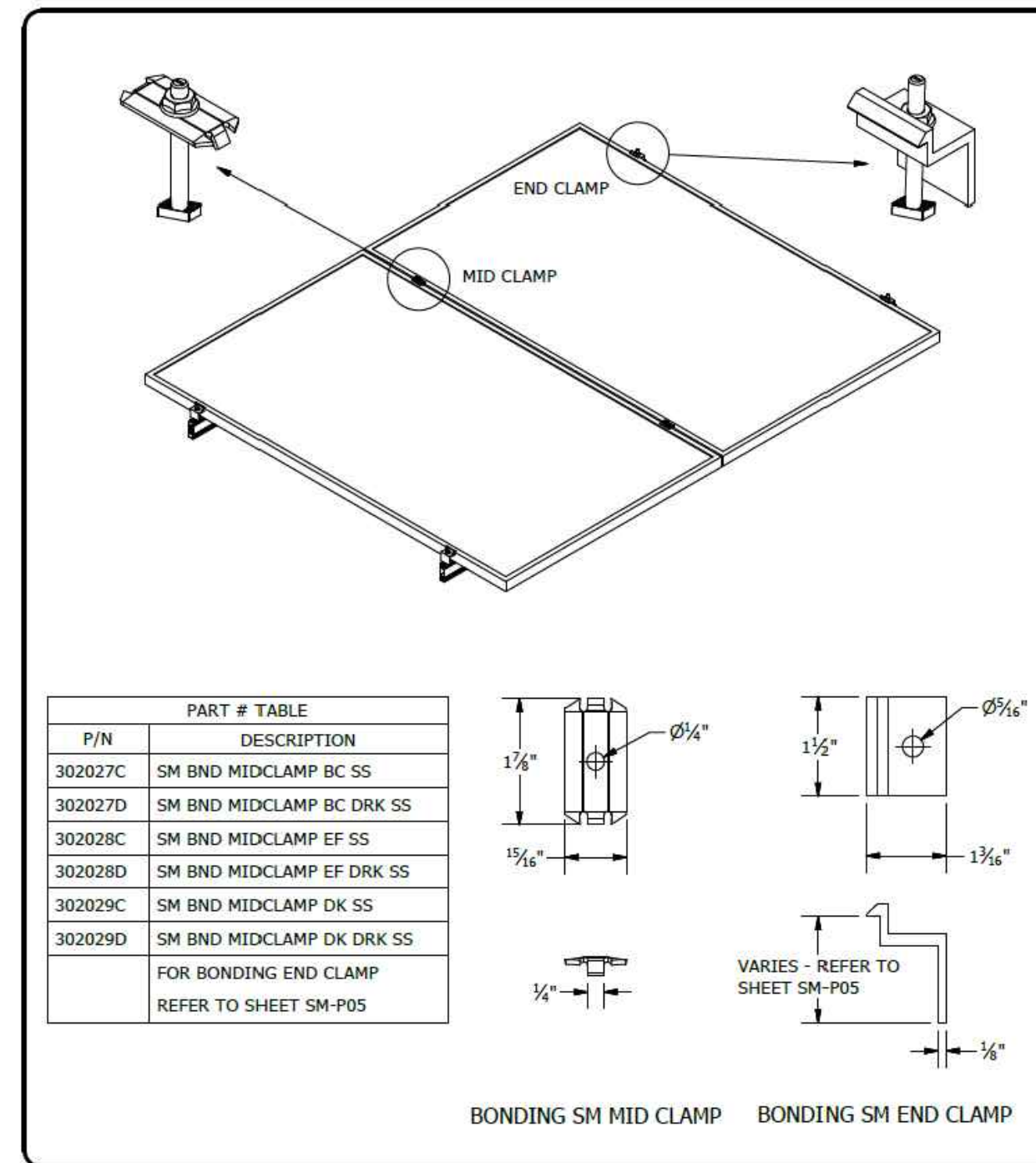
