

July 2021

Property Owner: Donald James

Property Address: 134 Southern Place, Lillington, NC 27546

**RE: Photovoltaic System Roof Installations**

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

Based on my review, the existing structure is adequate to support the proposed solar panel installation. This assessment is based on recent on-site inspection by SunPro 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 are within acceptable limits as shown on the attached calculations. The structural considerations used in our review and assessment include the following:

**Evaluation Criteria:**

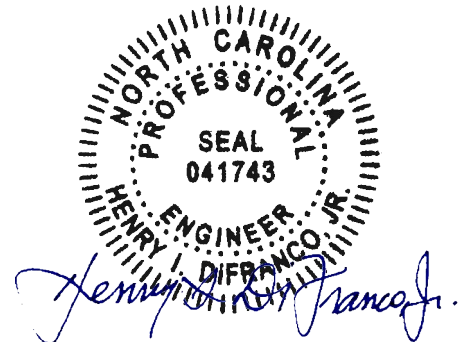
Applied Codes: ASCE 7-10      PEDE 2018      PETE 2018      ""NEC 2017  
Risk Category: II  
Design Wind Speed (3-second gust): 117 MPH  
Wind Exposure Category: C  
Ground Snow Load: 10 PSF  
Seismic Design Category: D

**Existing Structure:**

Roof Material: Shingle  
Roofing Structure: 2x6 rafters @ 24" O.C.  
Roof Slope: 7/12

**Connection of Array to Structure:**

Manufacturer: UNIRAC  
Mount: Flashloc Comp Kit  
Mounting Connection: Flashloc Comp Kit 5/16" lag screw w/min 2.5" embedment into framing  
Zone 1: 2 rails 4'-0" o.c. mounts  
Zone 2: 2 rails 4'-0" o.c. mounts  
Zone 3: 2 rails 4'-0" o.c. mounts



07/13/2021

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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 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.

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.

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

|                  |                      |                             |            |           |
|------------------|----------------------|-----------------------------|------------|-----------|
| Property Owner:  | Donald James         | Individual Panel Dimensions |            |           |
| Project Address: | 134 Southern Place   | Length (in)                 | Width (in) | Area (sf) |
| City, State:     | Lillington, NC 27546 | 77                          | 39         | 20.85     |

| Wind Load Calculation Summary (ASCE 7-10 C&C Provisions)       |             |            |                             |        |
|--|-------------|------------|-----------------------------|--------|
| Building Characteristics, Design Input, and Adjustment Factors |             |            |                             |        |
| Roof Dimensions:   | Length (b): | 53 ft.     | Least Dimension:            | 51 ft. |
|  | Width (w):  | 51 ft.     |                             |        |
| Roof Height (h):   |             | 15 ft.     | Must be less than 60        | ✓      |
| Pitch:   | 7 on 12 =   | 30.3°      | Must be less than 45°       | ✓      |
| Roof Configuration   |             | Gable      |                             |        |
| Roof Structure:  |             | 2x Rafters |                             |        |
| 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, $K_z$                                    |             | 1.09       | 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), $q_h$ :                               |             | 32.47      | 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 | 5.1               |
| 2 - Roof Height x 0.4                               | 6                 |
| 3 - Least Roof Horizontal Dimension (L or W) x 0.04 | 2.04              |
| 4 - Lesser of (1) and (2)                           | 5.1               |
| 5 - Greater of (3) and (4)                          | 5.1               |
| 6 - Greater of (5) and 3 feet                       | <b>a= 5.1 ft.</b> |

| 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   | -0.95         | <b>-22.0</b> | 0.85       | <b>20.0</b> | Interior Roof Area, >(a) ft from edge |
| Zone 2   | -1.12         | <b>-25.3</b> | 0.85       | <b>20.0</b> | Strip of (a) ft wide at roof edge     |
| Zone 3   | -1.12         | <b>-25.3</b> | 0.85       | <b>20.0</b> | Corner intersection of Zone 2 strips  |

