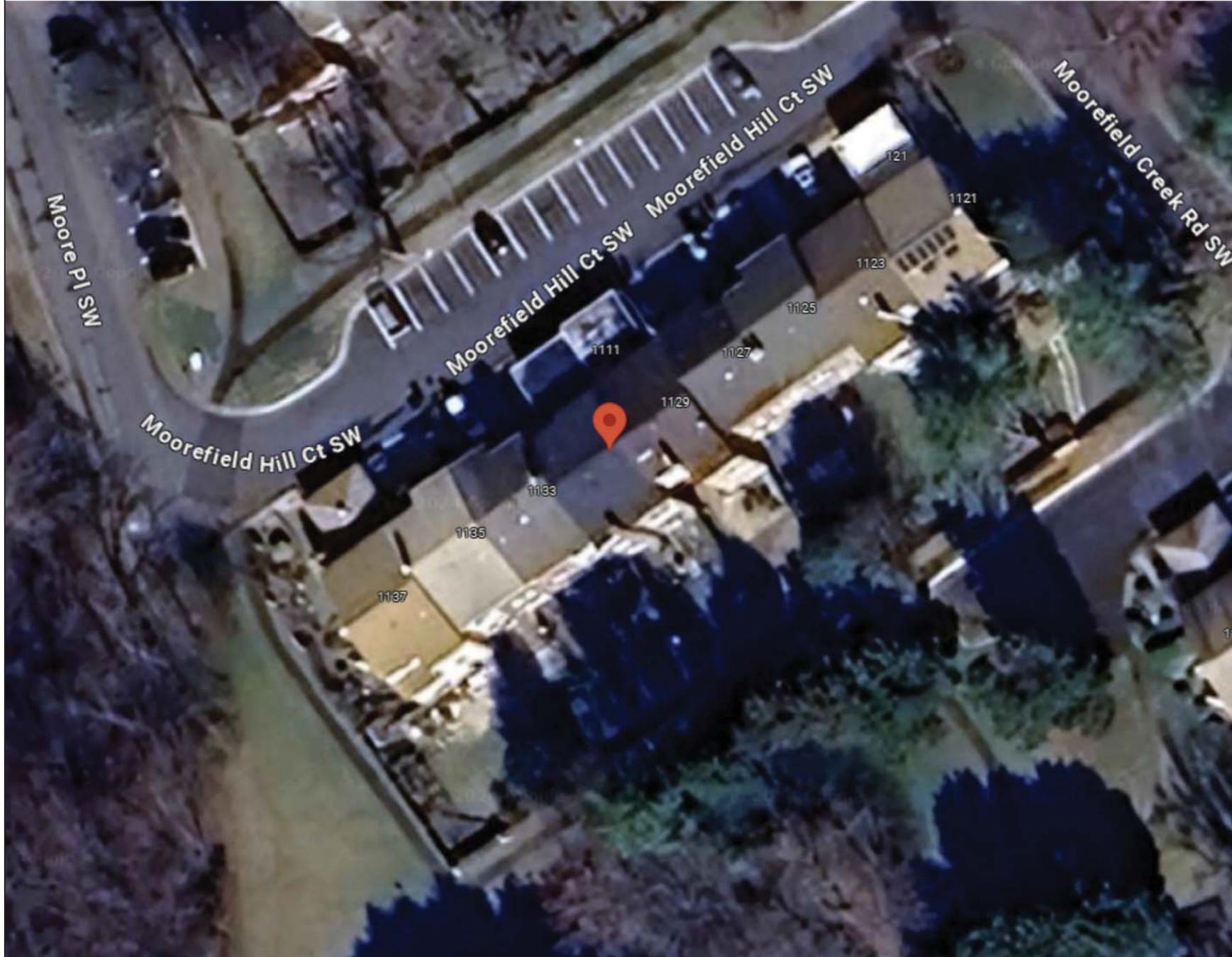


AERIAL SITE VIEW



SCOPE OF WORK

INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM

5.88 kW DC & 4.06 kW AC PHOTOVOLTAIC SOLAR ARRAY

PV MODULES: (14) SILFAB SOLAR SIL-420 HC+

INVERTER(S): (14) ENPHASE IQ8PLUS-72-2-US

ROOF TYPE: COMPOSITION SHINGLE - 1 LAYER(S)

PV MOUNTING HARDWARE: UNIRAC NXT

SHEET LIST

G-1	COVER SHEET
S-3	ROOF PLAN
S-4	STRUCTURAL DETAILS
S-4.1	STRONGHOLD BUTYL MISSED RAFTER/TRUSS DETAIL REV A
S-5	STRUCTURAL CALCULATIONS & NOTES
E-6	ELECTRICAL DETAILS (LINE DIAGRAM)
E-7	ELECTRICAL CALCULATIONS & NOTES
E-9	ELECTRICAL LABELS & LOCATIONS

JURISDICTION CODES AND STANDARDS

GOVERNING CODES

- ALL WORK SHALL COMPLY WITH:
 - 2020 NATIONAL ELECTRIC CODE (NEC)
 - 2021 VIRGINIA UNIFORM STATEWIDE BUILDING CODE (VUSBC)
 - 2021 VIRGINIA RESIDENTIAL CODE (VRC)
 - 2021 VIRGINIA STATEWIDE FIRE PREVENTION CODE (VSFPC)

2021 VIRGINIA UNIFORM STATEWIDE BUILDING CODES (USBC), 2021 VIRGINIA UNIFORM STATEWIDE CONSTRUCTION CODES (USCC), 2021 VRC, 2021 VCC

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

- A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
- MODULES HAVE AN ANTI-REFLECTIVE COATING TO PREVENT GLARE
- JUNCTION BOXES UNDER PV ARRAY SHALL BE INSTALLED TO BE CONSIDERED ACCESSIBLE BY NEC 690.34

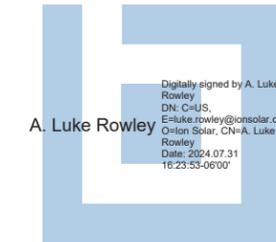
ELECTRICAL CRITERIA, NOTES

TEMPERATURE SOURCE: ASHRAE
 WEATHER STATION: WASHINGTON DC REAGAN AP
 EXTREME MIN. TEMPERATURE: -12
 ASHRAE 2% HIGH TEMP: 34