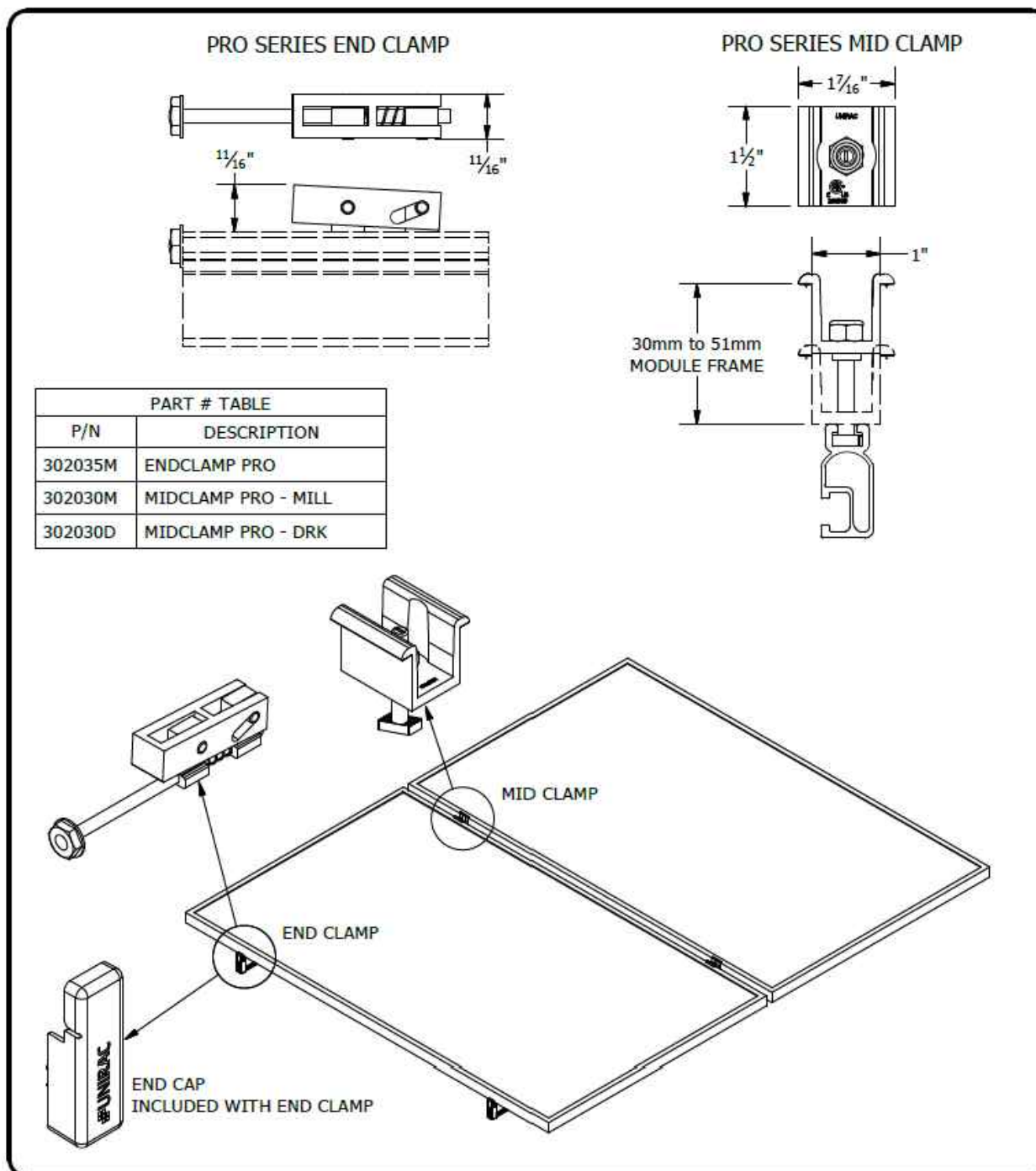
PHONE: 9152011490

