AERIAL SITE VIEW

SCOPE OF WORK

INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM

8 kW DC & 5.8 kW AC PHOTOVOLTAIC SOLAR ARRAY

PV MODULES: (20) SILFAB SOLAR SIL-400 HC+
INVERTER(S): (20) ENPHASE IQ8PLUS-72-2-US

ROOF TYPE: COMPOSITION SHINGLE - 2 LAYER(S)
PV MOUNTING HARDWARE: ECOFASTEN CLICKFIT

SHEET LIST

JURISDICTION CODES AND STANDARDS

GOVERNING CODES
1. ALL WORK SHALL COMPLY WITH:
2020 NATIONAL ELECTRIC CODE (NEC)
2015 INTERNATIONAL BUILDING CODE (IBC)
2015 INTERNATIONAL RESIDENTIAL CODE (IRC)
2015 INTERNATIONAL FIRE CODE (IFC)

2018 NORTH CAROLINA STATE CODES
AND ALL STATE AND LOCAL BUILDING, ELECTRICAL, AND PLUMBING CODES.

SITE CLASSIFICATION NOTES, OSHA REGULATION
OCCUPANCY CLASS: SFR
CONSTRUCTION CLASS: V-B
ZONING TYPE: RESIDENTIAL

1. A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
2. THIS PROJECT HAS BEEN REVIEWED AND WILL NOT DIRECT CONCENTRATED SOLAR RADIATION OR GLARE ONTO NEARBY PROPERTIES OR ROADWAYS.
3. JUNCTION BOXES UNDER PV ARRAY SHALL BE INSTALLED TO BE CONSIDERED ACCESSIBLE BY NEC 690.34

ELECTRICAL CRITERIA, NOTES
TEMPERATURE SOURCE: ASHRAE
WEATHER STATION: POPE AFB
EXTREME MIN. TEMPERATURE: -10
ASHRAE 2% HIGH TEMP: 36

1. DRAWINGS HAVE BEEN DETAILED ACCORDING TO UL LISTING REQUIREMENTS.
2. TERMINALS AND LUGS WILL BE TIGHTENED TO MANUFACTURER TORQUE SPECIFICATIONS (WHEN PROVIDED) IN ACCORDANCE WITH NEC 110.14(D) ON ALL ELECTRICAL.
3. PV MODULE CERTIFICATIONS WILL INCLUDE UL1703, IEC61646, IEC61730.
4. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.
5. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION [NEC 110.26].
6. WHERE PV CABLES ON ROOFTOP WOULD OTHERWISE BE EXPOSED TO PHYSICAL DAMAGE, 3/4" EMT SHALL BE USED TO PROTECT CABLES
6. 1. FOR THE PROPOSED PV ELECTRICAL INSTALLATION, TYPE NM-CABLE SHALL ONLY BE USED WHEN RUNNING ELECTRICAL WIRING THROUGH THE ATTIC SPACE OR INTERIOR OF THE PERMITTED STRUCTURE. INSTALLATION OF TYPE NM-CABLE SHALL COMPLY WITH NEC 334.10 AND NEC 334.12.

STRUCTURAL CRITERIA, NOTES
DESIGN LOAD STANDARD: ASCE 7-10
WIND EXPOSURE CATEGORY: B
WIND SPEED (3-SEC GUST): 117 MPH
GROUND SNOW LOAD: 10 PSF
DESIGN ROOF SNOW LOAD: 10 PSF
SEISMIC DESIGN CATEGORY: C
SEISMIC RISK FACTOR: II

NORTH CAROLINA PROFESSIONAL SEAL 053270 ENGINEER A. LUKE ROWLEY
08/14/2023

NOTICE TO CONTRACTOR
All construction must comply with current NC Building Codes and is subject to field inspection and verification.
APPROVED
Limited building only review
Permit holder responsible for full compliance with the code
08/28/2023
Harnett COUNTY NORTH CAROLINA