- DRAWINGS HAVE BEEN DETAILED ACCORDING TO UL LISTING REQUIREMENTS.
- TERMINALS AND LUGS WILL BE TIGHTENED TO MANUFACTURER TORQUE SPECIFICATIONS (WHEN PROVIDED) IN ACCORDANCE WITH NEC 110.14(D) ON ALL ELECTRICAL.
- PV MODULE CERTIFICATIONS WILL INCLUDE UL1703, IEC61646, IEC61730.
- CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.
- PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION [NEC 110.26].
- WHERE PV CABLES ON ROOFTOP WOULD OTHERWISE BE EXPOSED TO PHYSICAL DAMAGE, 3/4" EMT SHALL BE USED TO PROTECT CABLES

STRUCTURAL CRITERIA, NOTES

DESIGN LOAD STANDARD: ASCE 7-16
 WIND EXPOSURE CATEGORY: C
 WIND SPEED (3-SEC GUST): 112 MPH
 GROUND SNOW LOAD: 26 PSF
 DESIGN ROOF SNOW LOAD: 19 PSF
 SEISMIC DESIGN CATEGORY: B
 SEISMIC RISK FACTOR: II



Attachment 03



ION DEVELOPER
 DAVID STANLEY CONRAD
 ELE, CLASS A & AES/TRADESMAN MELE
 2705169798



ION SOLAR
 44 E 800 N
 OREM, UTAH 84057
 888.781.7074

PROJECT ID
 00CPFX

SITE OWNER
 ELAINE L FINCH

137 MOOREFIELD HILL COURT SOUTHWEST
 VIENNA, VIRGINIA 22180

EQUIP. (14) SILFAB SOLAR SIL-420 HC+
 (14) ENPHASE IQ8PLUS-72-2-US

SYSTEM SIZE
 5.88KW DC
 4.06KW STC-AC, 5.247KW CEC-AC

PROJECT DESIGNER
 JAN ROBLEDO

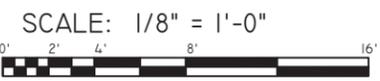
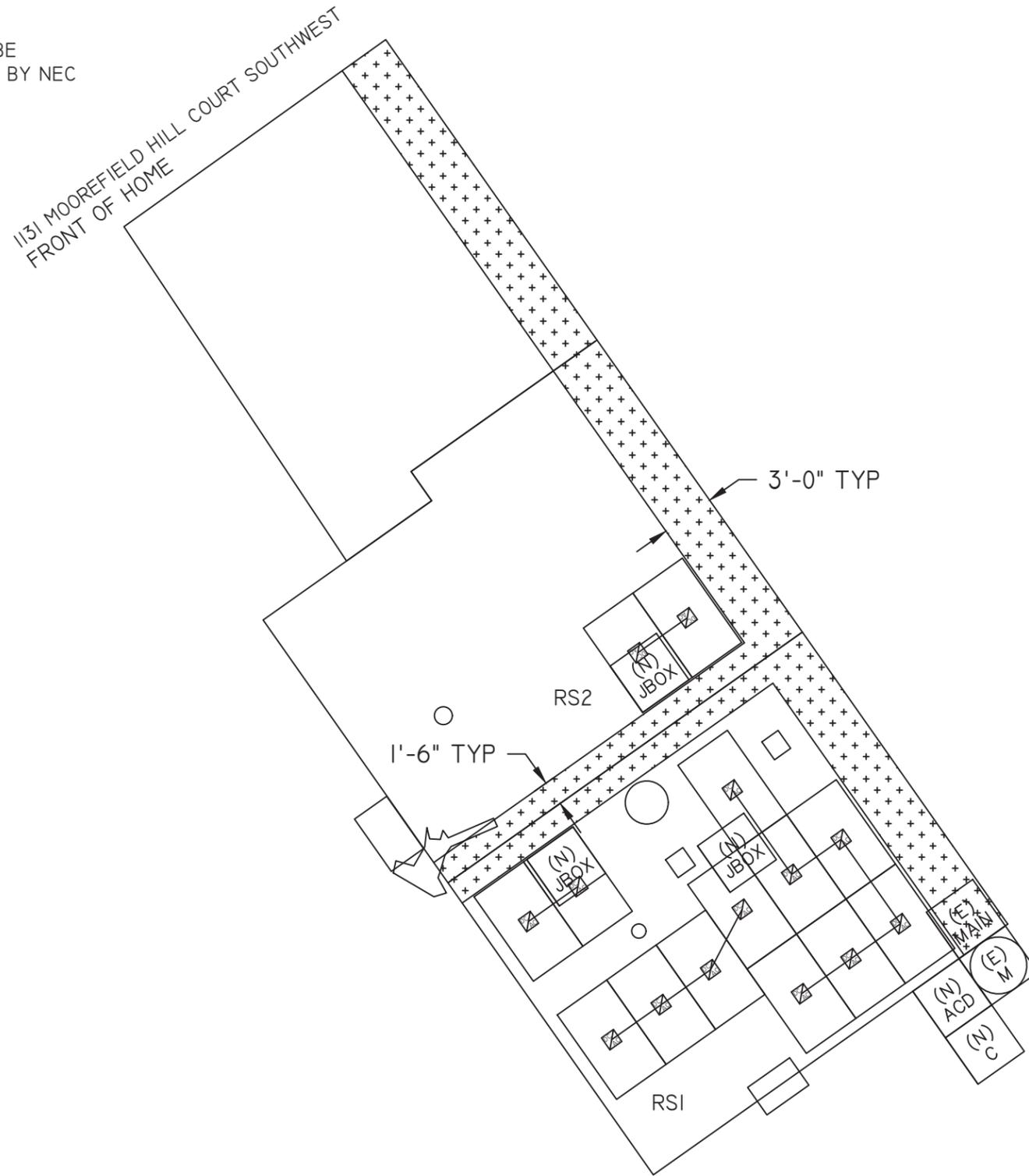
DATE
 01-AUG-2024

SHEET NAME
 COVER SHEET

SHEET #	REV
G-1	0

SITE NOTES:

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

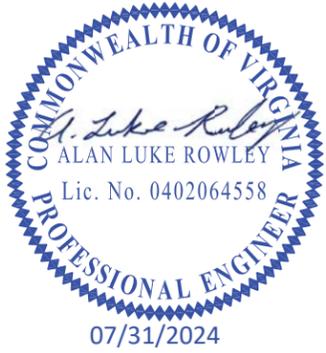


SYSTEM LEGEND

- | | | | |
|--|-----------------------------|--|---------------------------|
| (E) UTILITY METER / MAIN SERVICE PANEL | (N) PV COMBINER PANEL | (N) JUNCTION BOX | SUNEYE LOCATION |
| (E) MAIN SERVICE PANEL | (N) PV LOAD CENTER | (N) AC DISCONNECT (VISIBLE-OPEN LOCKABLE LABELED DISCONNECT) | FIRE SETBACK |
| (E) SUBPANEL | (N) PV PRODUCTION METER | (N) MICROINVERTER | (N) PV MODULE |
| | (N) DC-DC / STRING INVERTER | (N) DC DISCONNECT | STRUCTURALLY DISQUALIFIED |