PROJECT NAME & ADDRESS
EDWARD BRADLEY SR

551 HEATHROW DR,
SPRING LAKE,
NC 28390

COUNTY:-HARNETT COUNTY

SYSTEM SIZE
DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC



UNIRAC
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

UNIRAC
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

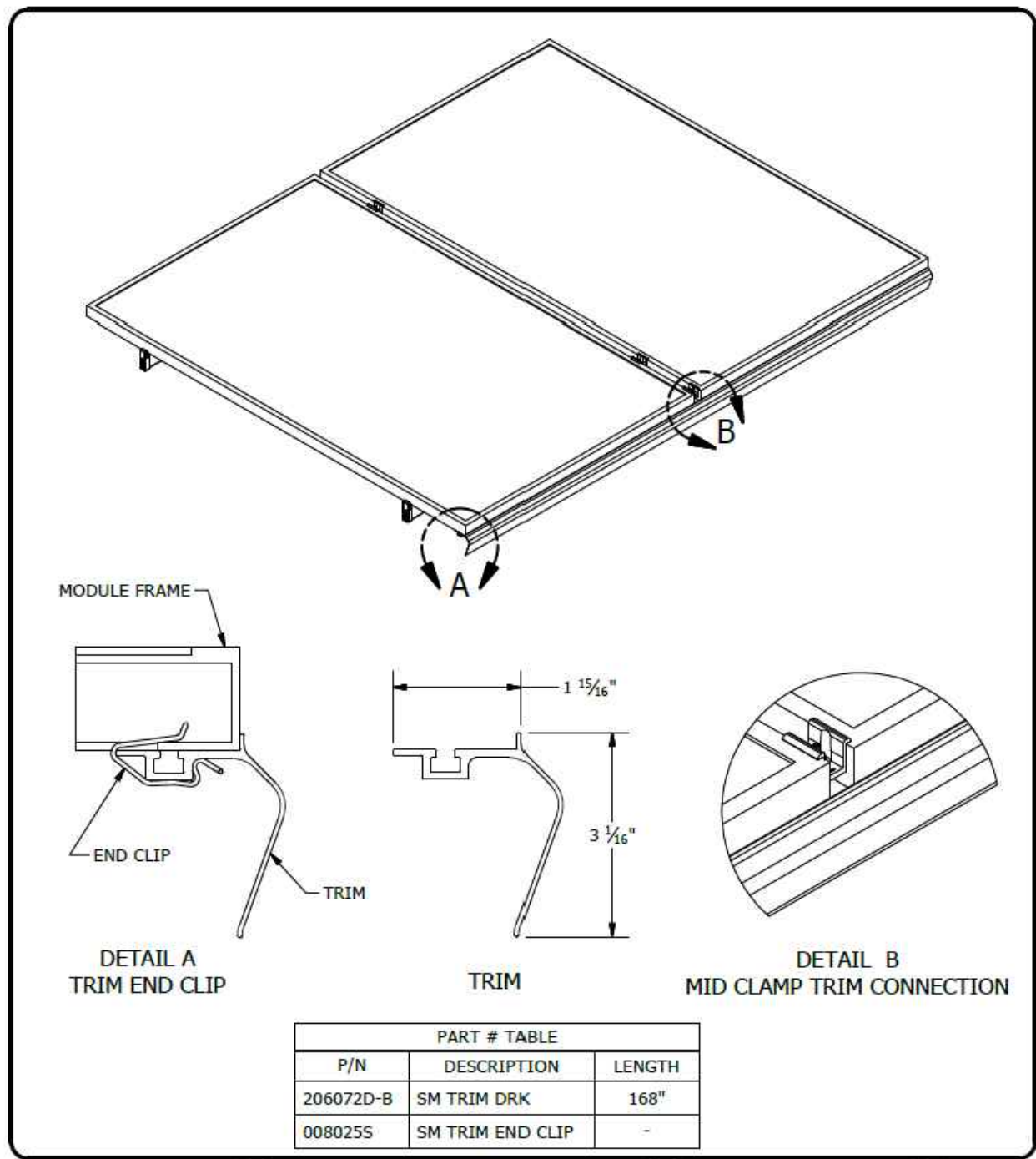
LEGAL NOTICE

SM-A01A
SHEET

SHEET TITLE
RESOURCE DOCUMENT

DRAWN DATE 5/12/2022
DRAWN BY ERK

SHEET NUMBER
R-004



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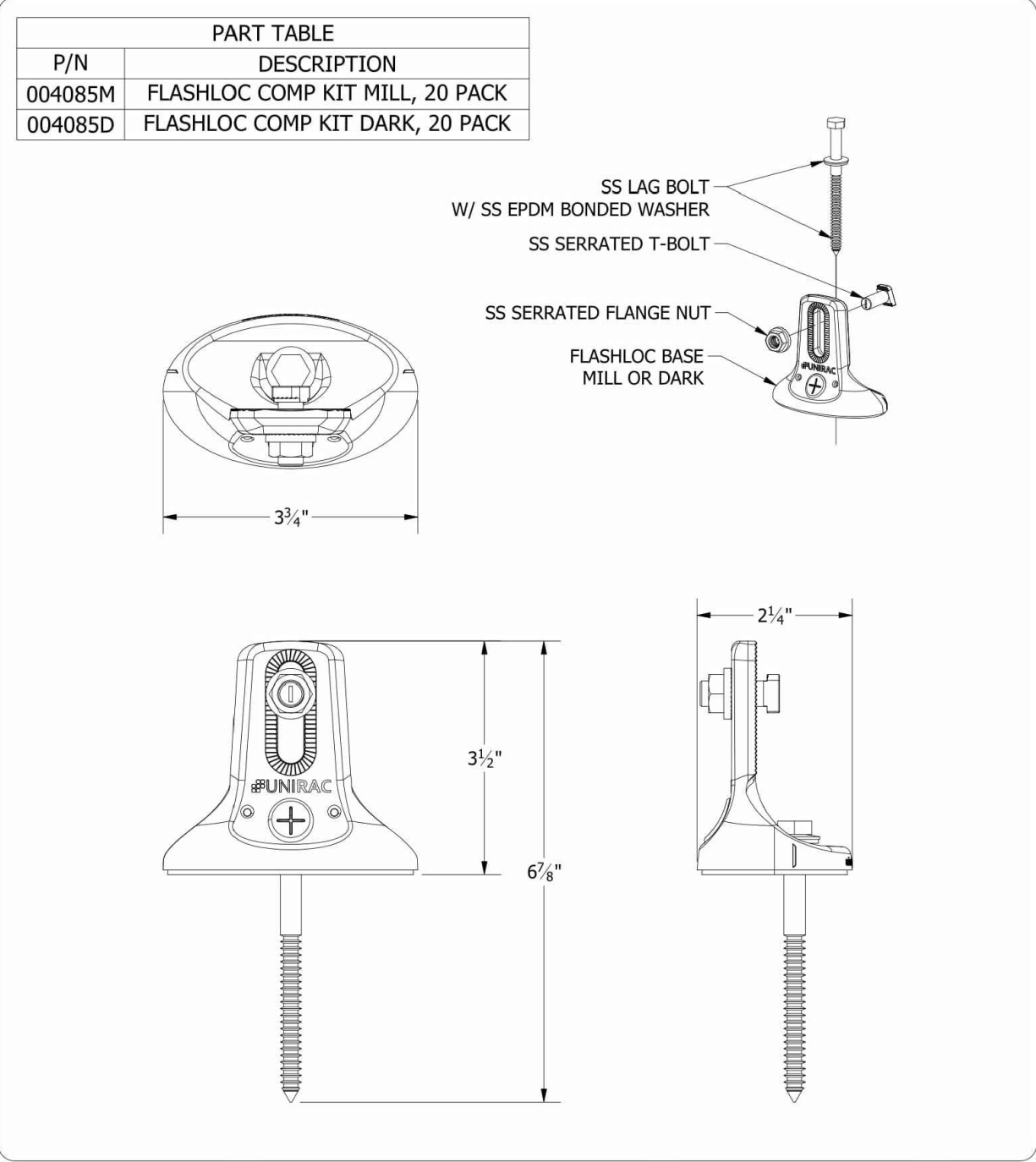
PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	SM TRIM END CLIP
REVISION DATE:	9/27/2017

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