ION

NABCEP BOARD CERTIFIED
PV INSTALLATION PROFESSIONAL
SCOTT A. GURNEY
#PV-011719-015186
EXP. 3-17-2025

ION DEVELOPER, LLC
4801 N UNIVERSITY AVE #900 PROVO, UT 84604
888.781.7074

ANTHONY GIOVANNI RIVERA
LIMITED CLASSIFICATION LICENSE
L.29168

SITE INFORMATION:
MORGAN PRINCE
59 DOONBEG DRIVE
FUQUAY VARINA, NORTH CAROLINA 27526

(20) SILFAB SOLAR SIL-400 HC+
(20) ENPHASE IQ8PLUS-72-2-US
8KW DC, 5.8KW STC-AC,
7.135KW CEC-AC

DRAWING BY
SHAWN COLLIER

DATE
14-AUG-2023

PROJECT ID
00AUBP

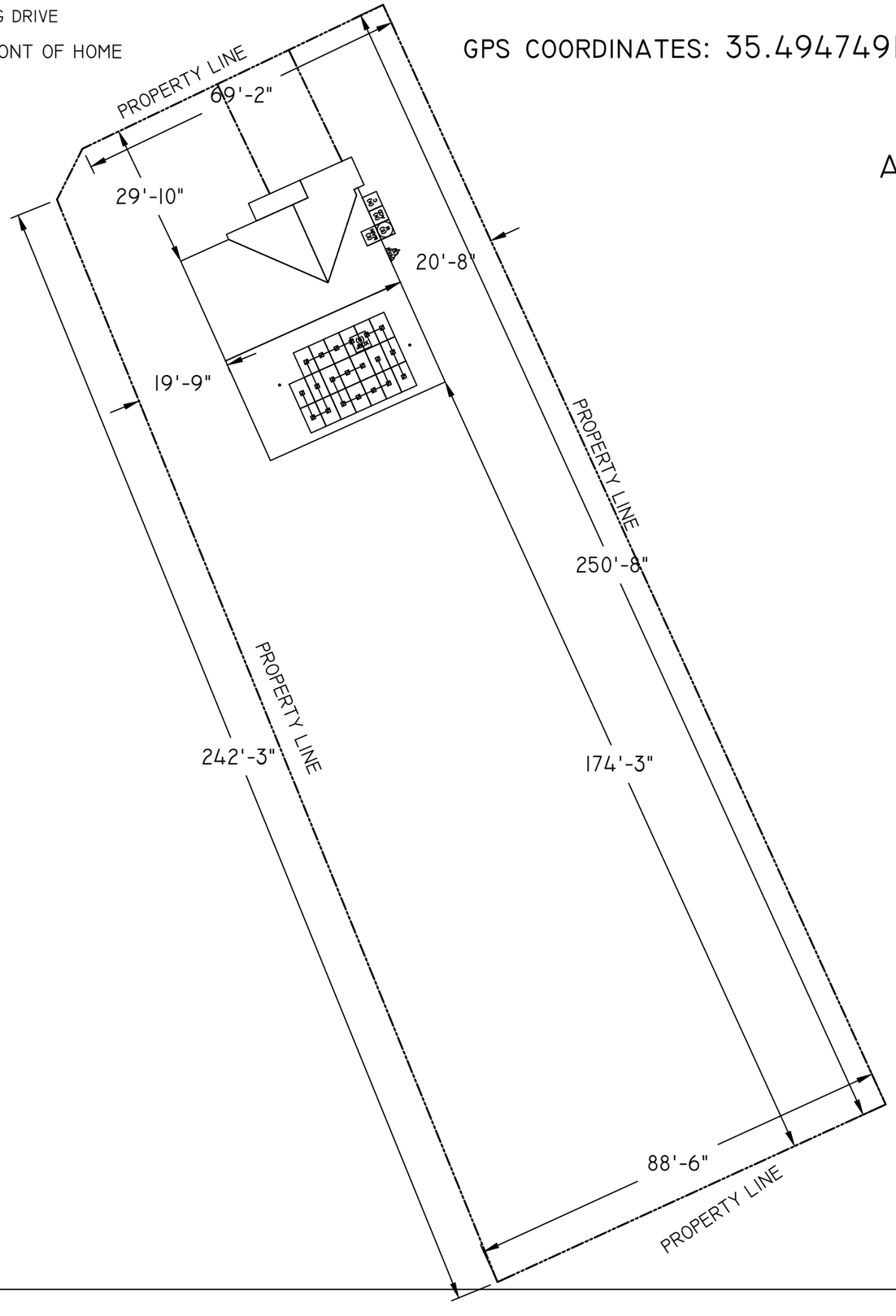
SHEET NAME
COVER SHEET

SHEET NUMBER
G-1

REVISON
0

59 DOONBEG DRIVE

FRONT OF HOME



GPS COORDINATES: 35.49474913429313, -78.8224690576696

LOT#157

SQFT: 1330

AREA OF LOT: 20,777.931 SQFT

NORTH CAROLINA PROFESSIONAL SEAL 053270 ENGINEER A. LUKE ROWLEY

08/14/2023

SCALE: 0.003261

0' 6'-4 5/8" 12'-9 1/4" 25'-6 5/8" 51'-1 1/4"

ION

NABCEP BOARD CERTIFIED PV INSTALLATION PROFESSIONAL SCOTT A. GURNEY #PV-011719-01586 EXP. 3-17-2025

ION DEVELOPER, LLC
4801 N UNIVERSITY AVE #900 PROVO, UT 84604
888.781.7074

ANTHONY GIOVANNI RIVERA
LIMITED CLASSIFICATION LICENSE
L.29168

SITE INFORMATION:
MORGAN PRINCE
59 DOONBEG DRIVE
FUQUAY VARINA, NORTH CAROLINA 27526

(20) SILFAB SOLAR SIL-400 HC+
(20) ENPHASE IQ8PLUS-72-2-US
8KW DC, 5.8KW STC-AC,
7.135KW CEC-AC

DRAWING BY
SHAWN COLLIER

DATE
14-AUG-2023

PROJECT ID
00AUBP

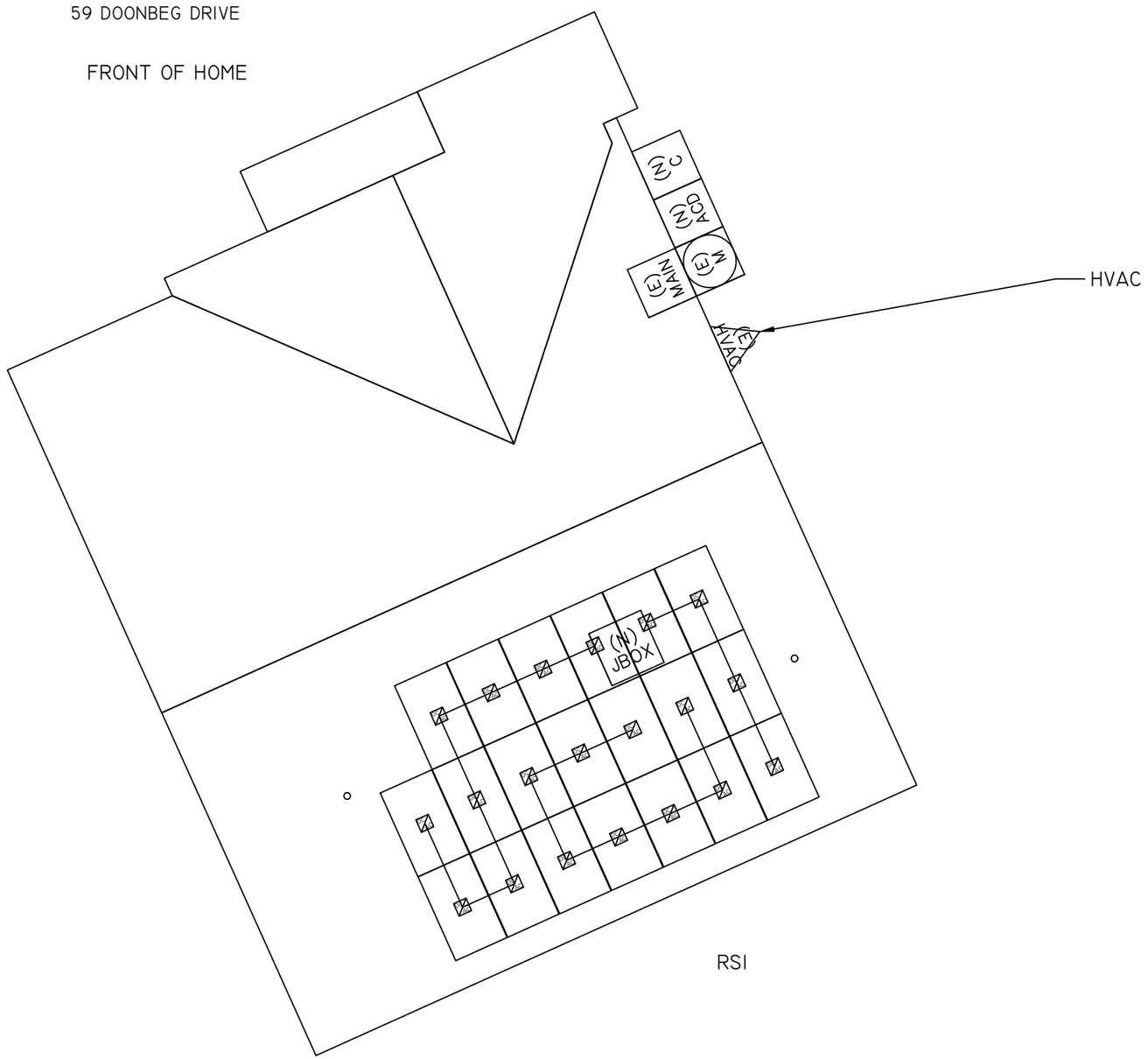
SHEET NAME
SITE PLAN

SHEET NUMBER
V-2

REVISON
0

SITE NOTES:

JUNCTION BOXES UNDER PV ARRAY SHALL BE INSTALLED TO BE CONSIDERED ACCESSIBLE BY NEC 690.34



NORTH CAROLINA PROFESSIONAL SEAL 053270 ENGINEER A. LUKE ROWLEY
08/14/2023

SCALE: 1/8" = 1'-0"
0' 2' 4' 8' 16'

SYSTEM LEGEND

- (E) M — (E) UTILITY METER / MAIN SERVICE PANEL
- (E) MAIN — (E) MAIN SERVICE PANEL
- (E) SUB — (E) SUBPANEL
- (N) C — (N) PV COMBINER PANEL
- (N) LC — (N) PV LOAD CENTER
- (N) PVM — (N) PV PRODUCTION METER
- (N) I — (N) DC-DC / STRING INVERTER
- (N) JBOX — (N) JUNCTION BOX
- (N) ACD — (N) AC DISCONNECT (VISIBLE-OPEN LOCKABLE LABELED DISCONNECT)
- DC/AC — (N) MICROINVERTER
- (N) DCD — (N) DC DISCONNECT
- S# — SUNEYE LOCATION
- FIRE SETBACK
- (N) PV MODULE
- STRUCTURALLY DISQUALIFIED

ROOF SECTION CRITERIA AND SPECIFICATIONS

ROOF SECTION	PV MODULE QTY	AZIMUTH	PITCH	TSRF
RSI	20	156	28	97%

ION

NABCEP BOARD CERTIFIED
PV INSTALLATION PROFESSIONAL
SCOTT A. GURNEY
#PV-011719-015186
EXP. 3-17-2025

ION DEVELOPER, LLC
4801 N UNIVERSITY AVE #900 PROVO, UT 84604
888.781.7074

ANTHONY GIOVANNI RIVERA
LIMITED CLASSIFICATION LICENSE
L.29168

SITE INFORMATION:
MORGAN PRINCE
59 DOONBEG DRIVE
FUQUAY VARINA, NORTH CAROLINA 27526

(20) SILFAB SOLAR SIL-400 HC+
(20) ENPHASE IQ8PLUS-72-2-US
8KW DC, 5.8KW STC-AC,
7.135KW CEC-AC

DRAWING BY
SHAWN COLLIER

DATE
14-AUG-2023

PROJECT ID
00AUBP

SHEET NAME
ROOF PLAN

SHEET NUMBER
S-3

REVISON
0

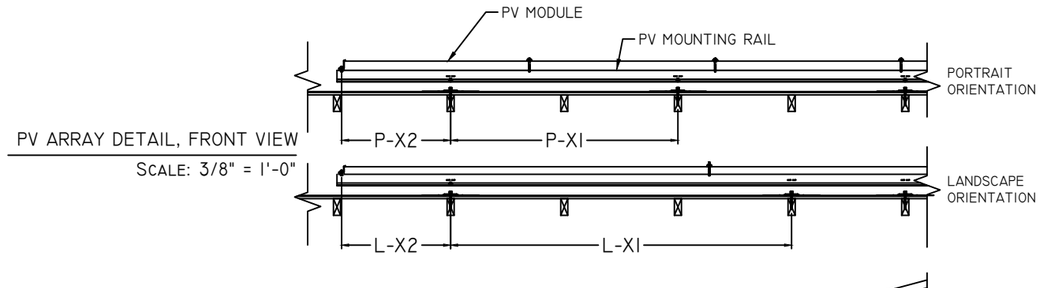
RACKING INSTALLATION SCHEDULE AND STRUCTURAL CRITERIA

PV RACKING	
RACKING:	ECOFASTEN CLICKFIT
RACKING TYPE:	RAIL
STANDOFF:	CLICKFIT L-FOOT
STANDOFF TYPE:	L-FOOT & FLASHING
FASTENER:	5/16" X 3-1/2" ZINC PLATED STEEL LAG SCREW

STRUCTURAL	
ROOF TYPE:	COMPOSITION SHINGLE
ROOF SHEATHING TYPE:	7/16" OSB
STRUCTURE TYPE:	MANUFACTURED WOOD TRUSS
RAFTER SIZE:	2x4
RAFTER SPACING:	24

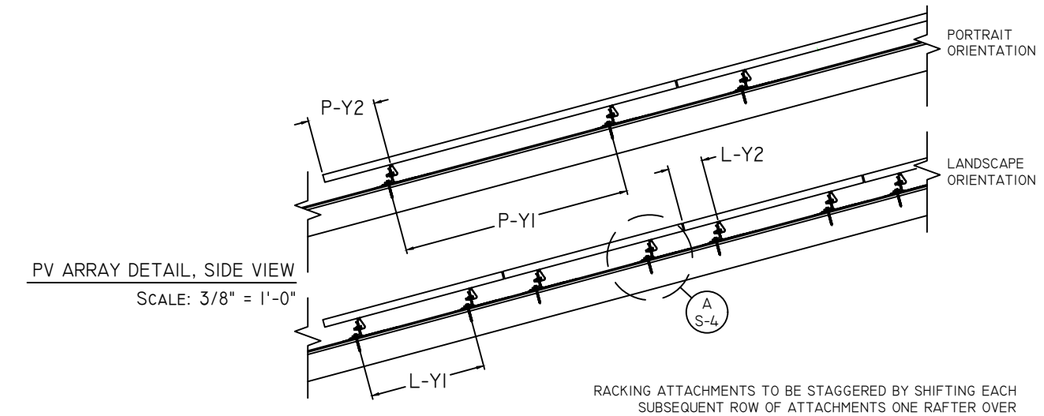
ARRAY PARAMETERS	
TOTAL ROOF AREA (SQ. FT.)	2178
TOTAL PV MODULE AREA (SQ. FT.)	426
% PV MODULE ROOF COVERAGE	20%

SPAN AREA	TAG	SPAN
RAIL - PORTRAIT - MODULE ORIENTATION		
X- SPACING	P-X1	48 IN. O.C. MAX.
X-CANTILEVER	P-X2	16 IN. MAX.
Y- SPACING	P-Y1	41.3 IN. MIN. - 45.3 IN. MAX.
Y-CANTILEVER	P-Y2	15 IN. MIN. - 17 IN. MAX.
RAIL - LANDSCAPE - MODULE ORIENTATION		
X- SPACING	L-X1	72 IN. O.C. MAX.
X-CANTILEVER	L-X2	23 IN. MAX.
Y- SPACING	L-Y1	21.1 IN. MIN. - 25.1 IN. MAX.
Y-CANTILEVER	L-Y2	7.9 IN. MIN. - 9.8 IN. MAX.