ROOF SECTION CRITERIA AND SPECIFICATIONS

ROOF SECTION	PV MODULE QTY	AZIMUTH	PITCH	TSRF
RS1	12	145	23	92%
RS2	2	325	23	67%



ION DEVELOPER
DAVID STANLEY CONRAD
ELE, CLASS A & AES/TRADESMAN MELE
2705169798



ION SOLAR
44 E 800 N
OREM, UTAH 84057
888.781.7074

PROJECT ID
00CPFX

SITE OWNER
ELAINE L FINCH

1131 MOOREFIELD HILL COURT SOUTHWEST
VIENNA, VIRGINIA 22180

EQUIP. (14) SILFAB SOLAR SIL-420 HC+
(14) ENPHASE IQ8PLUS-72-2-US

SYSTEM SIZE 5.88KW DC
4.06KW STC-AC, 5.247KW CEC-AC

PROJECT DESIGNER
JAN ROBLEDO

DATE
01-AUG-2024

SHEET NAME
ROOF PLAN

SHEET # REV
S-3 0

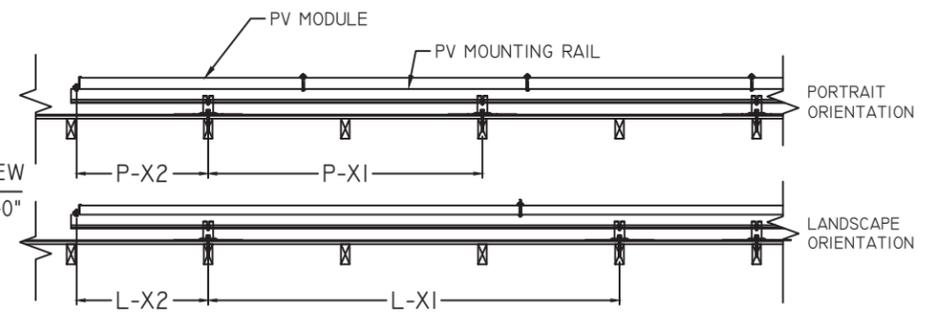
STRUCTURAL INSTALLATION SCHEDULE AND CRITERIA

ROOF MEMBRANE		SPAN AREA		TAG		SPAN	
ROOF TYPE:	COMPOSITION SHINGLE	RAIL - PORTRAIT - MODULE ORIENTATION					
ROOF SHEATHING TYPE:	1/2" PLYWOOD	X- SPACING	P-X1	48 IN. O.C. MAX.			
		X-CANTILEVER	P-X2	16 IN. MAX.			
		Y- SPACING	P-Y1	47.2 IN. MIN. - 59.1 IN. MAX.			
		Y-CANTILEVER	P-Y2	8.1 IN. MIN. - 14 IN. MAX.			
ARRAY PARAMETERS		RAIL - LANDSCAPE - MODULE ORIENTATION					
TOTAL ROOF AREA (SQ. FT.)	1420.43	X- SPACING	L-X1	72 IN. O.C. MAX.			
TOTAL PV MODULE AREA (SQ. FT.)	298.2	X-CANTILEVER	L-X2	23 IN. MAX.			
% PV MODULE ROOF COVERAGE	20.99%	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 RACKING							
RACKING:	UNIRAC NXT						
RACKING TYPE:	RAIL						
	UNIRAC STRONGHOLD BUTYL ATT KIT #14S						
STANDOFF:	MILL						
STANDOFF TYPE:	L-FOOT & BUTYL TAPE MASTIC						
FASTENER:	#14 X 3" WOOD SCREW						

STRUCTURAL FRAMING					
ROOF SECTION	STRUCTURE TYPE	RAFTER / TC SIZE (IN)	RAFTER / TC SPACING (IN)	STRUCTURAL UPGRADE	UPGRADE SIZE & LENGTH (FT)
RS1	CONVENTIONAL FRAMING	2x12	24	NONE - SINGLE PLY (1x)	NONE
RS2	CONVENTIONAL FRAMING	2x12	24	NONE - SINGLE PLY (1x)	NONE