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LEGAL NOTICE

FL-A01
SHEET

CONTRACTOR

22171 MCH RD
MANDEVILLE, LA 70471
PHONE: 9152011490

PROJECT NAME & ADDRESS
EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE
DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

SHEET TITLE
**RESOURCE
DOCUMENT**

DRAWN DATE	5/12/2022
DRAWN BY	ERK

SHEET NUMBER
R-005

CONTRACTOR



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MANDEVILLE, LA 70471
PHONE: 9152011490

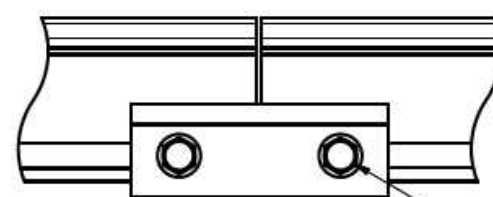
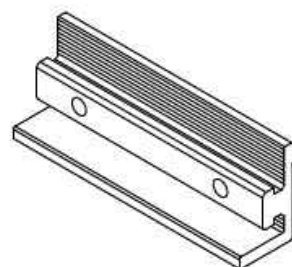
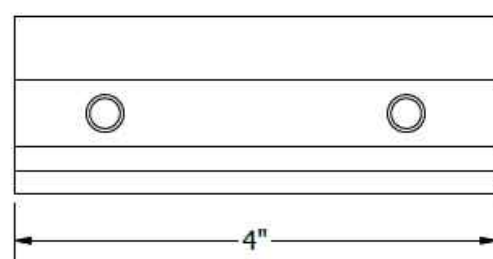
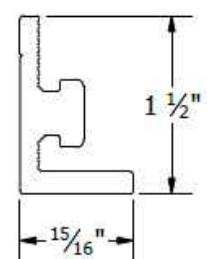
PROJECT NAME & ADDRESS
EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