PV ARRAY DETAIL, FRONT VIEW

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



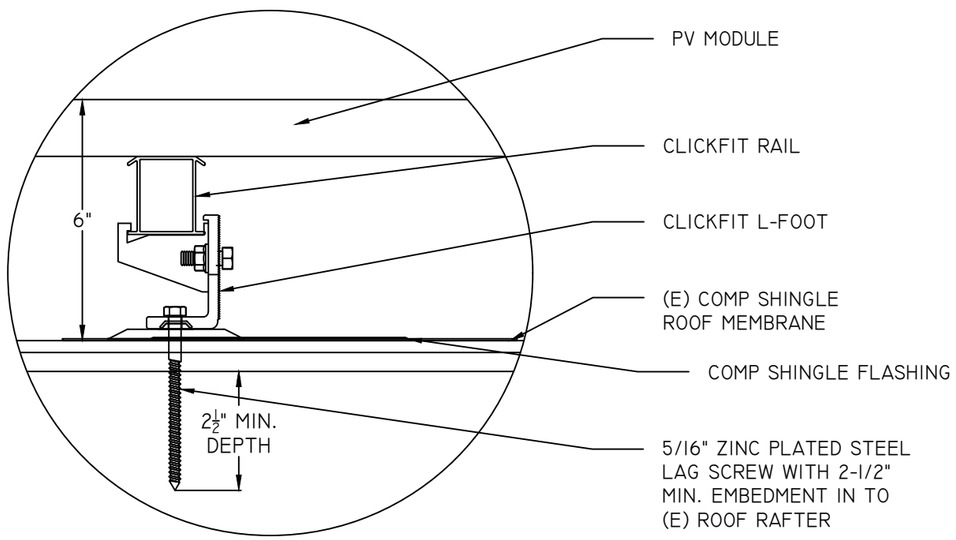
PV ARRAY DETAIL, SIDE VIEW

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

RACKING ATTACHMENTS TO BE STAGGERED BY SHIFTING EACH SUBSEQUENT ROW OF ATTACHMENTS ONE RAFTER OVER TO DISTRIBUTE LOAD ACROSS ALL FRAMING MEMBERS UNDER PV ARRAY.

NORTH CAROLINA PROFESSIONAL SEAL 053270 ENGINEER A. LUKE ROWLEY

08/14/2023



A STANDOFF DETAIL

SCALE: 3" = 1'-0"

ION

NABCEP BOARD CERTIFIED PV INSTALLATION PROFESSIONAL SCOTT A. GURNEY #PV-011719-015186 EXP. 3-17-2025

ION DEVELOPER, LLC
4801 N UNIVERSITY AVE #900 PROVO, UT 84604
888.781.7074

ANTHONY GIOVANNI RIVERA
LIMITED CLASSIFICATION LICENSE
L.29168

SITE INFORMATION:
MORGAN PRINCE
59 DOONBEG DRIVE
FUQUAY VARINA, NORTH CAROLINA 27526

(20) SILFAB SOLAR SIL-400 HC+
(20) ENPHASE IQ8PLUS-72-2-US
8KW DC, 5.8KW STC-AC,
7.135KW CEC-AC

DRAWING BY: SHAWN COLLIER

DATE: 14-AUG-2023

PROJECT ID: 00AUBP

SHEET NAME: STRUCTURAL DETAILS

SHEET NUMBER: S-4

REVISON: 0

PV SYSTEM STRUCTURAL SPECIFICATIONS AND CALCULATIONS

PV SYSTEM EQUIPMENT SPECIFICATIONS

MODULE MANUFACTURER / TYPE	SILFAB SOLAR SIL-400 HC+
SOLAR MODULE WEIGHT (LBS)	47
SOLAR MODULE LENGTH (IN.)	75.3
SOLAR MODULE WIDTH (IN.)	40.8
SOLAR MODULE AREA (SQ. FT)	21.3
PV RACKING	ECOFASTEN CLICKFIT
PV RACKING TYPE	RAIL
PV ROOF ATTACHMENT	CLICKFIT L-FOOT
PV ROOF ATTACHMENT FASTENER	5/16" X 3-1/2" ZINC PLATED STEEL LAG SCREW
RACKING DEAD LOAD (PSF)	0.8
SOLAR MODULE DEAD LOAD (PSF)	2.21
TOTAL PV ARRAY DEAD LOAD (PSF)	3.01

PV SYSTEM STRUCTURAL SPECIFICATIONS

STRUCTURE TYPE - ROOF SHAPE	INHABITED - GABLE / FLAT ROOF
MIN. ROOF SLOPE (DEG.)	28
MEAN ROOF HEIGHT (FT.)	11
PORTRAIT ATT. SPACING (IN. O.C.)	48
LANDSCAPE ATT. SPACING (IN. O.C.)	72
# OF ATTACHMENT POINTS	42
MAX. POINT LOAD (LBS / ATT.)	37.7
MAX. TOTAL PV DEAD LOAD TO RAFTER (LBS)	75.5

DESIGN WIND PRESSURE AND CONNECTION UPLIFT CALCULATIONS

ASCE 7-10 (C&C)

DESIGN WIND PRESSURE (PSF) = P = $q_H[(GC_P)-(GC_{Pi})]$ — EQN. 30.4-1

VELOCITY PRESSURE (PSF) = $q_H = 0.00256(K_H)(K_{ZT})(K_D)(V^2)$ — EQN. 30.3-1

TERRAIN EXPO. CONSTANT (α) =	7	TABLE 26.9-1	INTERNAL PRESSURE COEFF. (GC_{Pi}) =	0	TABLE 26.11-1
TERRAIN EXPO. CONSTANT (Z_G)(FT) =	1200	TABLE 26.9-1			FIG. 29.4-8
VP EXPOSURE COEFF.(K_H) =	0.70	EQN. 30.3-1			EQN. 30.3-1
TOPOGRAPHIC FACTOR (K_{ZT}) =	1.0	EQN. 26.8-1	q_H (PSF) =	20.85	
WIND DIRECTIONALITY FACTOR (K_D) =	0.85	TABLE 26.6-1	ASCE 7-10 VP (PSF) (0.6) X q_H =	12.51	

GABLE ROOF 27° < Ø ≤ 45°	UPLIFT ZONE 1	UPLIFT ZONE 2	UPLIFT ZONE 3	DOWNWARD ALL ZONES	FIGURE 30.4-2C
RAIL - PORTRAIT MODULE ORIENTATION	*48 IN. O.C.*	*48 IN. O.C.*	*48 IN. O.C.*	*48 IN. O.C.*	
EXTERNAL PRESSURE COEFF. (GC_P) =	-0.9	-1.7	-2.6	0.5	
ASD PRESSURE (0.6P)(PSF) =	-11.26	-21.27	-32.53	17.38	
TRIBUTARY AREA (SQ. FT) =	12.6	12.6	9.4		
MAX. UPLIFT (0.6D+0.6P) (LBS) =	-118.7	-244.3	-289.2		
RAIL - LANDSCAPE MODULE ORIENTATION	*72 IN. O.C.*	*72 IN. O.C.*	*72 IN. O.C.*	*72 IN. O.C.*	
EXTERNAL PRESSURE COEFF. (GC_P) =	-0.9	-1.7	-2.6	0.5	
ASD PRESSURE (0.6P)(PSF) =	-11.26	-21.27	-32.53	17.38	
TRIBUTARY AREA (SQ. FT) =	10.20	10.20	5.10		
MAX. UPLIFT (0.6D+0.6P) (LBS) =	-96.4	-132.4	-156.7		