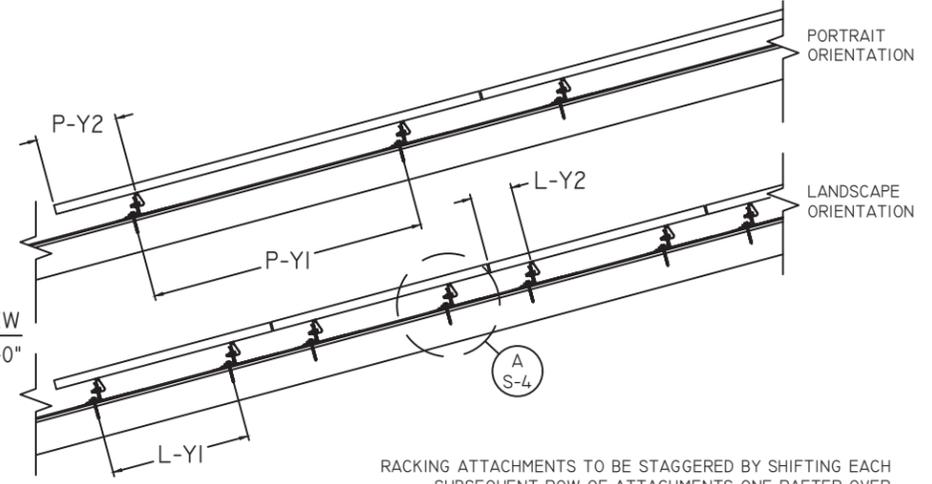
PV ARRAY DETAIL, FRONT VIEW

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



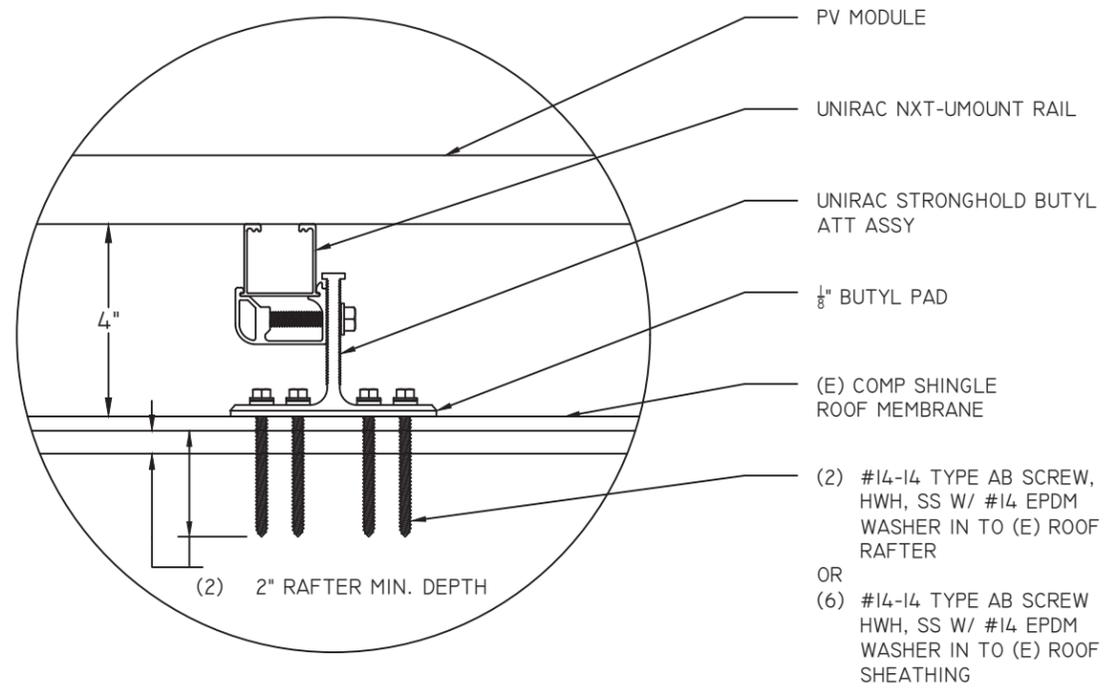
PV ARRAY DETAIL, SIDE VIEW

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

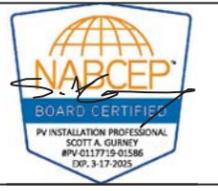


RACKING ATTACHMENTS TO BE STAGGERED BY SHIFTING EACH SUBSEQUENT ROW OF ATTACHMENTS ONE RAFTER OVER TO DISTRIBUTE LOAD ACROSS ALL FRAMING MEMBERS UNDER PV ARRAY.

*IF RAFTER IS MISSED, USE (6) 7/16" OSB MIN. DEPTH FASTENERS AND ADD (1) EXTRA MOUNT ATTACHED TO A RAFTER ≤ 24" TO EACH SIDE



A COMP SHINGLE - STRONGHOLD BUTYL ATT KIT - STANDOFF DETAIL
SCALE: 3" = 1'-0"



ION DEVELOPER
DAVID STANLEY CONRAD
ELE, CLASS A & AES/TRADESMAN MELE
2705169798

ION SOLAR
44 E 800 N
OREM, UTAH 84057
888.781.7074

PROJECT ID
00CPFX

SITE OWNER
ELAINE L FINCH

131 MOORE FIELD HILL COURT SOUTHWEST
VIENNA, VIRGINIA 22180

EQUIP. (14) SILFAB SOLAR SIL-420 HC+
(14) ENPHASE IQ8PLUS-72-2-US

SYSTEM SIZE 5.88KW DC
4.06KW STC-AC, 5.247KW CEC-AC

PROJECT DESIGNER
JAN ROBLEDO

DATE
01-AUG-2024

SHEET NAME
STRUCTURAL DETAILS

SHEET #	REV
S-4	0

PV SYSTEM STRUCTURAL SPECIFICATIONS AND CALCULATIONS

DESIGN LOCATION AND SITE SPECIFICATIONS

JURISDICTION	TOWN OF VIENNA
STATE	VIRGINIA
ADOPTED LOAD STANDARD	ASCE 7-16
OCCUPANCY / RISK CATEGORY	II
BASIC WIND SPEED (MPH (3-SEC GUST))	112
WIND EXPOSURE CATEGORY	C
GROUND SNOW LOAD (PSF) (Pg)	26
BASE ELEVATION (FT)	371

PV SYSTEM STRUCTURAL SPECIFICATIONS

STRUCTURE TYPE	INHABITED - GABLE / FLAT ROOF
MIN. ROOF SLOPE (DEG.)	23
MEAN ROOF HEIGHT (FT.)	29
PORTRAIT ATT. SPACING (IN. O.C.)	48
LANDSCAPE ATT. SPACING (IN. O.C.)	72
# OF ATTACHMENT POINTS	40
MAX. POINT LOAD (LBS / ATT.)	56.6
MAX. PV DEAD LOAD TO RAFTER (LBS)	56.6

PV SYSTEM EQUIPMENT SPECIFICATIONS

MODULE MANUFACTURER / TYPE	SILFAB SOLAR SIL-420 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	UNIRAC NXT
PV RACKING TYPE	RAIL
PV ROOF ATTACHMENT	UNIRAC STRONGHOLD BUTYL ATT KIT #1/4S MILL
PV ROOF ATTACHMENT FASTENER	#1/4 X 3" WOOD SCREW
RACKING DEAD LOAD (PSF)	0.8
SOLAR MODULE DEAD LOAD (PSF)	2.21
TOTAL PV ARRAY DEAD LOAD (PSF)	3.01

DESIGNED ROOF SNOW LOAD CALCULATIONS

ASCE 7-16 (C&C)	= Ps =
SLOPED ROOF SNOW LOAD (PSF) (Cs)(0.7)(Ce)(Ct)(Is)(Pg)	
EXPOSURE FACTOR (Ce) =	1.0
THERMAL FACTOR (Ct) =	1.0
IMPORTANCE FACTOR (Is) =	1.0
SLOPE FACTOR (Cs) =	1.0
Ps (PSF) =	19 OK

DESIGN WIND PRESSURE CALCULATIONS

DESIGN WIND PRESSURE (PSF) = P = qh(GCp)(ye)(ya)	EQN. 26.10-1
VELOCITY PRESSURE (PSF) = qh = 0.00256(Kh)(Kzt)(Kd)(Ke)(V^2)	TABLE 26.13-1
TERRAIN EXPO. CONSTANT (a) =	9.5
TERRAIN EXPO. CONSTANT (Zg)(FT) =	900
VP EXPOSURE COEFF. (Kh) =	0.98
TOPOGRAPHIC FACTOR (Kzt) =	1.0
WIND DIRECTIONALITY FACTOR (Kd) =	0.85
ARRAY EDGE FACTOR (ye) =	1
QH (PSF) =	26.62