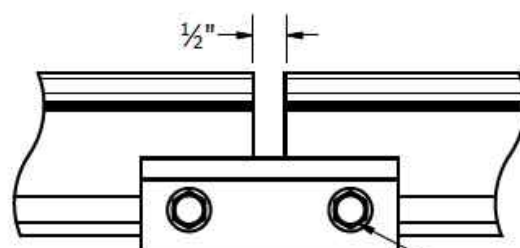
SYSTEM SIZE
DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

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

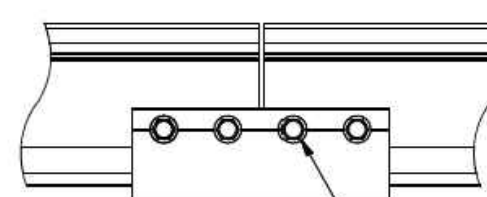
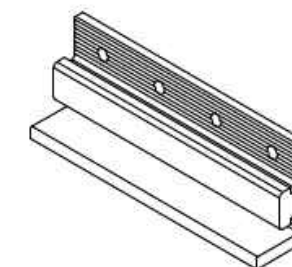
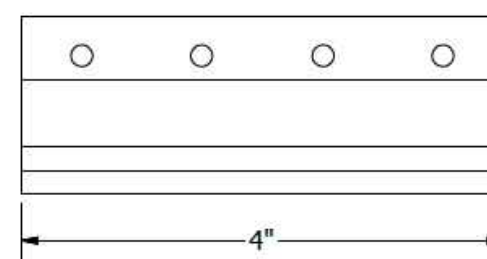
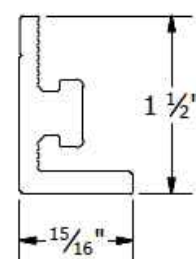
DRAWING NOT TO SCALE
ALL DIMENSIONS ARE NOMINAL

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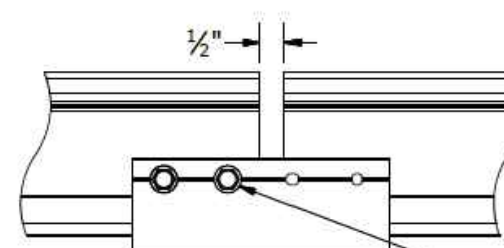
SHEET

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



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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