ROOF ATTACHMENT FASTENER CHECK

NDS 12.2

CLICKFIT L-FOOT - 5/16" X 3-1/2" ZINC PLATED STEEL LAG SCREW — *MANUFACTURER MAX. UPLIFT CAPACITY = 895 LBS*

LAG SCREW WITHDRAWAL DESIGN VALUE (LBS) = W = $1800(G^{3/2})(D^{3/4})$ — 12.2.1

ROOF ATTACHMENT FASTENER (D) =	5/16	IN. LAG SCREW	LUMBER SPECIFIC GRAVITY (G)=	0.42	TABLE 2.3.2
FASTENER QTY PER ATTACHMENT =	1		LOAD DURATION FACTOR (C_D) =	1.6	TABLE 12.3.3A
FASTENER EMBEDMENT DEPTH (IN.) =	2.5		PRYING COEFFICIENT =	1.5	
WITHDRAWAL DESIGN VALUE(W)(LBS / IN.) =	204.8				
LAG SCREW WITHDRAWL CAPACITY (LBS) =	546.1				
MAX. ATT. WITHDRAWAL CAPACITY (LBS) =	546.1	> 289.2	MAX UPLIFT DEMAND (LBS)	OK	

DESIGN LOCATION AND SITE SPECIFICATIONS

JURISDICTION	HARNETT COUNTY
STATE	NORTH CAROLINA
ADOPTED LOAD STANDARD	ASCE 7-10
OCCUPANCY / RISK CATEGORY	II
BASIC WIND SPEED (MPH (3-SEC GUST))	117
WIND EXPOSURE CATEGORY	B
GROUND SNOW LOAD (PSF) (P_G)	10
BASE ELEVATION (FT)	188

DESIGNED ROOF SNOW LOAD CALCULATIONS

ASCE 7-10 (C&C)

SLOPED ROOF SNOW LOAD (PSF) =IF(RSI_ROOF_PITCH<10,"= P_F = 0.7(C_E)(C_T)(I_S)(P_G)"," = P_S = (C_S)(0.7)(C_E)(C_T)(I_S)(P_G)") — EQN. 7.4-1

EXPOSURE FACTOR (C_E) =	1.0	TABLE 7.3-1
THERMAL FACTOR (C_T) =	1.0	TABLE 7.3-2
IMPORTANCE FACTOR (I_S) =	1.0	TABLE 1.5-2
SLOPE FACTOR (C_S) =	1.0	FIG. 7.4-1
P_S (PSF) =	10	OK

GRAVITY LOAD / FRAMING CALCULATIONS

DEAD LOAD (PSF)		RSI
ROOF MEMBRANE	COMPOSITION SHINGLE	4.0
SHEATHING	7/16" OSB	1.7
PITCH (DEG)	28	
FRAMING	MANUFACTURED WOOD TRUSS - TOP CHORD 2X4 @ 24 IN. O.C. - SPF #2 @6 FT. MAX SPAN	1.0

TOTAL ROOF DEAD LOAD (PSF)	6.7
ADJUSTED TO SLOPED ROOF (PSF)	7.7
PV ARRAY ADJ. TO ROOF SLOPE (PSF)	3.4
ROOF LIVE LOAD > ROOF SNOW LOAD (PSF)	20.0
TOTAL LOAD (PSF)	31.1

RAFTER / TOP CHORD MEMBER PROPERITES	SPF #2 - 2x4
SECTION MODULUS (S)(IN^3)	3.06
MOMENT OF INERTIA (I)(IN^4)	5.36
TOTAL LOAD ON MEMBER (W) (PLF)	62.2
MAX. MEMBER SPAN (L) (FT)	6
MODULUS OF ELASTICITY (E) (PSI)	1400000
SHEAR (Fv) (PSI)	135
AREA (A) (IN^2)	5.25

MAX BENDING STRESS CHECK	(FB)(CD)(CF)(CR)
BENDING (FB) (PSI)	875
LOAD DURATION FACTOR (C_D)	1.25
SIZE FACTOR (C_F)	1.50
REPETITIVE MEMBER FACTOR (C_R)	1.15
ALLOWABLE BENDING STRESS (PSI)	1886.7
ACTUAL BENDING STRESS (PSI) = (wL^2)/(8(S))	1096.1
	58% OK

MAX DEFLECTION CHECK - TOTAL LOAD	UNIFORM DISTRIBUTED
ALLOWABLE DEFLECTION	L / 180
	0.400 IN.
ACTUAL MAX DEFLECTION	(W)(L)^4 / 185(E)(I)
	0.100 IN.
	25% OK
MAX DEFLECTION CHECK - LIVE LOAD	
ALLOWABLE DEFLECTION	L / 240
	0.3 IN.
ACTUAL MAX DEFLECTION	(W)(L)^4 / 185(E)(I)
	0.100 IN.
	33% OK

MAX SHEAR CHECK	
ALLOWABLE SHEAR	Fv (A)
	708.75 LBS.
ACTUAL MAX SHEAR	(W)(L)/2
	186 LBS.
	26% OK

NORTH CAROLINA PROFESSIONAL SEAL 053270 ENGINEER A. LUKE ROWLEY
A. Luke Rowley
08/14/2023

ION

NABCEP BOARD CERTIFIED
PV INSTALLATION PROFESSIONAL
SCOTT A. GURNEY
#PV-011719-01586
EXP. 3-17-2025

ION DEVELOPER, LLC
4801 N UNIVERSITY AVE #900 PROVO, UT 84604
888.781.7074

ANTHONY GIOVANNI RIVERA
LIMITED CLASSIFICATION LICENSE
L.29168

SITE INFORMATION:
MORGAN PRINCE
59 DOONBEG DRIVE
FUQUAY VARINA, NORTH CAROLINA 27526
(20) SILFAB SOLAR SIL-400 HC+
(20) ENPHASE IQ8PLUS-72-2-US
8KW DC, 5.8KW STC-AC,
7.135KW CEC-AC