ASCE 7-16 (C&C)

EQN. 26.10-1
TABLE 26.13-1
TABLE 26.11-1
TABLE 26.11-1
EQN. C26.10-1
EQN. 26.8-1
TABLE 26.6-1
EQN. 29.4-7
FIG. 29.4-8
EQN. 26.10-1

GRAVITY LOAD / FRAMING CALCULATIONS

DEAD LOAD (PSF)	RS1	RS2
ROOF MEMBRANE	COMPOSITION SHINGLE 4.0	COMPOSITION SHINGLE 4.0
SHEATHING	1/2" PLYWOOD 1.7	1/2" PLYWOOD 1.7
PITCH (DEG)	23	23
FRAMING	CONVENTIONAL FRAMING - NONE - SINGLE PLY (IX) - RAFTER 2X12 @ 24 IN. O.C. - SPF #2 @ 13.4 FT. MAX SPAN 2.7	CONVENTIONAL FRAMING - NONE - SINGLE PLY (IX) - RAFTER 2X12 @ 24 IN. O.C. - SPF #2 @ 13.4 FT. MAX SPAN 2.7

RAIL - COMPRESSION / UPLIFT

UNIRAC NXT	CONTINUOUS SPAN BM = (wL^2)/8
MAXIMUM HORIZONTAL RAIL SPAN (FT.) =	4.0
MAXIMUM VERTICAL SPACING BETWEEN RAILS (FT.) =	4.9
TOTAL LOAD (PSF) =	20.8
TOTAL LOAD ADJ. TO ROOF SLOPE (W)(LB. / FT.) =	-18.8
ALLOWABLE MANU. BENDING MOMENT (LB. / FT.) =	223
ACTUAL MAX. BENDING MOMENT (LB / FT.) =	37.7
	OK

CONNECTIONS - UPLIFT / DOWNWARD

GABLE ROOF 20° < θ ≤ 27°	FIGURE 30.3-2C			
	UPLIFT	UPLIFT	UPLIFT	UPLIFT
	DOWNWARD	DOWNWARD	DOWNWARD	DOWNWARD
	ALL ZONES	ALL ZONES	ALL ZONES	ALL ZONES
RAIL - PORTRAIT MODULE ORIENTATION	48 IN. O.C.	48 IN. O.C.	48 IN. O.C.	48 IN. O.C.
SOLAR PANEL PRESSURE EQ. FACTOR (ya) =	0.80	0.80	0.80	0.80
EXTERNAL PRESSURE COEFF. (GCp) =	-1.4	-2.5	-3.6	0.7
ASD PRESSURE (0.6P)(PSF) =	-17.89	-31.94	-46.00	24.85
TRIBUTARY AREA (SQ. FT) =	12.6	12.6	9.4	9.4
MAX. UPLIFT (0.6D+0.6P) (LBS) =	-201.9	-378.3	-416.0	
RAIL - LANDSCAPE MODULE ORIENTATION	72 IN. O.C.	72 IN. O.C.	72 IN. O.C.	72 IN. O.C.
SOLAR PANEL PRESSURE EQ. FACTOR (ya) =	0.80	0.80	0.80	0.80
EXTERNAL PRESSURE COEFF. (GCp) =	-1.4	-2.5	-3.6	0.7
ASD PRESSURE (0.6P)(PSF) =	-17.89	-31.94	-46.00	24.85
TRIBUTARY AREA (SQ. FT) =	10.20	10.20	5.10	5.10
MAX. UPLIFT (0.6D+0.6P) (LBS) =	-164.1	-205.0	-225.4	

ROOF ATTACHMENT / FASTENER CHECK

UNIRAC STRONGHOLD BUTYL ATT KIT #1/4S MILL - #1/4 X 3" WOOD SCREW	NDS 12.2
LAG SCREW WITHDRAWAL DESIGN VALUE (LBS) = W = 1800(G^3/2)(D^3/4)	12.2.1
ROOF ATTACHMENT FASTENER (D) (IN.) =	6/25
FASTENER QTY PER ATTACHMENT =	6
FASTENER EMBEDMENT DEPTH (IN.) =	2.0
LUMBER SPECIFIC GRAVITY (G) =	0.42
LOAD DURATION FACTOR (Cd) =	1.6
PRying COEFFICIENT =	1.4
WITHDRAWAL DESIGN VALUE(W)(LBS / IN.) =	168.0
LAG SCREW WITHDRAWAL CAPACITY (LBS) =	384.0
MANUFACTURER MAX. UPLIFT CAPACITY (LBS) =	779.0
MAX. ATT. WITHDRAWAL CAPACITY (LBS) =	779.0
MAX. ATT. WITHDRAWAL STRESS (LBS) =	416.0
	OK

PV ARRAY	3.0	3.0
TOTAL ROOF DEAD LOAD	11.4	11.4
ADJUSTED TO SLOPED ROOF	12.4	12.4
GREATER OF LIVE / SNOW LOAD	19.0	19.0
LIVE LOAD (PSF)	20.0	20.0
TOTAL GREATEST LIVE OR PV LOAD (PSF)	32.4	32.4
IBC 1607.14.4.1		

RAFTER / TOP CHORD MEMBER PROPERTIES

SPF #2 - 2x12 - NONE - SINGLE PLY (IX)	SPF #2 - 2x12 - NONE - SINGLE PLY (IX)
SECTION MODULUS (S)(IN^3)	31.64
MOMENT OF INERTIA (I)(IN^4)	177.98
TOTAL LOAD ON MEMBER (W) (PLF)	58.2
MEMBER SPAN 1 (L) (FT)	13.4
MEMBER SPAN 2 (K) (FT)	8.4
MIN. EAve SPAN (V) (FT)	1
MODULUS OF ELASTICITY (E) (PSI)	1400000
SHEAR (Fv) (PSI)	135
AREA (A) (IN^2)	16.875

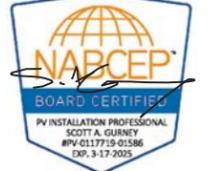
MAX BENDING STRESS CHECK	(Fb)(Cd)(Cf)(Cr)	(Fb)(Cd)(Cf)(Cr)
BENDING (Fb) (PSI)	875	875
LOAD DURATION FACTOR (Cd)	1.25	1.25
SIZE FACTOR (Cf)	1.00	1.00
REPETITIVE MEMBER FACTOR (Cr)	1.15	1.15
ALLOWABLE BENDING STRESS (PSI)	1257.8	1257.8