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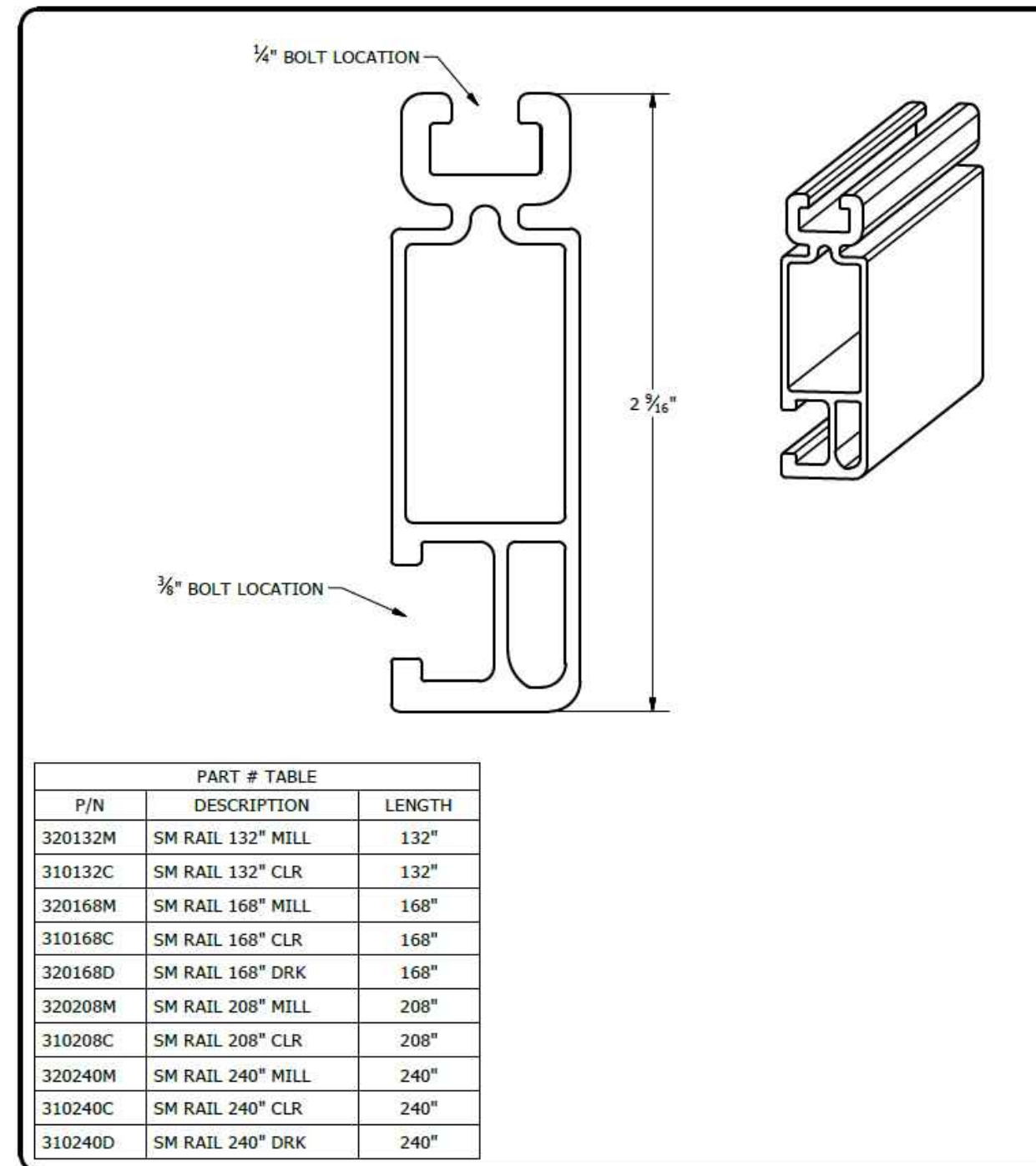
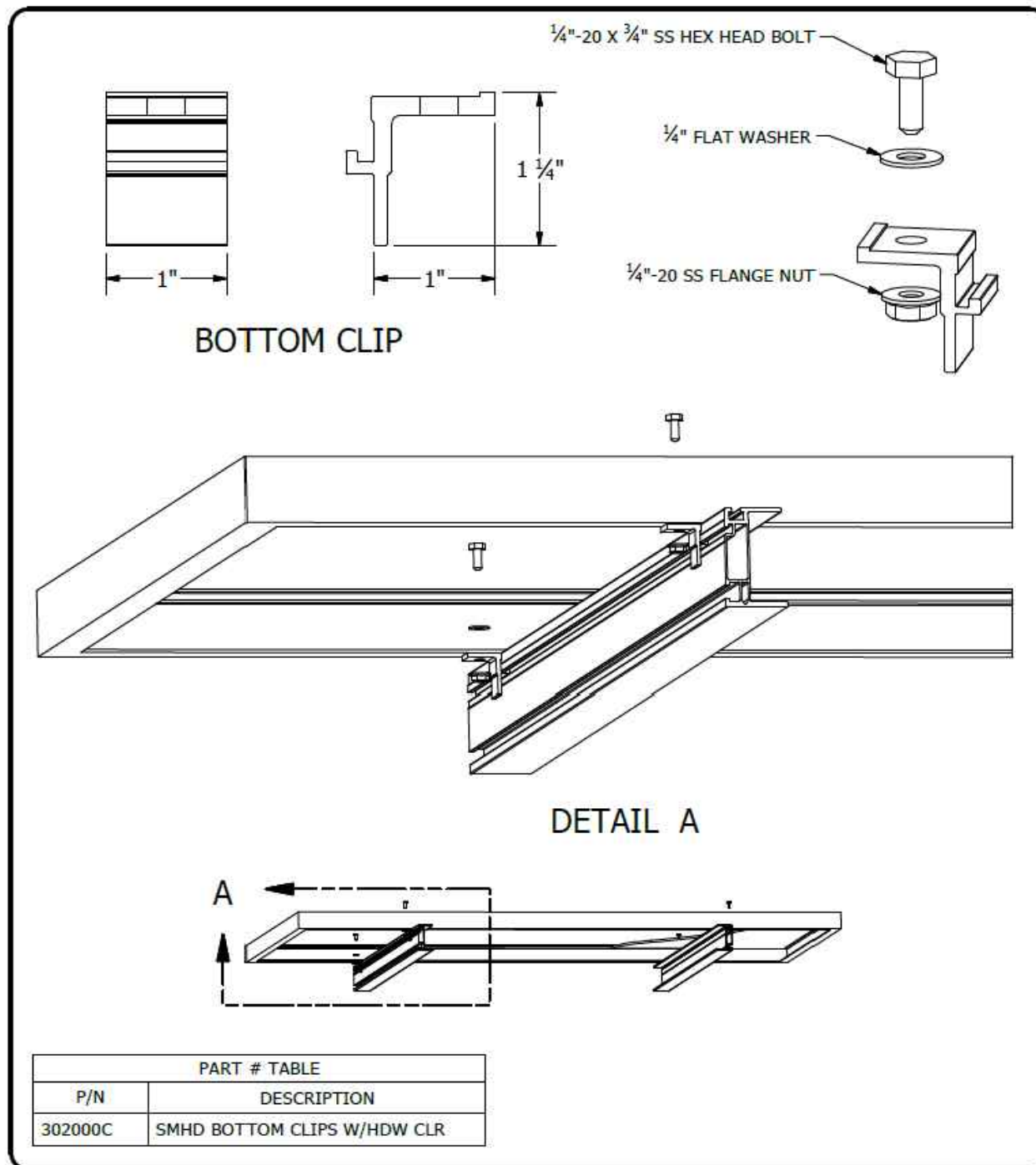
SM-A05