DRAWING BY
SHAWN COLLIER

DATE
14-AUG-2023

PROJECT ID
00AUBP

SHEET NAME
STRUCTURAL CALCS

SHEET NUMBER
S-5

REVISON
0

CONDUCTOR AND RACEWAY SCHEDULE

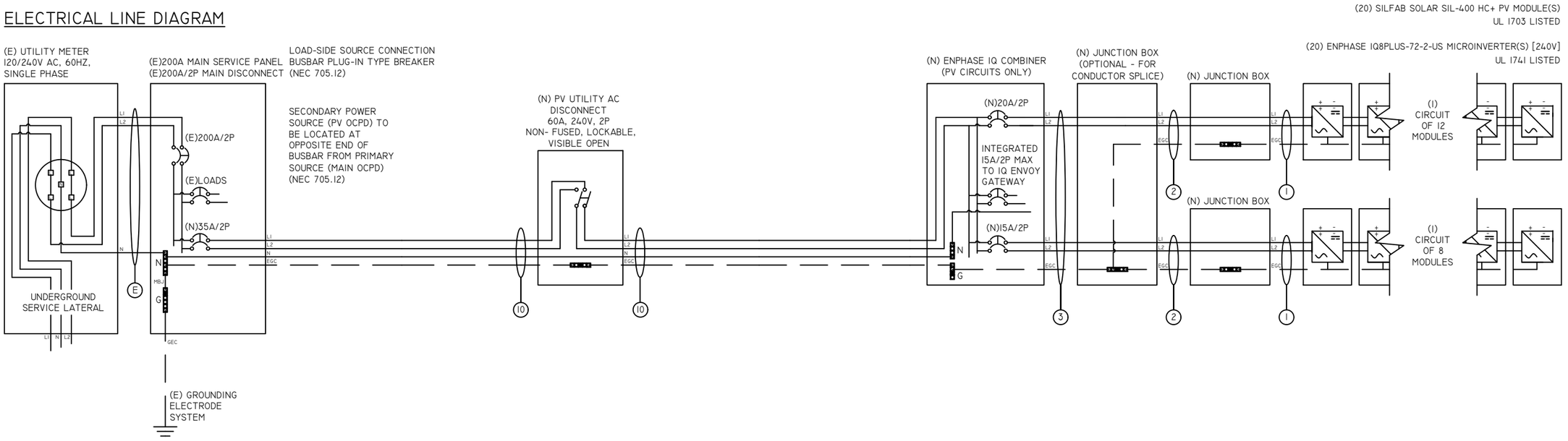
TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V
10	(1)	8 AWG	THHN / THWN-2, CU.	BLACK (L1)	24.2 A AC (MAX)
	(1)	8 AWG	THHN / THWN-2, CU.	RED (L2)	240 V AC
	(1)	10 AWG	THHN / THWN-2, CU.	WHITE (N)	
	(1)	10 AWG	THHN / THWN-2, CU.	GREEN (EGC)	
	(1)	3/4 IN.	EMT	(RACEWAY)	EXTERIOR

TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V
3	(2)	10 AWG	THHN / THWN-2, CU.	BLACK (L1)	14.52 A AC (MAX)
	(2)	10 AWG	THHN / THWN-2, CU.	RED (L2)	240 V AC
	(1)	10 AWG	THHN / THWN-2, CU.	GREEN (EGC)	
	(1)	3/4 IN.	EMT	(RACEWAY)	EXTERIOR

TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V
2	(1)	10 AWG	2C, NM-B W/G, CU. (CABLE)	(L1, L2, EGC)	14.52 A AC (MAX) 240 V AC
					INTERIOR

TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V
1	(1)	12 AWG	2C, TC-ER, CU.	(L1, L2)	14.52 A AC (MAX)
	(1)	6 AWG	SOLID BARE CU.	(EGC)	240 V AC
					EXTERIOR

ELECTRICAL LINE DIAGRAM



ELECTRICAL LINE DIAGRAM NOTES

MICROINVERTER CEC PEAK OUTPUT POWER: 290W
MODULE RATED POWER (PMAX) 400W

1. FOR THE PROPOSED PV ELECTRICAL INSTALLATION, TYPE NM-CABLE SHALL ONLY BE USED WHEN RUNNING ELECTRICAL WIRING THROUGH THE ATTIC SPACE OR INTERIOR OF THE PERMITTED STRUCTURE. INSTALLATION OF TYPE NM-CABLE SHALL COMPLY WITH NEC 334.10 AND NEC 334.12.

ION

NABCEP BOARD CERTIFIED
PV INSTALLATION PROFESSIONAL
SCOTT A. GURNEY
#PV-011719-01586
EXP. 3-17-2025

ION DEVELOPER, LLC
4801 N UNIVERSITY AVE #900 PROVO, UT 84604
888.781.7074

ANTHONY GIOVANNI RIVERA
LIMITED CLASSIFICATION LICENSE
L.29168

SITE INFORMATION:
MORGAN PRINCE
59 DOONBEG DRIVE
FUQUAY VARINA, NORTH CAROLINA 27526

(20) SILFAB SOLAR SIL-400 HC+
(20) ENPHASE IQ8PLUS-72-2-US
8KW DC, 5.8KW STC-AC,
7.135KW CEC-AC

DRAWING BY
SHAWN COLLIER

DATE
14-AUG-2023

PROJECT ID
00AUBP

SHEET NAME
ELEC. LINE DIAG.

SHEET NUMBER
E-6

REVISON
0

PV SYSTEM ELECTRICAL SPECIFCATIONS AND CALCULATIONS

DESIGN LOCATION AND TEMPERATURES

TEMPERATURE DATA SOURCE	ASHRAE
STATE	NORTH CAROLINA
JURISDICTION	HARNETT COUNTY
WEATHER STATION	POPE AFB
ASHRAE EXTREME LOW TEMP (°C)	-10
ASHRAE 2% HIGH TEMP (°C)	36
DESIGNED MAX. SYSTEM VDROP / VRISE	4.00%

PV MODULE SPECIFICATIONS — SILFAB SOLAR SIL-400 HC+

RATED POWER (PMAX) (W)	400
MAXIMUM POWER VOLTAGE (VMP)	36.05
MAXIMUM POWER CURRENT (IMP)	11.1
OPEN CIRCUIT VOLTAGE (VOC)	43.02
SHORT CIRCUIT CURRENT (ISC)	11.58
PMP/VMP TEMP. COEFFICIENT	-0.36
VOC TEMP. COEFFICIENT	-0.28
SERIES FUSE RATING	20
ADJ. MODULE VOC @ ASHRAE LOW TEMP	47.2
ADJ. MODULE VMP @ ASHRAE 2% AVG. HIGH TEMP	30.5

INVERTER SPECIFICATIONS — ENPHASE IQ8PLUS-72-2-US

TYPE	MICROINVERTER
MAX. OR RECOMMENDED MODULE POWER (W)	440
MAXIMUM INPUT DC OPEN-CIRCUIT VOLTAGE (VOC)	60
MINIMUM START VOLTAGE (V)	30
MAXIMUM START VOLTAGE(V)	58
MAXIMUM INPUT CURRENT (ISC) (A)	15
MAX CONTINUOUS OUTPUT POWER (VA)	290
MAX. CONTINUOUS OUTPUT CURRENT (A)	1.21
NOMINAL (L-L) OUTPUT VOLTAGE	240
CEC WEIGHTED EFFICIENCY (%)	97.0%

SYSTEM ELECTRICAL SPECIFICATIONS

	CIR 1	CIR 2
NUMBER OF MODULES PER CIRCUIT	12	8
DC POWER RATING PER CIRCUIT (STC)(W DC)	4800	3200
TOTAL MODULE QUANTITY	20 PV MODULES	
STC DC POWER RATING OF ARRAY	8000W DC	
INVERTER OUTPUT CIRCUIT CURRENT(A AC)	14.52	9.68
125% INVERTER OUTPUT CIRCUIT CURRENT(A AC)	18.15	12.1
CIRCUIT OCPD RATING (A)	20	15