ACTUAL BENDING STRESS (PSI)	((WL^3)+(WK^3))/8(S)(L+K)	((WL^3)+(WK^3))/8(S)(L+K)
	379.8	379.8
	30% OK	30% OK

UNIFORM DISTRIBUTED	UNIFORM DISTRIBUTED
L / 120	L / 120
MAX DEFLECTION CHECK - TOTAL LOAD	
ALLOWABLE DEFLECTION	1.340 IN.
ACTUAL MAX DEFLECTION	0.070 IN.
(W)(L)^4 / 185(E)(I)	5% OK

UNIFORM DISTRIBUTED	UNIFORM DISTRIBUTED
L / 180	L / 180
MAX DEFLECTION CHECK - LIVE LOAD	
ALLOWABLE DEFLECTION	0.670 IN.
ACTUAL MAX DEFLECTION	0.048 IN.
(W)(L)^4 / 185(E)(I)	7% OK

MAX SHEAR CHECK	
ALLOWABLE SHEAR = Fv (A)	2278.1 LBS
ACTUAL MAX SHEAR = (W)(L)/2	390 LBS
	17% OK



ION DEVELOPER
DAVID STANLEY CONRAD
ELE, CLASS A & AES/TRADESMAN MELE
2705169798



PROJECT ID
00CPFX

SITE OWNER
ELAINE L FINCH

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VIENNA, VIRGINIA 22180

EQUIP. (14) SILFAB SOLAR SIL-420 HC+
(14) ENPHASE IQ8PLUS-72-2-US

SYSTEM SIZE
5.88KW DC
4.06KW STC-AC, 5.247KW CEC-AC

PROJECT DESIGNER
JAN ROBLEDO

DATE
01-AUG-2024

SHEET NAME
STRUCTURAL CALCULATIONS

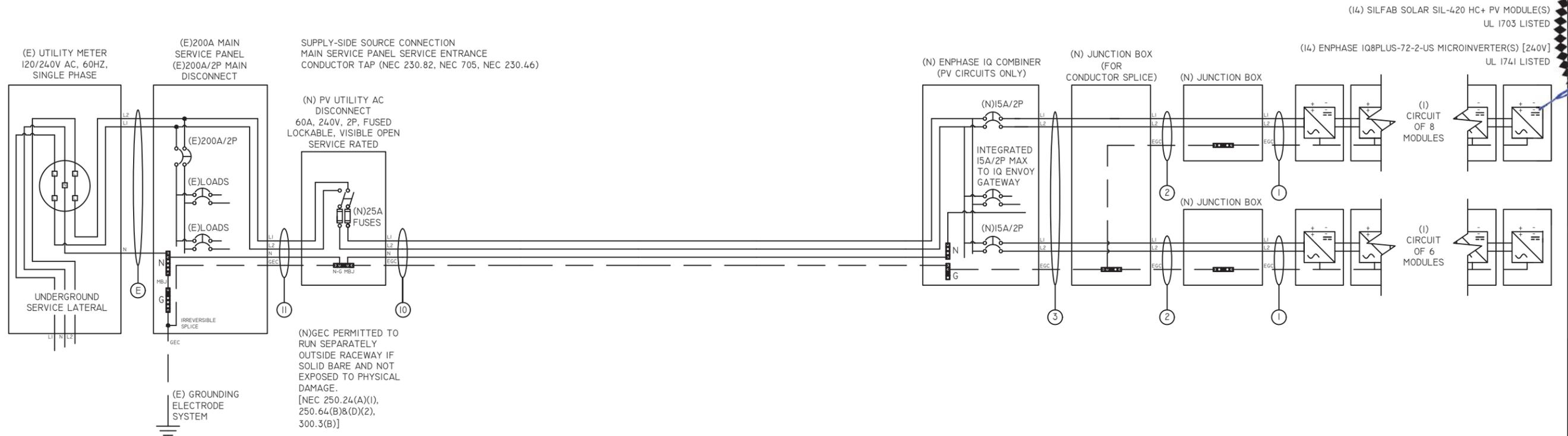
SHEET #
S-5

REV
0

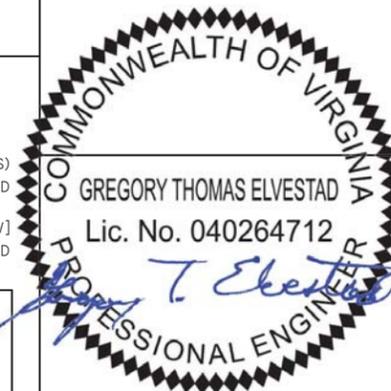
CONDUCTOR AND RACEWAY SCHEDULE

TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V	TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V	TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V	TAG	QTY	SIZE - #	TYPE	DESIGNATOR	I / V	
10	(1)	10 AWG	THHN / THWN-2, CU.	BLACK (L1)	16.94 A AC (MAX)	3	(2)	10 AWG	THHN / THWN-2, CU.	BLACK (L1)	9.68 A AC (MAX)	2	(1)	10 AWG	2C, NM-B W/G, CU.	(L1, L2, EGC)	9.68 A AC (MAX)	1	(1)	12 AWG	2C, TC-ER, CU.	(L1, L2)	9.68 A AC (MAX)	
	(1)	10 AWG	THHN / THWN-2, CU.	RED (L2)	240 V AC		(2)	10 AWG	THHN / THWN-2, CU.	RED (L2)	240 V AC		(1)	6 AWG	SOLID BARE CU.	(EGC)	240 V AC							
	(1)	10 AWG	THHN / THWN-2, CU.	WHITE (N)			(1)	10 AWG	THHN / THWN-2, CU.	GREEN (EGC)														
	(1)	10 AWG	THHN / THWN-2, CU.	GREEN (EGC)			(1)	3/4 IN.	EMT	(RACEWAY)														
	(1)	3/4 IN.	EMT	(RACEWAY)	EXTERIOR						EXTERIOR						INTERIOR						EXTERIOR	
11	(1)	6 AWG	THHN / THWN, CU.	BLACK (L1)	16.94 A AC (MAX)																			
	(1)	6 AWG	THHN / THWN, CU.	RED (L2)	240 V AC																			
	(1)	6 AWG	THHN / THWN, CU.	WHITE (N)																				
	(1)	6 AWG	THHN / THWN, CU.	GREEN (EGC)																				
	(1)	3/4 IN.	PVC SCH. 40	(RACEWAY)	EXTERIOR																			

ELECTRICAL LINE DIAGRAM



ELECTRICAL LINE DIAGRAM NOTES



Wyssling Consulting, PLLC
 76 N Meadowbrook Drive, Alpine UT 84004
 Virginia COA #407008373
 Signed 7/31/2024