| Snow Load                          |          |                    |
|------------------------------------|----------|--------------------|
| Ground Snow Load, $p_g$            | 10.0     | From ASCE 7 or AHJ |
| Terrain Category:                  | C        | Para 6.5.6.3       |
| Exposure                           | Fully    |                    |
| Exposure Factor $C_e$              | 0.9      | Table 7-2          |
| Thermal Factor, $C_t$              | 1.0      | Table 7-3          |
| Importance Factor, $I_s$           | 1.0      | Table 1.5.2        |
| Roof Configuration                 | Gable    |                    |
| Roof Slope                         | 30.3°    |                    |
| Distance from Eave to Ridge        | 25.5     |                    |
| $p_m$ , Minimum required Snow Load | N/A      | Para. 7.3.4        |
| $p_f$ , Calculated Snow Load       | 6.30     | Eq. 7.3-1          |
| $p_f$ , Design Snow Load           | 6.30 psf |                    |

| Mount Selection and Spacing  |                              |   |
|--|------------------------------|---|
| Manufacturer:  | Unirac                       | Perpendicular Panel Orientation               |
| Mount:   | Flashloc Comp Kit            | Allowable Arrangement by Uplift Pressure      |
| Substrate:   | Wood Rafters                 | < 37 psf : 2 rails, mounts @ 4'-0" o.c.       |
| Connector:   | 5/16" x 4" Lag Screw         | 37 to 75 psf : 2 rails, mounts @ 2'-0" o.c.   |
|  |                              | 75 to 112 psf : 3 rails, mounts @ 2'-0" o.c.  |
| Allowable Uplift:  | 480 max.                     | 112 to 150 psf : 4 rails, mounts @ 2'-0" o.c. |
|  |                              | > 150 psf : Mount capacity exceeded           |
| <b>Required Mount Layout</b>   |                              |   |
| <b>Zone 1</b>  | 2 rails, mounts @ 4'-0" o.c. |   |
| <b>Zone 2</b>  | 2 rails, mounts @ 4'-0" o.c. |   |
| <b>Zone 3</b>  | 2 rails, mounts @ 4'-0" o.c. |   |
| <i>(Allowable loads are based on individual mount failure before rail failure)</i> |                              |   |



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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 UL 1699B.

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**



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

SYSTEM SIZE:

DC SIZE: 12.410 KW DC-(STC)

AC SIZE: 9.860 KW AC

CUSTOMER NAME & ADDRESS

**DON JAMES**

**134 SOUTHERN  
PL, LILLINGTON,  
NC 27546, USA**

REVISIONS

| REV         | DESCRIPTION |
|-------------|-------------|
|             |             |
|             |             |
|             |             |
| DRAWN DATE  | 7/14/2021   |
| DRAWN BY    | BVP         |
| REVIEWED BY | -           |