COMBINED INVERTER CONTINUOUS OUTPUT CURRENT	24.2A AC
PV POWER PRODUCTION SYSTEM OCPD RATING (X1.25%)	35A
MAX. ARRAY STC-AC POWER (W)	5800W AC (STC)
MAX. ARRAY CEC-AC POWER (W)	7135W AC (CEC)

AC VOLTAGE RISE CALCULATIONS

	DIST (FT)	COND.	VRISE(V)	VEND(V)	%VRISE	
VRISE SEC. 1 (MICRO TO JBOX) *	28.8	12 Cu.	1.7	241.7	0.70%	
VRISE SEC. 2 (JBOX TO COMBINER BOX)	60	10 Cu.	2.1	242.1	0.87%	
VRISE SEC. 3 (COMBINER BOX TO POI)	10	8 Cu.	0.4	240.4	0.16%	
TOTAL VRISE			4.1	244.1	1.73%	OK

* 8 MICROINVERTER MAX SUB-BRANCH CIRCUIT SIZE TO COMPLY WITH VRISE CALCULATIONS.

RACEWAY / CONDUCTOR CALCULATIONS

MICROINV. TO JUNCTION BOX (1)

MAX INVERTER OUTPUT CIRCUIT CURRENT =	14.5 A AC		
CONDUCTOR SIZE / INSULATION / TYPE =	12 AWG	2C, TC-ER, CU.	
CONDUCTOR AMP. RATING @ 90°C =	30 A		
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)			
MAX INVERTER OUTPUT CURRENT X1.25% =	18.0 A AC		
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)			
AMB. TEMP. AMP. CORRECTION =	0.91		
# OF CONDUCTORS IN RACEWAY CORRECTION =	1.0		
ADJUSTED CONDUCTOR AMPACITY (A) =	27.3 A AC		
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =	18.0 < 27.3		
	(B)(1) - W/OUT CORRECTION FACTORS		
LARGER AMPACITY COMPLIANCE =	30.0 >	18.0	OK
RACEWAY SIZE / TYPE =	3/4 IN.	EMT OR NO RACEWAY	
CONDUCTOR(S) / CABLE(S) CROSS-SECTION AREA (IN.^2) =	0.142 IN.2		
CROSS-SECTIONAL AREA OF RACEWAY(IN.^2) =	0.533 IN.2		
% ALLOWABLE RACEWAY FILL (NEC CH. 9, TBL I) =	53% >	27%	OK

JUNCTION BOX TO JUNCTION BOX (2)

MAX INVERTER OUTPUT CIRCUIT CURRENT =	14.5 A AC		
CONDUCTOR SIZE / INSULATION / TYPE =	10 AWG	2C, NM-B W/G, CU.	
CONDUCTOR AMP. RATING @60°C =	30 A		
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)			
MAX INVERTER OUTPUT CURRENT X1.25% =	18.0 A AC		
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)			
AMB. TEMP. AMP. CORRECTION =	0.82		
# OF CONDUCTORS IN RACEWAY CORRECTION =	1.0		
ADJUSTED CONDUCTOR AMPACITY (A) =	24.6 A AC		
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =	18.0 < 24.6		
	(B)(1) - W/OUT CORRECTION FACTORS		
LARGER AMPACITY COMPLIANCE =	30.0 >	18.0	OK
RACEWAY SIZE / TYPE =		NO RACEWAY	

JUNCTION BOX TO COMBINER BOX (3)

MAX INVERTER OUTPUT CIRCUIT CURRENT =	14.5 A AC		
CONDUCTOR SIZE / INSULATION / TYPE =	10 AWG	THHN / THWN-2, CU.	
CONDUCTOR AMP. RATING @75°C =	30 A		
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)			
MAX INVERTER OUTPUT CURRENT X1.25% =	18.0 A AC		
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)			
AMB. TEMP. AMP. CORRECTION =	0.88		
# OF CONDUCTORS IN RACEWAY CORRECTION =	0.8		
ADJUSTED CONDUCTOR AMPACITY (A) =	21.12 A AC		
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =	18.0 < 21.1		
	(B)(1) - W/OUT CORRECTION FACTORS		
LARGER AMPACITY COMPLIANCE =	30.0 >	18.0	OK
RACEWAY SIZE / TYPE =	3/4 IN.	EMT	
CONDUCTOR(S) / CABLE(S) CROSS-SECTION AREA (IN.^2) =	0.106 IN.^2		
CROSS-SECTIONAL AREA OF RACEWAY(IN.^2) =	0.533 IN.^2		
% ALLOWABLE RACEWAY FILL (NEC CH. 9, TBL I) =	40% >	20%	OK

COMBINER BOX TO MAIN PV OCPD (10)

COMBINED INVERTER CONTINUOUS OUTPUT CURRENT =	24.2 A AC		
CONDUCTOR SIZE / INSULATION / TYPE =	8 AWG	THHN / THWN-2, CU.	
CONDUCTOR AMP. RATING @75°C =	50 A		
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)			
MAX COMBINED INVERTER CONTINUOUS OUTPUT CURRENT X1.25% =	30.0 A AC		
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)			
AMB. TEMP. AMP. CORRECTION =	0.88		
# OF CONDUCTORS IN RACEWAY CORRECTION =	1.0		
ADJUSTED CONDUCTOR AMPACITY (A) =	44 A AC		
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =	30.0 < 44.0		
	(B)(1) - W/OUT CORRECTION FACTORS		
LARGER AMPACITY COMPLIANCE =	50.0 >	30.0	OK
RACEWAY SIZE / TYPE =	3/4 IN.	EMT	
CONDUCTOR(S) / CABLE(S) CROSS-SECTION AREA (IN.^2) =	0.146 IN.^2		
CROSS-SECTIONAL AREA OF RACEWAY(IN.^2) =	0.533 IN.^2		
% ALLOWABLE RACEWAY FILL (NEC CH. 9, TBL I) =	40% >	27%	OK

ION

NABCEP BOARD CERTIFIED
PV INSTALLATION PROFESSIONAL
SCOTT A. GURNEY
#PV-011719-015286
EXP. 3-17-2025

ION DEVELOPER, LLC
4801 N UNIVERSITY AVE #900 PROVO, UT 84604
888.781.7074

ANTHONY GIOVANNI RIVERA
LIMITED CLASSIFICATION LICENSE
L.29168

SITE INFORMATION:
MORGAN PRINCE
59 DOONBEG DRIVE
FUQUAY VARINA, NORTH CAROLINA 27526

(20) SILFAB SOLAR SIL-400 HC+
(20) ENPHASE IQ8PLUS-72-2-US
8KW DC, 5.8KW STC-AC,
7.135KW CEC-AC

DRAWING BY
SHAWN COLLIER

DATE
14-AUG-2023

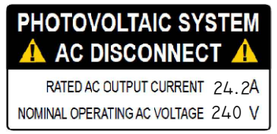
PROJECT ID
00AUBP

SHEET NAME
ELECTRICAL CALCS.