SHEET

SHEET TITLE
**RESOURCE
DOCUMENT**

DRAWN DATE 5/12/2022
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SHEET NUMBER
R-006



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

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

CONTRACTOR

22171 MCH RD
MANDEVILLE, LA 70471
PHONE: 9152011490

PROJECT NAME & ADDRESS
EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE
DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

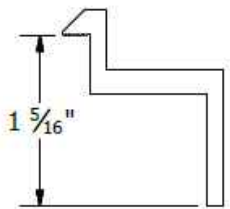
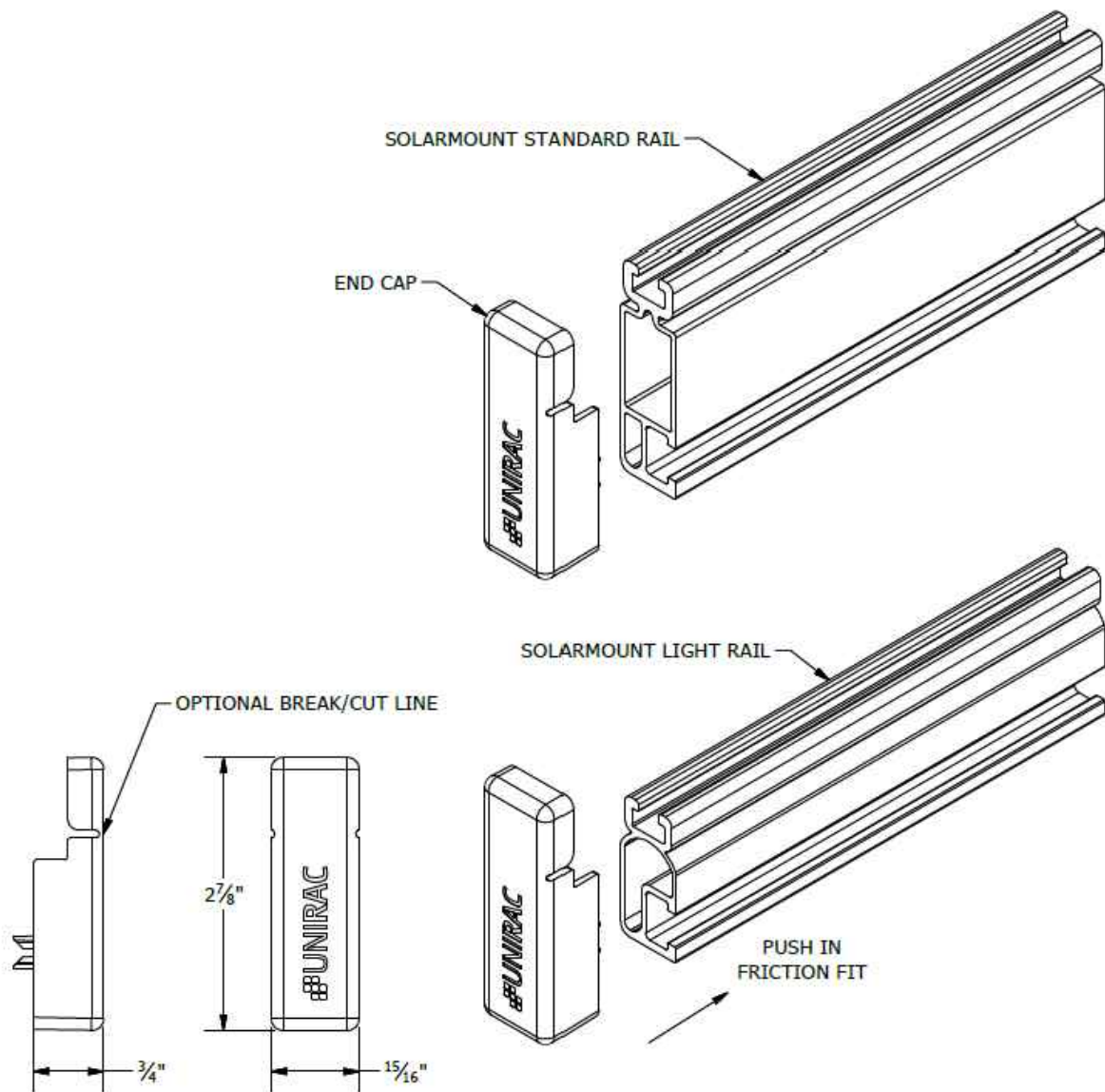
SHEET TITLE
**RESOURCE
DOCUMENT**