Signature with Seal

**NOTES**





SHEET NUMBER

**G-002**

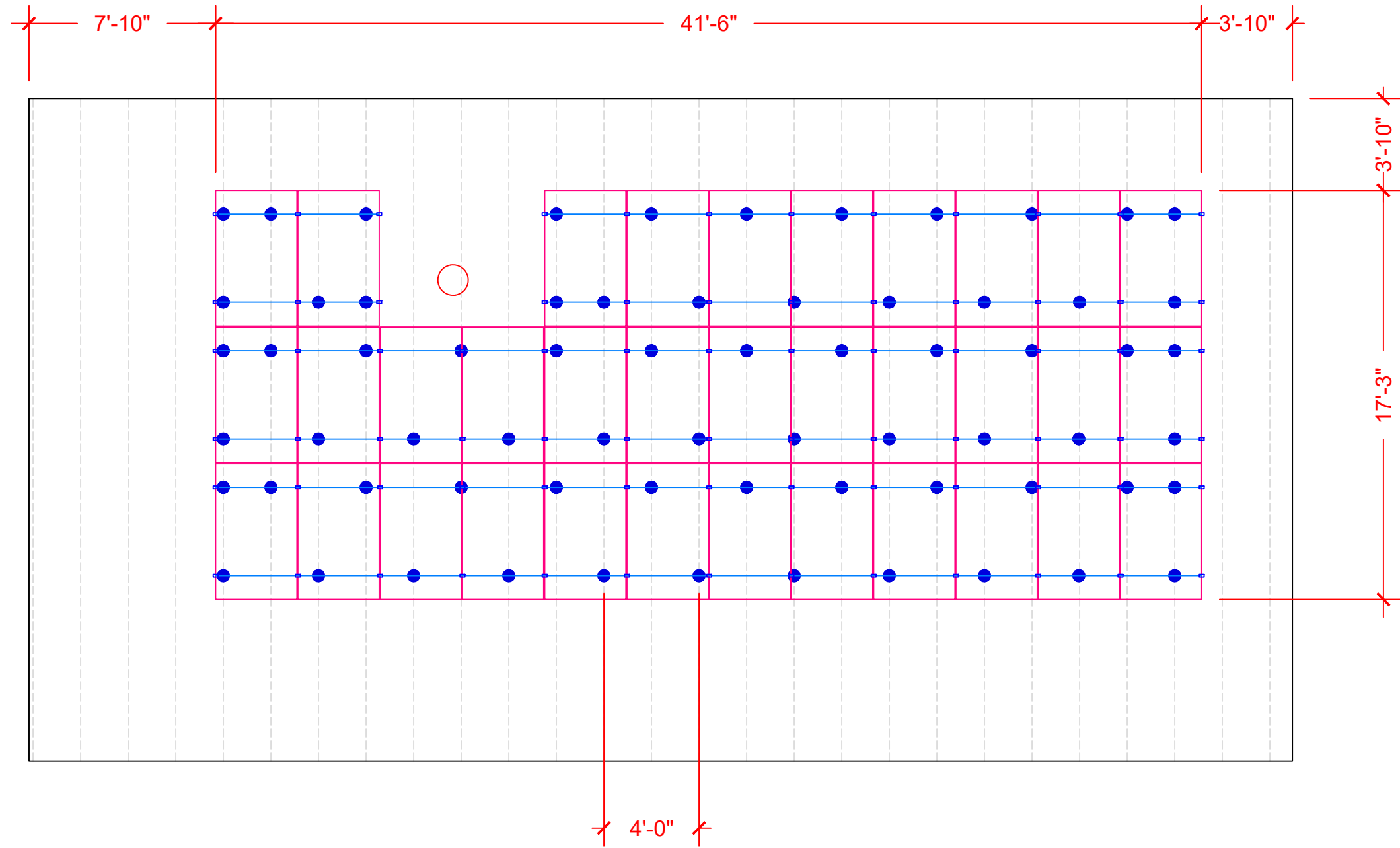






-  - CLAMP
-  - UNIRAC FLASHLOC
-  - RAIL
-  - RAFTER

68 - TOTAL MOUNT



ARRAY 1  
TILT- 30 DEG  
AZIMUTH - 280 DEG

1 | ATTACHMENT PLAN  
SCALE: 3/16" = 1'-0"

**CONTRACTOR**



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

**SYSTEM SIZE:**

DC SIZE: 12.410 KW DC-(STC)  
AC SIZE: 9.860 KW AC

**CUSTOMER NAME & ADDRESS**

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**134 SOUTHERN**  
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**ATTACHMENT PLAN**

SHEET NUMBER

**A-103**

**CONTRACTOR**



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MANDEVILLE, LA 70471  
PHONE: 9152011490

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AC SIZE: 9.860 KW AC

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**REVISIONS**

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DRAWN BY: BVP  
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**LINE DIAGRAM**

SHEET NUMBER

**E-601**

**SOLAR MODULE SPECIFICATIONS**

|                        |                                      |
|------------------------|--------------------------------------|
| MANUFACTURER / MODEL # | LG ELECTRONICS LG365N1C-A6           |
| VMP                    | 34.5V                                |
| IMP                    | 10.58A                               |
| VOC                    | 41.6V                                |
| ISC                    | 11.27A                               |
| TEMP. COEFF. VOC       | -0.26%/°C                            |
| MODULE DIMENSION       | 68.50"L x 41.02"W x 1.57"D (In Inch) |