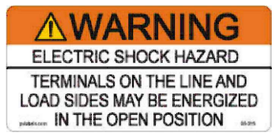
SHEET NUMBER
E-7

REVISON
0

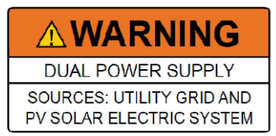
ELECTRICAL FIELD-APPLIED HAZARD MARKINGS



A — AT EACH PV SYSTEM DISCONNECTING MEANS. [NEC 690.54, NEC 690.13(B)]



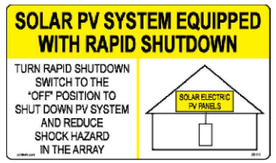
B — FOR PV DISCONNECTING MEANS WHERE ALL TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION. [NEC 690.13(B), NEC 705.22]



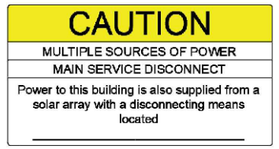
C — AT EQUIPMENT CONTAINING OVERCURRENT DEVICES IN CIRCUTS SUPPLYING POWER TO A BUSBAR OR CONDUCTOR SUPPLIED FROM MULTIPLE SOURCES. [NEC 705.12(C)]

D — PLACED ADJACENT TO PV SYSTEM PLUG-IN TYPE BREAKER TO A BUSBAR FOR A LOAD SIDE CONNECTION. [NEC 705.12(B)(3)(2)]

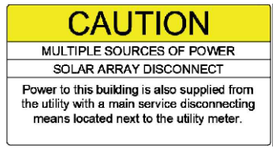
F — SIGN LOCATED ON OR NO MORE THAN 3 FT FROM THE RAPID SHUT DOWN DISCONNECT SWITCH(S). IF MORE THAN ONE PV RSD IS IN AN ENCLOSURE, EACH SHALL BE LABELED. [NEC 690.56(C), NEC 690.12(C)]



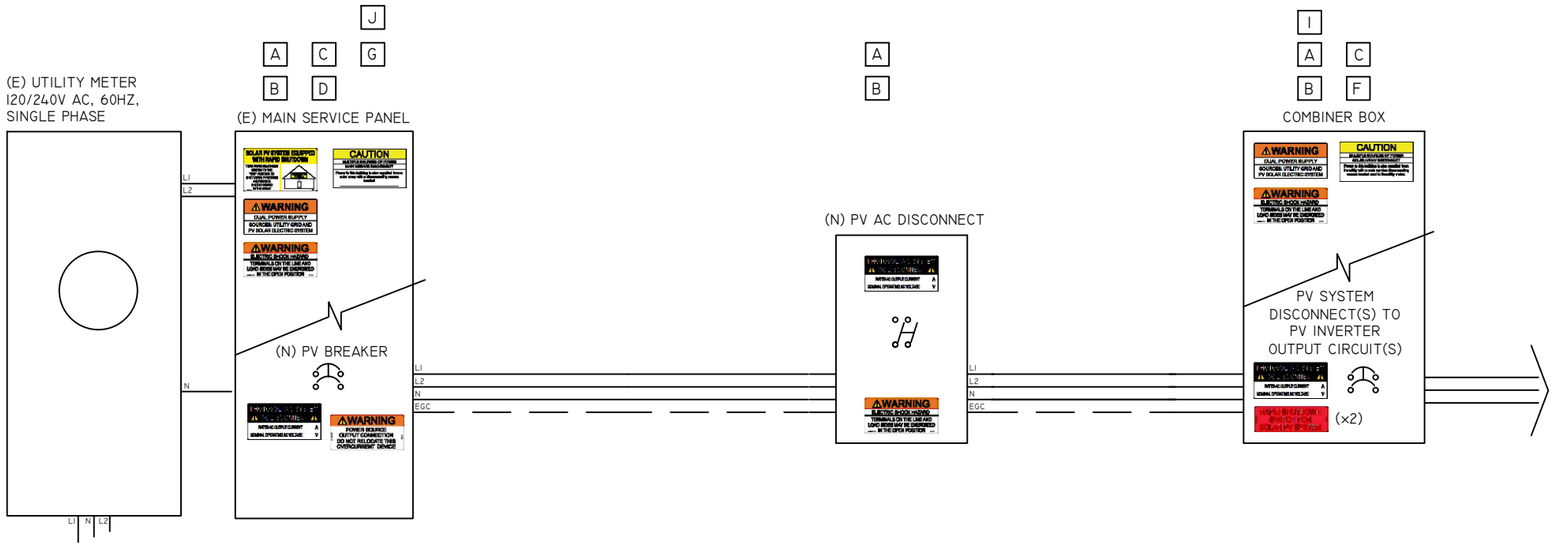
G — FOR BUILDINGS WITH PV SYSTEMS. TO BE LOCATED AT EACH SERVICE EQUIPMENT LOCATION TO WHICH THE PV SYSTEM IS CONNECTED. [NEC 690.56(C)]



J — PERMANENT DIRECTORY TO BE LOCATED AT MAIN SERVICE EQUIPMENT DENOTING THE LOCATION OF THE PV RAPID SHUTDOWN SYSTEM DISCONNECTING MEANS IF SOLAR ARRAY RAPID SHUT DOWN DISCONNECT SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS. [NEC 705.10, NEC 690.56(C)(1)]



I — PERMANENT DIRECTORY TO BE LOCATED AT SOLAR ARRAY RAPID SHUTDOWN SWITCH DENOTING THE LOCATION OF THE SERVICE EQUIPMENT LOCATION IF SOLAR ARRAY RAPID SHUT DOWN DISCONNECT SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS. [NEC 705.10]



ALL CAUTION, WARNING, OR DANGER SIGNS OR LABELS SHALL:

1. COMPLY WITH ANSI Z535.4-2011 STANDARDS.
2. BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HANDWRITTEN.
3. SHALL BE OF SUFFICEINT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
4. UNLESS OTHERS SPECIFIED MINIMUM TEXT HEIGHT TO BE $\frac{3}{32}$" (3MM).

ION

NABCEP BOARD CERTIFIED
PV INSTALLATION PROFESSIONAL
SCOTT A. GURNEY
#PV-011719-01586
EXP. 3-17-2025

ION DEVELOPER, LLC
4801 N UNIVERSITY AVE #900 PROVO, UT 84604
888.781.7074

ANTHONY GIOVANNI RIVERA
LIMITED CLASSIFICATION LICENSE
L.29168

SITE INFORMATION:
MORGAN PRINCE
59 DOONBEG DRIVE
FUQUAY VARINA, NORTH CAROLINA 27526

(20) SILFAB SOLAR SIL-400 HC+
(20) ENPHASE IQ8PLUS-72-2-US
8KW DC, 5.8KW STC-AC,
7.135KW CEC-AC

DRAWING BY
SHAWN COLLIER

DATE
14-AUG-2023

PROJECT ID
00AUBP

SHEET NAME
ELECTRICAL LABELS

SHEET NUMBER
E-9

REVISON
0