DRAWN DATE 5/12/2022
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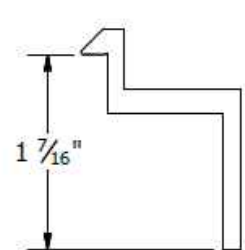
SHEET NUMBER
R-007

NOTES:

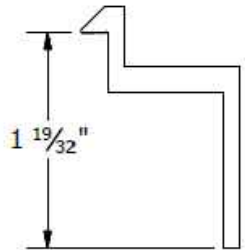
1. END CAP INCLUDED WITH EVERY END CLAMP.
2. END CAP FITS SOLARMOUNT LIGHT AND STANDARD RAIL PROFILES.



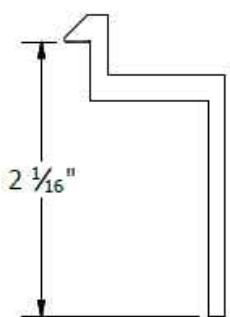
B CLAMP
30mm to 32mm Module Thickness
(1.18" to 1.26")



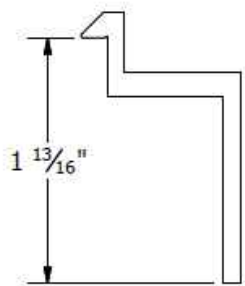
C CLAMP
33mm to 36mm Module Thickness
(1.30" to 1.42")



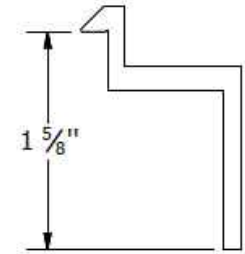
D CLAMP
38mm to 40mm Module Thickness
(1.50" to 1.57")



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

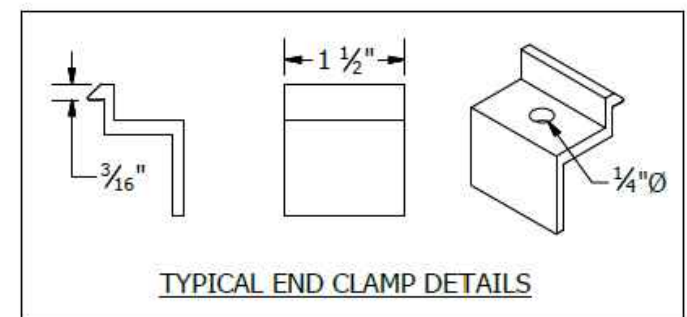


F CLAMP
45mm to 47mm Module Thickness
(1.77" to 1.85")



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



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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
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LEGAL NOTICE

SM-P05
SHEET

CONTRACTOR



22171 MCH RD
MANDEVILLE, LA 70471
PHONE: 9152011490

PROJECT NAME & ADDRESS
EDWARD BRADLEY SR

**551 HEATHROW DR,
SPRING LAKE,
NC 28390**

COUNTY:-HARNETT COUNTY

SYSTEM SIZE
DC SIZE: 9.720 KW DC-(STC)
AC SIZE: 7.830 KW AC

SHEET TITLE
**RESOURCE
DOCUMENT**

DRAWN DATE 5/12/2022
DRAWN BY ERK

SHEET NUMBER
R-008