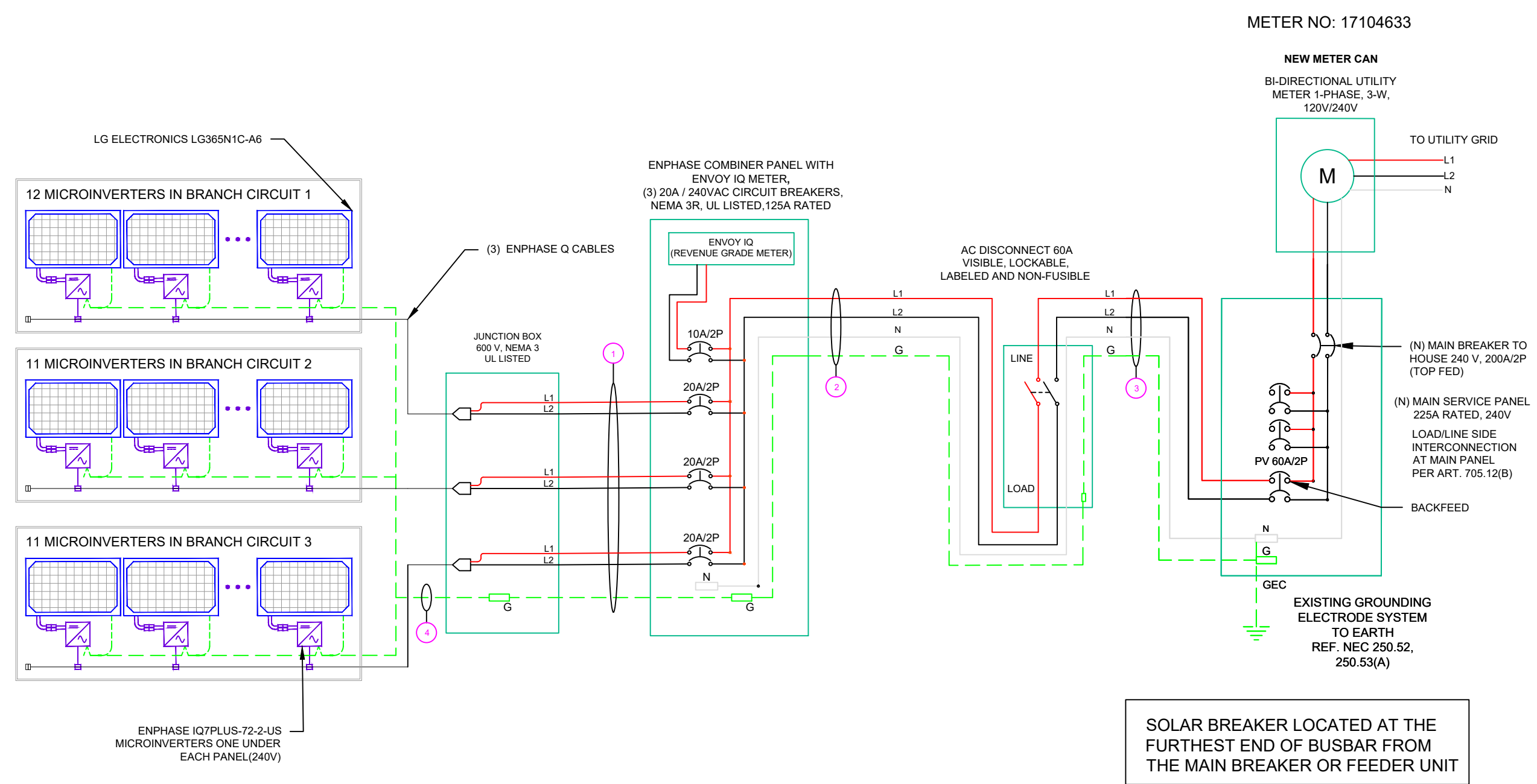
**INVERTER SPECIFICATIONS**

|                           |                                       |
|---------------------------|---------------------------------------|
| 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   | #12/2 ROMEX IN ATTIC/#12 THWN-2 ON EXTERIOR & (1)#6 THWN -2 / (GN) |
| 2   | #6 THWN-2 & (1)#6 THWN-2 GROUND / (GN)                             |
| 3   | #6 THWN-2 & (1)#6 THWN-2 GROUND / (GN)                             |
| 4   | (1)#6 BARE GROUND  |

(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 APPLICATINS WHERE PERMITTED BY NEC ART .348



METER NO: 17104633

**NEW METER CAN**

BI-DIRECTIONAL UTILITY METER 1-PHASE, 3-W, 120V/240V

TO UTILITY GRID  
L1  
L2  
N

AC DISCONNECT 60A  
VISIBLE, LOCKABLE,  
LABELED AND NON-FUSIBLE

(N) MAIN BREAKER TO HOUSE 240 V, 200A/2P (TOP FED)

(N) MAIN SERVICE PANEL 225A RATED, 240V  
LOAD/LINE SIDE INTERCONNECTION AT MAIN PANEL PER ART. 705.12(B)

BACKFEED

EXISTING GROUNDING ELECTRODE SYSTEM TO EARTH  
REF. NEC 250.52, 250.53(A)

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

LG ELECTRONICS LG365N1C-A6

12 MICROINVERTERS IN BRANCH CIRCUIT 1

11 MICROINVERTERS IN BRANCH CIRCUIT 2

11 MICROINVERTERS IN BRANCH CIRCUIT 3

ENPHASE IQ7PLUS-72-2-US MICROINVERTERS ONE UNDER EACH PANEL(240V)

ENPHASE COMBINER PANEL WITH ENVOY IQ METER, (3) 20A / 240VAC CIRCUIT BREAKERS, NEMA 3R, UL LISTED, 125A RATED

JUNCTION BOX 600 V, NEMA 3 UL LISTED

(3) ENPHASE Q CABLES

| 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                                 |