ION DEVELOPER
 DAVID STANLEY CONRAD
 ELE, CLASS A & AES/TRADESMAN MELE
 2705169798



ION SOLAR
 44 E 800 N
 OREM, UTAH 84057
 888.781.7074

PROJECT ID	00CPFX
SITE OWNER	ELAINE L FINCH
SITE ADDRESS	1311 MOORE FIELD HILL COURT SOUTHWEST VIENNA, VIRGINIA 22180
EQUIP.	(I4) SILFAB SOLAR SIL-420 HC+ (I4) ENPHASE IQ8PLUS-72-2-US
SYSTEM SIZE	5.88KW DC 4.06KW STC-AC, 5.247KW CEC-AC
PROJECT DESIGNER	JAN ROBLEDO
DATE	01-AUG-2024
SHEET NAME	ELECTRICAL LINE DIAGRAM
SHEET #	E-6
REV	0

Gregory Elvestad, PE
 Digitally signed by Gregory Elvestad, PE
 DN: C=US, S=Utah, L=Alpine, O=Wyssling Consulting, OU=Director of Electrical Engineering, CN="Gregory Elvestad, PE", E=gelvestad@wysslingconsulting.com
 Reason: I am the author of this document
 Location:
 Date: 2024.07.31 12:27:03-06'00'
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PV SYSTEM ELECTRICAL SPECIFICATIONS AND CALCULATIONS

DESIGN LOCATION AND TEMPERATURES

TEMPERATURE DATA SOURCE	ASHRAE
STATE	VIRGINIA
JURISDICTION	TOWN OF VIENNA
WEATHER STATION	WASHINGTON DC REAGAN AP
ASHRAE EXTREME LOW TEMP (°C)	-12
ASHRAE 2% HIGH TEMP (°C)	34
DESIGNED MAX. SYSTEM VDOP / VRISE	4.00%

PV MODULE SPECIFICATIONS

RATED POWER (P _{MAX}) (W)	420
MAXIMUM POWER VOLTAGE (V _{MP})	39.19
MAXIMUM POWER CURRENT (I _{MP})	10.72
OPEN CIRCUIT VOLTAGE (V _{OC})	45.67
SHORT CIRCUIT CURRENT (I _{SC})	11.46
PMP/VMP TEMP. COEFFICIENT	-0.36
VOC TEMP. COEFFICIENT	-0.28
SERIES FUSE RATING	20
ADJ. MODULE VOC @ ASHRAE LOW TEMP	50.4
ADJ. MODULE VMP @ ASHRAE 2% AVG. HIGH TEMP	33.4

INVERTER SPECIFICATIONS

TYPE	ENPHASE IQ8PLUS-72-2-US
MAX. OR RECOMMENDED MODULE POWER (W)	440
MAXIMUM INPUT DC OPEN-CIRCUIT VOLTAGE (V _{OC})	60
MINIMUM START VOLTAGE (V)	30
MAXIMUM START VOLTAGE(V)	58
MAXIMUM INPUT CURRENT (I _{SC}) (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

NUMBER OF MODULES PER CIRCUIT	CIR 1	CIR 2
DC POWER RATING PER CIRCUIT (STC)(W DC)	8	6
TOTAL MODULE QUANTITY	3360	2520
STC DC POWER RATING OF ARRAY	14 PV MODULES	
INVERTER OUTPUT CIRCUIT CURRENT(A AC)	5880W DC	
I25% INVERTER OUTPUT CIRCUIT CURRENT(A AC)	9.68	7.26
CIRCUIT OCPD RATING (A)	12.1	9.08
COMBINED INVERTER CONTINUOUS OUTPUT CURRENT	15	15
PV POWER PRODUCTION SYSTEM OCPD RATING (X125%)	16.94A	AC
MAX. ARRAY STC-AC POWER (W)	25A	
MAX. ARRAY CEC-AC POWER (W)	4060W AC (STC)	
	5247W AC (CEC)	

AC VOLTAGE RISE CALCULATIONS

	DIST (FT)	COND.	VRISE(V)	VEND(V)	%VRISE
VRISE SEC. 1 (MICRO TO JBOX) *	28.8	12 Cu.	1.1	241.1	0.46%
VRISE SEC. 2 (JBOX TO COMBINER BOX)	70	10 Cu.	1.6	241.6	0.68%
VRISE SEC. 3 (COMBINER BOX TO POI)	10	10 Cu.	0.4	240.4	0.17%
TOTAL VRISE			3.1	243.1	1.31% 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 =	9.7 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 X125%=	12.0 A AC
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)	
AMB. TEMP. AMP. CORRECTION =	0.96
# OF CONDUCTORS IN RACEWAY CORRECTION =	1.0
ADJUSTED CONDUCTOR AMPACITY (A) =	28.8 A AC
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =	12.0 < 28.8
(B)(1) - W/OUT CORRECTION FACTORS	
LARGER AMPACITY COMPLIANCE =	30.0 > 12.0 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 1) =	53% > 27% OK

JUNCTION BOX TO JUNCTION BOX (2)

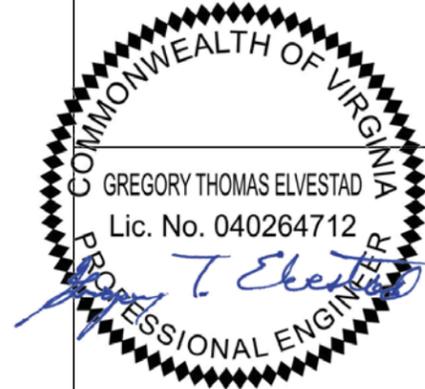
MAX INVERTER OUTPUT CIRCUIT CURRENT =	9.7 A AC
CONDUCTOR SIZE / INSULATION / TYPE =	10 AWG 2C, NM-B W/G, CU.
CONDUCTOR AMP. RATING @60°C =	30 A
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)	
MAX INVERTER OUTPUT CURRENT X125%=	12.0 A AC
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)	
AMB. TEMP. AMP. CORRECTION =	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) =	12.0 < 27.3
(B)(1) - W/OUT CORRECTION FACTORS	
LARGER AMPACITY COMPLIANCE =	30.0 > 12.0 OK
RACEWAY SIZE / TYPE =	NO RACEWAY

JUNCTION BOX TO COMBINER BOX (3)

MAX INVERTER OUTPUT CIRCUIT CURRENT =	9.7 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 X125%=	12.0 A AC
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)	
AMB. TEMP. AMP. CORRECTION =	0.94
# OF CONDUCTORS IN RACEWAY CORRECTION =	0.8
ADJUSTED CONDUCTOR AMPACITY (A) =	22.56 A AC
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =	12.0 < 22.6
(B)(1) - W/OUT CORRECTION FACTORS	
LARGER AMPACITY COMPLIANCE =	30.0 > 12.0 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 1) =	40% > 20% OK

COMBINER BOX TO MAIN PV OCPD (10)

COMBINED INVERTER CONTINUOUS OUTPUT CURRENT =	16.9 A AC
CONDUCTOR SIZE / INSULATION / TYPE =	10 AWG THHN / THWN-2, CU.
CONDUCTOR AMP. RATING @75°C =	35 A
PER NEC 690.8(B)(1)(W/OUT CORRECTION FACTORS)	
MAX COMBINED INVERTER CONTINUOUS OUTPUT CURRENT X125% =	21.0 A AC
PER NEC 690.8(B)(2)(WITH CORRECTION FACTORS)	
AMB. TEMP. AMP. CORRECTION =	0.94
# OF CONDUCTORS IN RACEWAY CORRECTION =	1.0
ADJUSTED CONDUCTOR AMPACITY (A) =	32.9 A AC
LARGER AMPACITY OF 690.8(B)(1) OR (B)(2) =	21.0 < 32.9
(B)(1) - W/OUT CORRECTION FACTORS	
LARGER AMPACITY COMPLIANCE =	35.0 > 21.0 OK
RACEWAY SIZE / TYPE =	3/4 IN. EMT
CONDUCTOR(S) / CABLE(S) CROSS-SECTION AREA (IN. ²) =	0.084 IN. ²
CROSS-SECTIONAL AREA OF RACEWAY(IN. ²) =	0.533 IN. ²
% ALLOWABLE RACEWAY FILL (NEC CH. 9, TBL 1) =	40% > 16% OK



Wyssling Consulting, PLLC
 76 N Meadowbrook Drive, Alpine UT 84004
 Virginia COA #407008373

Signed 7/31/2024



ION DEVELOPER
 DAVID STANLEY CONRAD
 ELE, CLASS A & AES/TRADESMAN MELE
 2705169798

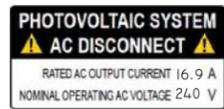


ION SOLAR
 44 E 800 N
 OREM, UTAH 84057
 888.781.7074

PROJECT ID	00CPFX
SITE OWNER	ELAINE L FINCH
PROJECT ADDRESS	131 MOORE FIELD HILL COURT SOUTHWEST VIENNA, VIRGINIA 22180
EQUIP.	(14) SILFAB SOLAR SIL-420 HC+ (14) ENPHASE IQ8PLUS-72-2-US
SYSTEM SIZE	5.88KW DC 4.06KW STC-AC, 5.247KW CEC-AC
PROJECT DESIGNER	JAN ROBLEDO
DATE	01-AUG-2024
SHEET NAME	ELECTRICAL CALCULATIONS
SHEET #	E-7
REV	0

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ELECTRICAL FIELD-APPLIED HAZARD MARKINGS



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



O PERMANENT DIRECTORY TO BE LOCATED AT MAIN SERVICE EQUIPMENT LOCATION IF ALL ELECTRICAL POWER SOURCE DISCONNECTING MEANS (SOLAR ARRAY RAPID SHUTDOWN SWITCH) ARE GROUPED AND IN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS. [NEC 690.56(C) & NEC 705.10].



T LOCATED ON SERVICE METER ENCLOSURE [UTILITY SPECIFIC LABEL]



F 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]



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



P 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]



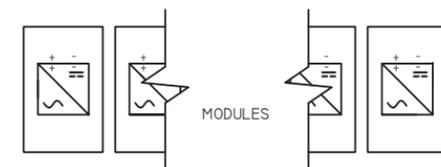
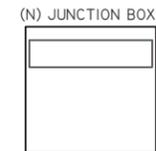
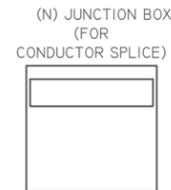
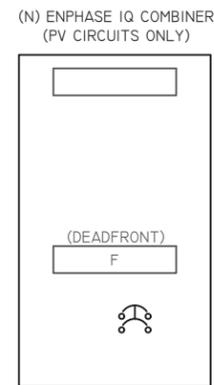
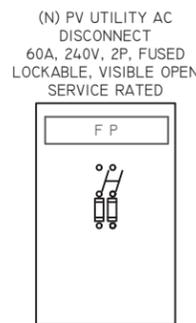
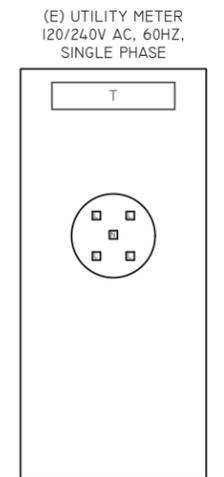
B PLACED ADJACENT TO PV SYSTEM PLUG-IN TYPE BREAKER TO A BUSBAR FOR A LOAD SIDE CONNECTION. [NEC 705.12(B)(3)(2)]



C 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)]

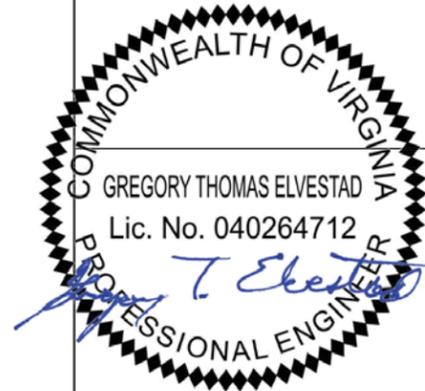


D FOR RAPID SHUTDOWN SWITCH INITIATION DEVICE LOCATED AT A READILY ACCESSIBLE OUTDOOR LOCATION. [NEC 690.12]



- 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 SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
 4. UNLESS OTHERS SPECIFIED MINIMUM TEXT HEIGHT TO BE 1/8" (3MM).

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DAVID STANLEY CONRAD
ELE, CLASS A & AES/TRADESMAN MELE
2705169798



ION SOLAR
44 E 800 N
OREM, UTAH 84057
888.781.7074

PROJECT ID 00CPF-X

SITE OWNER ELAINE L FINCH

SITE ADDRESS FIELD HILL COURT SOUTHWEST
VIENNA, VIRGINIA 22180

EQUIP. (14) SILFAB SOLAR SIL-420 HC+
(14) ENPHASE IQ8PLUS-72-2-US

SYSTEM SIZE 5.88KW DC
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DATE 01-Aug-2024

SHEET NAME ELECTRICAL LABELS

SHEET # E-9 REV 0