**CONTRACTOR**



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CUSTOMER NAME & ADDRESS  
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| REVIEWED BY | -           |

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**ELECTRICAL CALCULATIONS**

SHEET NUMBER

**E-602**

**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)

= [(12 x 1.21) x 1.25] / [0.91 x 0.8]

= 24.93A

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)

= [(34 x 1.21) x 1.25] / [0.91 x 1]

= 56.51 A

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

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

= TOTAL INVERTER O/P CURRENT x 1.25

= (34 x 1.21) x 1.25 = 51.43 A

SELECTED OCPD = 60 A ...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 + 60) <= 1.2 x 225A**

**260.00 <= 270.00 HENCE OK**

**CONTRACTOR**



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

**SYSTEM SIZE:**

DC SIZE: 12.410 KW DC-(STC)  
AC SIZE: 9.860 KW AC

**CUSTOMER NAME & ADDRESS**

**DON JAMES**  
**134 SOUTHERN**  
**PL, LILLINGTON,**  
**NC 27546, USA**

REVISIONS

| REV         | DESCRIPTION |
|-------------|-------------|
|             |             |
|             |             |
|             |             |
| DRAWN DATE  | 7/14/2021   |
| DRAWN BY    | BVP         |
| REVIEWED BY | -           |

Signature with Seal

**PLACARD**

SHEET NUMBER

**E-603**

**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**

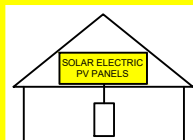
**LABEL 6**  
AT EACH AC DISCONNECT

**! 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

**CAUTION**

POWER TO THIS BUILDING IS ALSO SUPPLIED  
FROM THE FOLLOWING SOURCES WITH  
DISCONNECTS LOCATED AS SHOWN:

