



Freedom Forever

COUNTY OF CONTRA COSTA

5/9/2023

BRUCE GINN

Job Address: 19 JAY CT, ALAMO, CA 94507

Plan revisions noted below.

1. The BOM has been updated as per the requirement
2. ADD STRUCTURAL HAS BEEN UPDATED.
3. The report has been added.

GROUND MOUNT SOLAR PERMIT PACKAGE
BRUCE GINN
11.200KW DC GRID TIED PHOTOVOLTAIC SYSTEM
19 JAY CT, ALAMO, CA 94507

BUILDING INFORMATION

FOOTING TYPE : CONCRETE PIER	OCCUPANCY: R3/U
CONSTRUCTION TYPE: V-B	APN: 1936700168
CONCRETE PIER QUANTITY : 14	

PV SYSTEM SUMMARY:

SYSTEM SIZE (DC)	: STC: 400 x 28 = 11.200kW DC
	: PTC: 372.3 x 28 = 10.4244kW DC
SYSTEM SIZE (AC)	: 7.600kW AC @ 240V
MODULES	: (28) FREEDOM FOREVER: FF-MP-BBB-400
OPTIMIZERS	: (28) SOLAR EDGE: S440
INVERTER	: SOLAR EDGE: SOLAREEDGE SE7600H-USRGM [240] [SI1-S8]
TILT	: 30°
AZIMUTH	: 184°
ATTACHMENT TYPE	: IRONRIGDGE GROUND MOUNT SYSTEM WITH IRONRIDGE XR-1000 RAIL
MAIN SERVICE PANEL	: EXISTING 200 AMPS MSP ON HOT FED
INTERCONNECTION	: PV BREAKER
OCPD RATING	: 40 AMPS
UTILITY	: PACIFIC GAS AND ELECTRIC COMPANY

GENERAL NOTES:	
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1. LOCAL UTILITY PROVIDER SHALL BE NOTIFIED PRIOR TO USE AND ACTIVATION OF ANY SOLAR PHOTOVOLTAIC INSTALLATION .
2. THIS PROJECT SHALL COMPLY WITH LOCAL ORDINANCES .
3. PROPER ACCESS AND WORKING CLEARANCE WILL BE PROVIDED .
4. ALL ELECTRICAL WORK SHOWN ON THESE PLANS WILL BE COMPLETED BY THE UNDERSIGNED .
5. ALL APPLICABLE PV EQUIPMENT LISTED AND COMPLIANT WITH UL2703, UL1741 AND UL1703
6. ALL ROOF PENETRATIONS TO BE SEALED WITH A HIGH PERFORMANCE ROOF SEALANT SUCH AS GeoCel 2300 CLEAR SEALANT .
7. THE SYSTEM WILL NOT BE INTERCONNECTED UNTIL APPROVAL FROM THE LOCAL JURISDICTION AND THE UTILITY IS OBTAINED .
8. THE SOLAR PHOTOVOLTAIC INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS .
9. IF THE EXISTING MAIN PANEL DOES NOT HAVE VERIFIABLE GROUNDING ELECTRODE, IT IS THE NECESSARY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE .
10. EACH MODULE WILL BE GROUNDED UL 2703 OR UL 1703 APPROVED USING THE SUPPLIED CONNECTION POINTS IDENTIFIED ON THE MODULE AND THE MANUFACTURER'S INSTALLATION INSTRUCTIONS" .
11. A LADDER SHALL BE IN PLACE FOR THE INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS .
12. MAX HEIGHT OF MODULES OFF OF ROOF FACE : <6" .
13. PHOTOVOLTAIC SYSTEM WILL COMPLY WITH 2022 CEC. .
14. PHOTOVOLTAIC SYSTEM INVERTER IS UNGROUNDED. NO CONDUCTORS ARE SOLIDLY GROUNDED IN THE INVERTER, AND SYSTEM COMPLIES WITH 690.35. .
15. MODULES CONFORM TO AND ARE LISTED UNDER UL 1703. .
16. INVERTER CONFORMS TO AND IS LISTED UNDER UL 1741. .
17. ELECTRICAL EQUIPMENT AND MATERIAL TO BE LISTED, LABELED, AND INSTALLED PER THE CEC, THE INSTALLATION STANDARDS/MANUFACTURER'S RECOMMENDATIONS AND IF REQUIRED A RECOGNIZED ELECTRICAL TESTING LABORATORY. .
18. CONDUITS EXPOSED TO SUNLIGHT ON ROOF SHALL BE LOCATED NOT LESS THAN 7/8" ABOVE ROOF SURFACE.
19. IN EXPOSED LOCATIONS, WIRING AND CABLING SHALL BE IN CONDUIT OR CABLE SHALL BE RATED FOR EXPOSURE; TYPE NM CABLE ALLOWED IN PROTECTED LOCATIONS. WITHIN ATTIC SPACES, ALLOWED TO RUN TYPE NM (ROMEX) 10/3 OR 12/3 CONDUCTORS THROUGH OPEN SPACE OR TYPE THHN IN MINIMUM 3/4" ALUMINUM CONDUIT
20. MATERIALS, EQUIPMENT AND INSTALLATION SHALL COMPLY WITH THE REQUIREMENTS, STANDARDS, RULES AND REGULATIONS OF THE FOLLOWING AND BE MOST SUITABLE TO THE PURPOSE INTENDED:

CODE INFORMATION	
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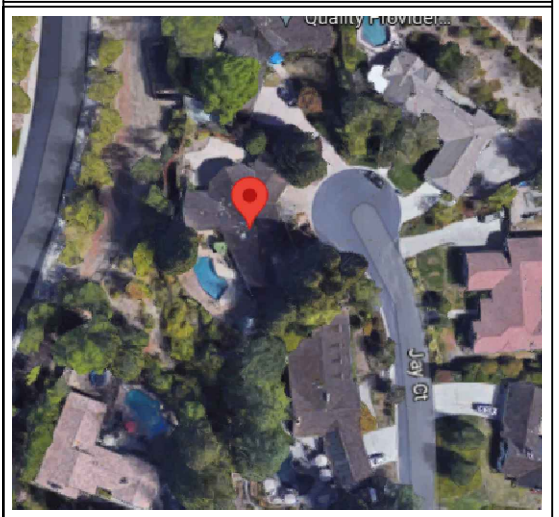
**THE INSTALLATION OF SOLAR ARRAYS AND PHOTOVOLTAIC
POWER SYSTEMS SHALL COMPLY WITH THE FOLLOWING CODES:**

2022 CALIFORNIA BUILDING CODE
2022 CALIFORNIA FIRE CODE
2022 CALIFORNIA PLUMBING CODE
2022 CALIFORNIA MECHANICAL CODE
2022 CALIFORNIA ENERGY CODE
2022 CALIFORNIA RESIDENTIAL CODE
2022 CALIFORNIA ADMINISTRATIVE CODE
2022 CALIFORNIA ELECTRICAL CODE

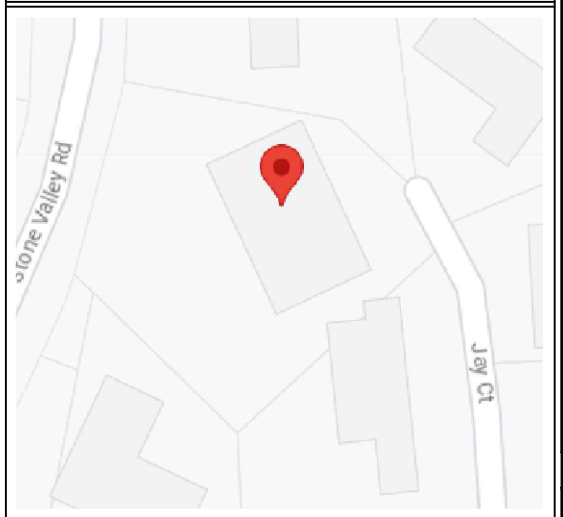
AHJ: COUNTY OF CONTRA COSTA

RECEIVED on 09/26/2024 CDP24-00064
By Contra Costa County
Department of Conservation and Development

AERIAL VIEW



VICINITY VIEW



SHEET INDEX	
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PV-9.1	PLACARD
PV-10.0	OPTIMIZER CHART
PV-11.0	SAFETY PLAN
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PV-13.0+	SPEC. SHEETS

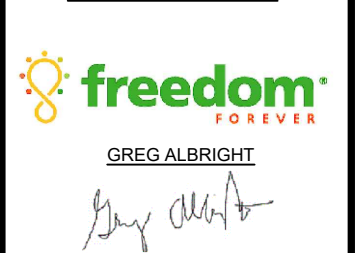


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**CURRENT RENEWABLES
ENGINEERING INC.**
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J-13, RIVERSIDE CA 92507
PHONE: (951)-405-1733
WWW.CRENG.CO

CONTRACTOR INFO



Gay Allen

43445 BUSINESS PARK DR #110,
TEMECULA, CA 92590

STATE OF CALIFORNIA
C10 – ELECTRICAL; B – GENERAL
BUILDING CONTRACTOR; C39 –
ROOFING; C46 – SOLAR 1029644

STATE OF CALIFORNIA
C10 – ELECTRICAL; B – GENERAL
BUILDING CONTRACTOR; C39 –
ROOFING; C46 – SOLAR 1029644

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Solar Individual Permit Package

BRUCE GINN

11.200KW Grid Tied Photovoltaic System
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19 JAY CT,
ALAMO, CA 94507

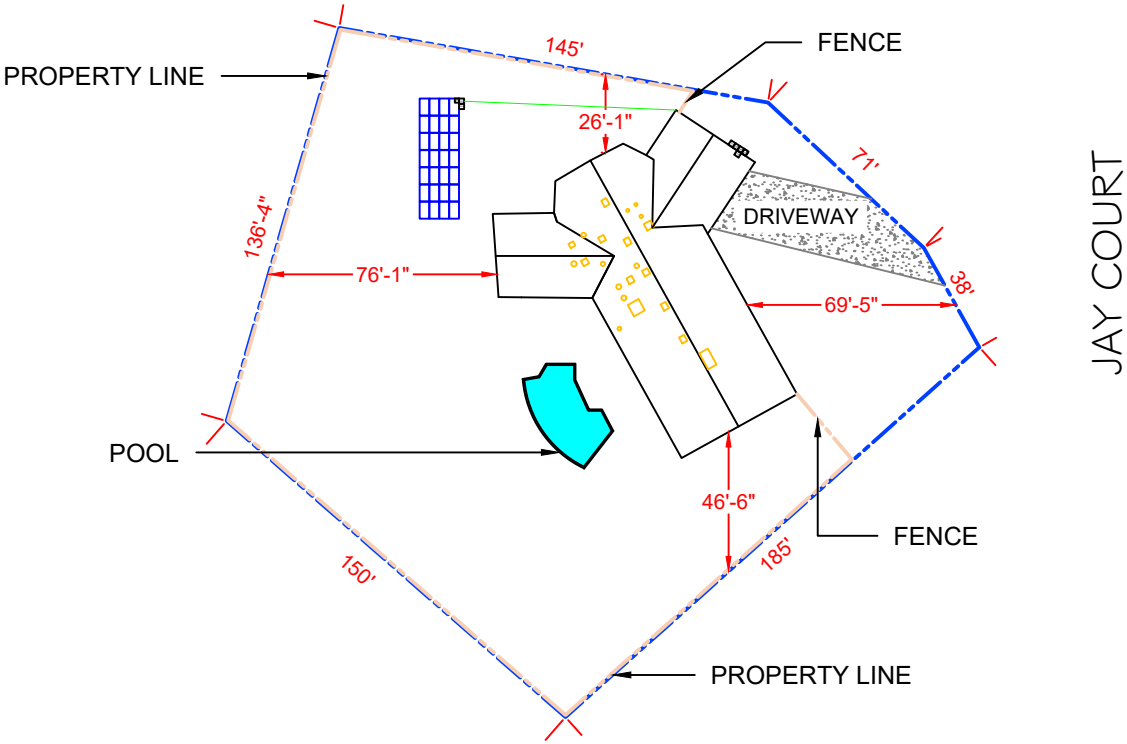
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A.1	UPDATED DESIGN	5/2/2023
A.2	UPDATED DESIGN	5/9/2023

OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-1.0

COVER PAGE

- NOTES:**
1. MINOR FIELD ADJUSTMENTS ALLOWED BASED ON ACTUAL SITE CONDITION AND MEASUREMENTS.
 2. THE 30 SECOND SHUTDOWN REQUIREMENT IS INCORPORATED INTO THE 2022 CEC AND UL STANDARD 1741.
 3. EXISTING ROOF VENT SHOULD NOT BE COVERED.

APN : 1936700168
ACREAGE : 4.42 ACRES



LEGEND

- UM UTILITY METER
- MSP MAIN SERVICE PANEL
- SUB SUB PANEL
- AC AC DISCONNECT
- INV INVERTER
- JB JUNCTION BOX
- MODULE
- ROOF OBSTRUCTIONS



5/8/2023

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BRUCE GINN

**11.200KW Grid Tied
Photovoltaic System**

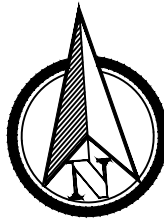
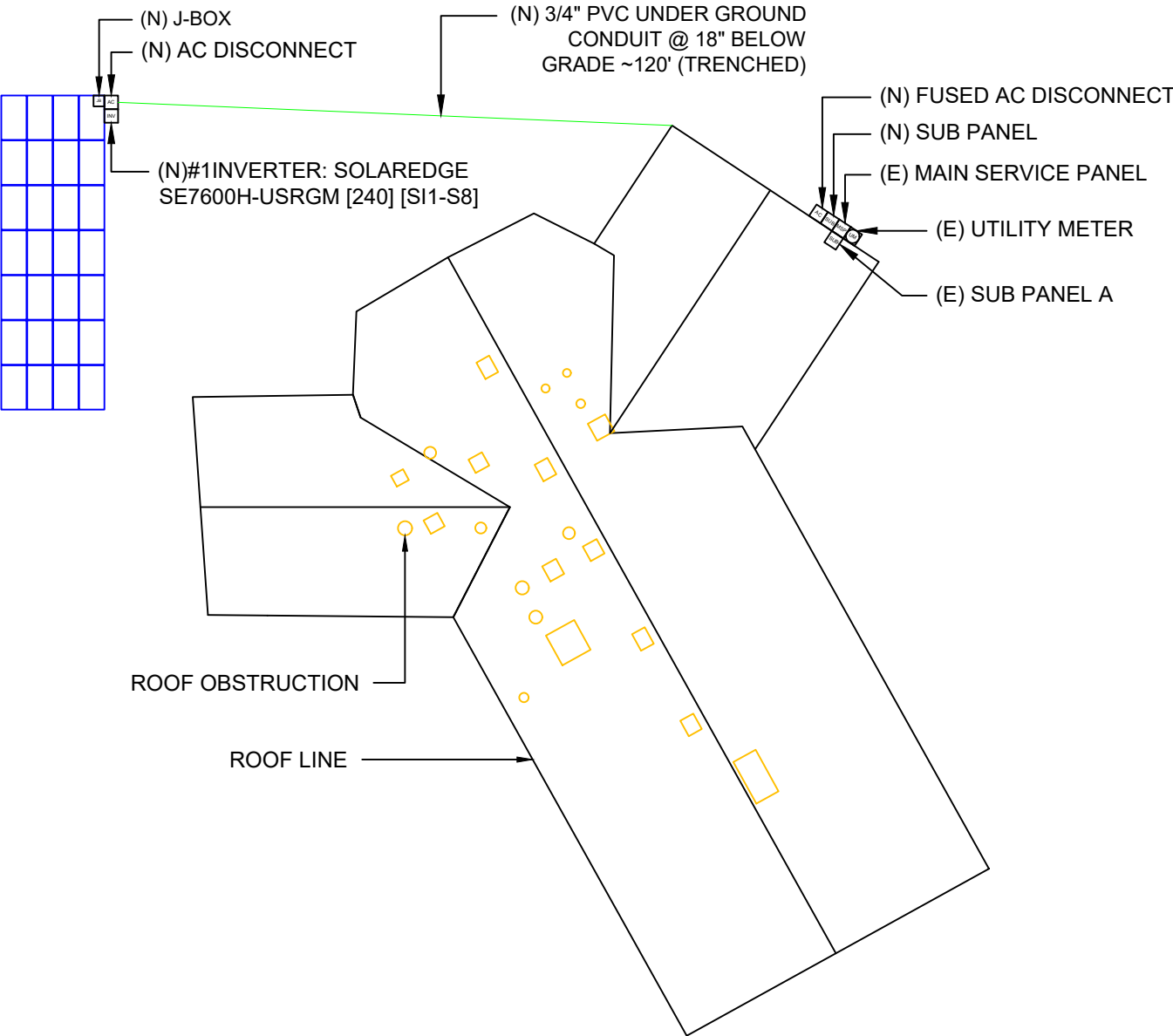
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A.1	UPDATED DESIGN	5/2/2023
A.2	UPDATED DESIGN	5/9/2023

OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-2.0

TITLE
SITE PLAN

ENLARGE VIEW



1 SITE PLAN
SCALE: 1/64" = 1'-0"

1. MINOR FIELD ADJUSTMENTS ALLOWED BASED ON ACTUAL SITE CONDITION AND MEASUREMENTS.
2. THE 30 SECOND SHUTDOWN REQUIREMENT IS INCORPORATED INTO THE 2022 CEC AND UL STANDARD 1741.
3. EXISTING ROOF VENT SHOULD NOT BE COVERED.

Revised



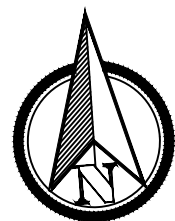
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Guy Allen

TITLE

SITE PLAN

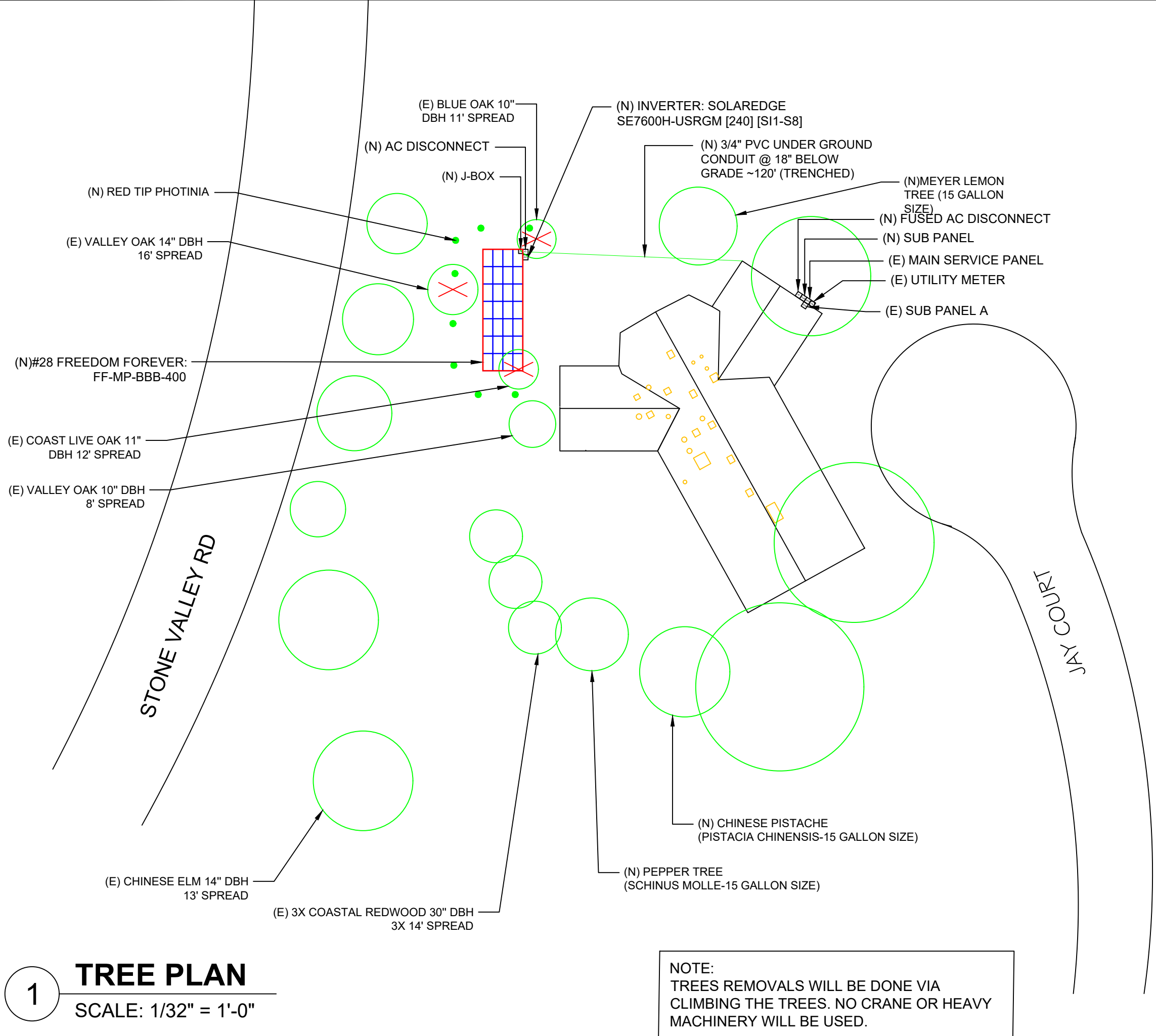


NOTE:
TREES REMOVALS WILL BE DONE VIA
CLIMBING THE TREES. NO CRANE OR HEAVY
MACHINERY WILL BE USED.

1

SITE PLAN

SCALE: 1/32" = 1'-0"



1

TREE PLAN

SCALE: 1/32" = 1'-0"

NOTE:
TREES REMOVALS WILL BE DONE VIA
CLIMBING THE TREES. NO CRANE OR HEAVY
MACHINERY WILL BE USED.

LEGEND

UM	UTILITY METER
MSP	MAIN SERVICE PANEL
SUB	SUB PANEL
AC	AC DISCONNECT
INV	INVERTER
JB	JUNCTION BOX
[Blue Box]	MODULE
[Orange Diamond]	ROOF OBSTRUCTIONS
[Green Circle]	TREE

REGISTERED PROFESSIONAL ENGINEER
ALI HAJJ HASHEM
C 84486
Ali Hajj
CIVIL
STATE OF CALIFORNIA
EXP. 09/30/2025
STAMPED 03/07/2025

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freedom
FOREVER

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Solar Individual Permit Package

BRUCE GINN

11.200KW Grid Tied
Photovoltaic System

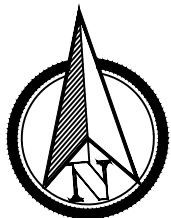
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A.6	UPDATED DESIGN	3/6/2025

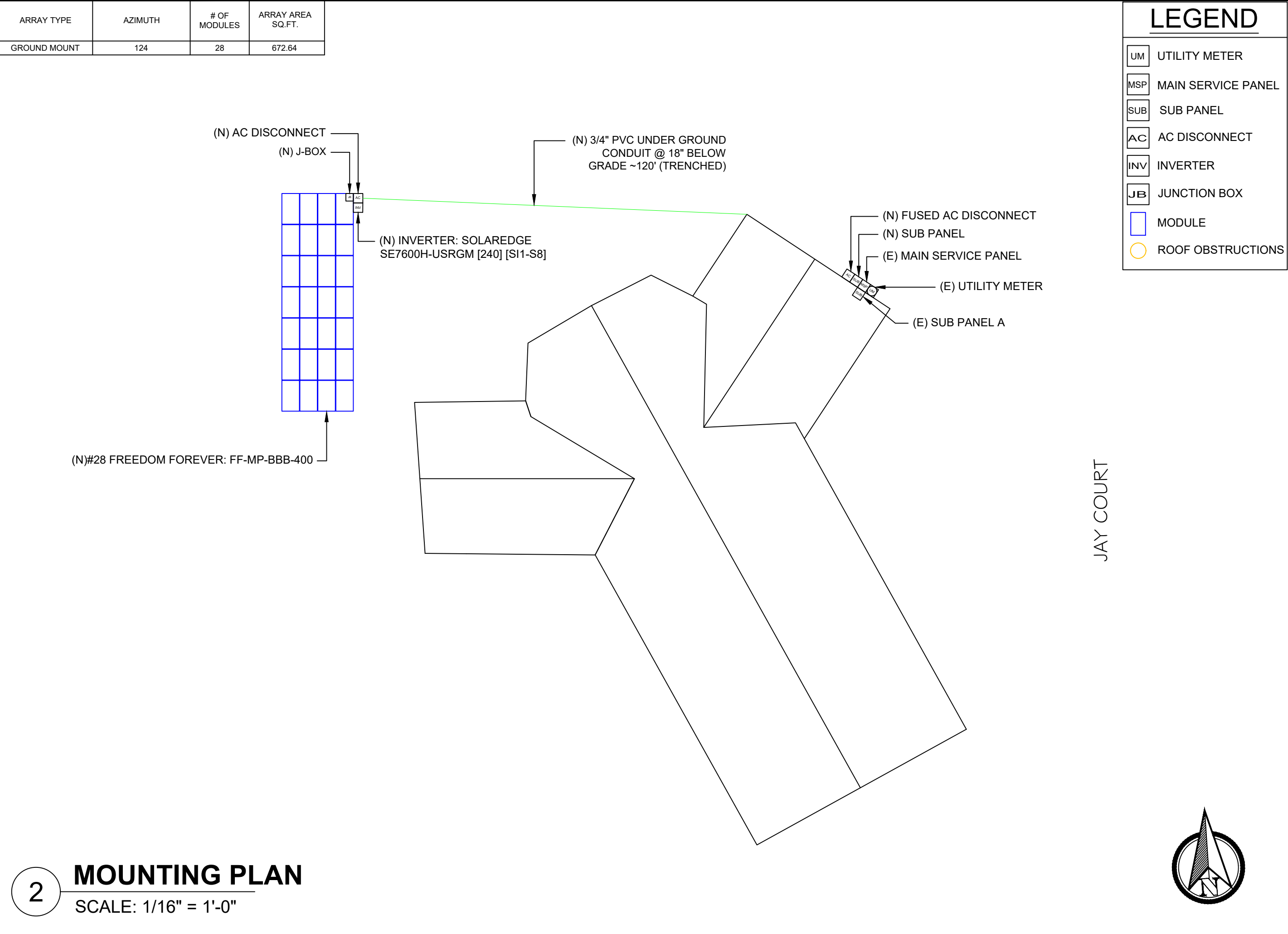
OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	3/6/2025
DRAWN BY	E.R
SHEET #	PV-3.0

TITLE

TREE PLAN



ARRAY TYPE	AZIMUTH	# OF MODULES	ARRAY AREA SQ.FT.
GROUND MOUNT	124	28	672.64



LEGEND

- UM UTILITY METER
- MSP MAIN SERVICE PANEL
- SUB SUB PANEL
- AC AC DISCONNECT
- INV INVERTER
- JB JUNCTION BOX
- MODULE
- ROOF OBSTRUCTIONS



5/8/2023

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Solar Individual Permit Package

BRUCE GINN

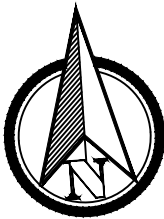
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OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-3.0

TITLE
MOUNTING PLAN



Trees removals will be done via climbing the trees. No crane or heavy machinery will be used.

RECEIVED on 09/26/2024 **CDTP24-00064**
By Contra Costa County
Department of Conservation and Development

LEGEND

- UM UTILITY METER
- MSP MAIN SERVICE PANEL
- SUB SUB PANEL
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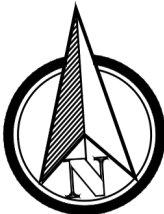
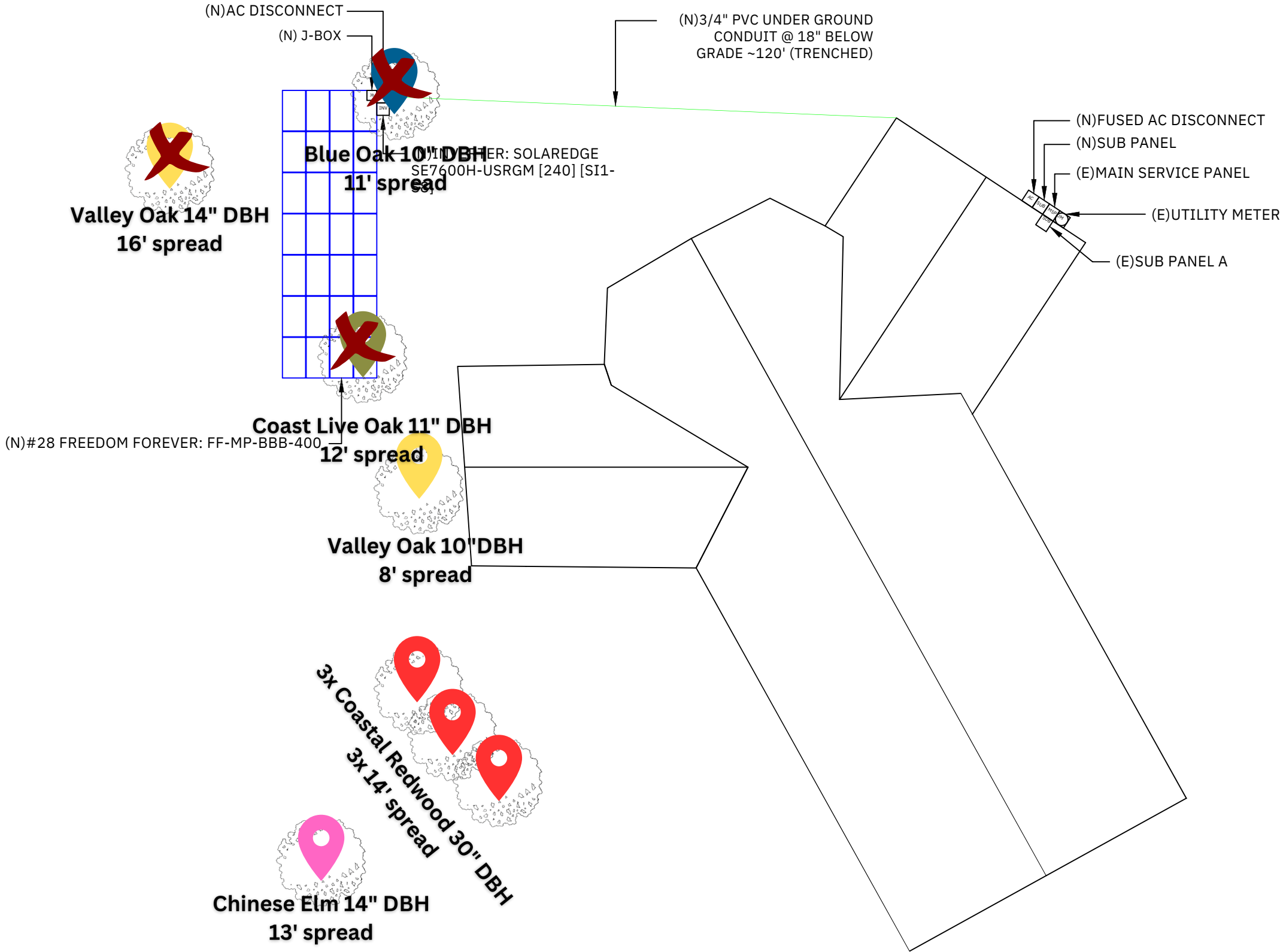
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Tied Photovoltaic
System

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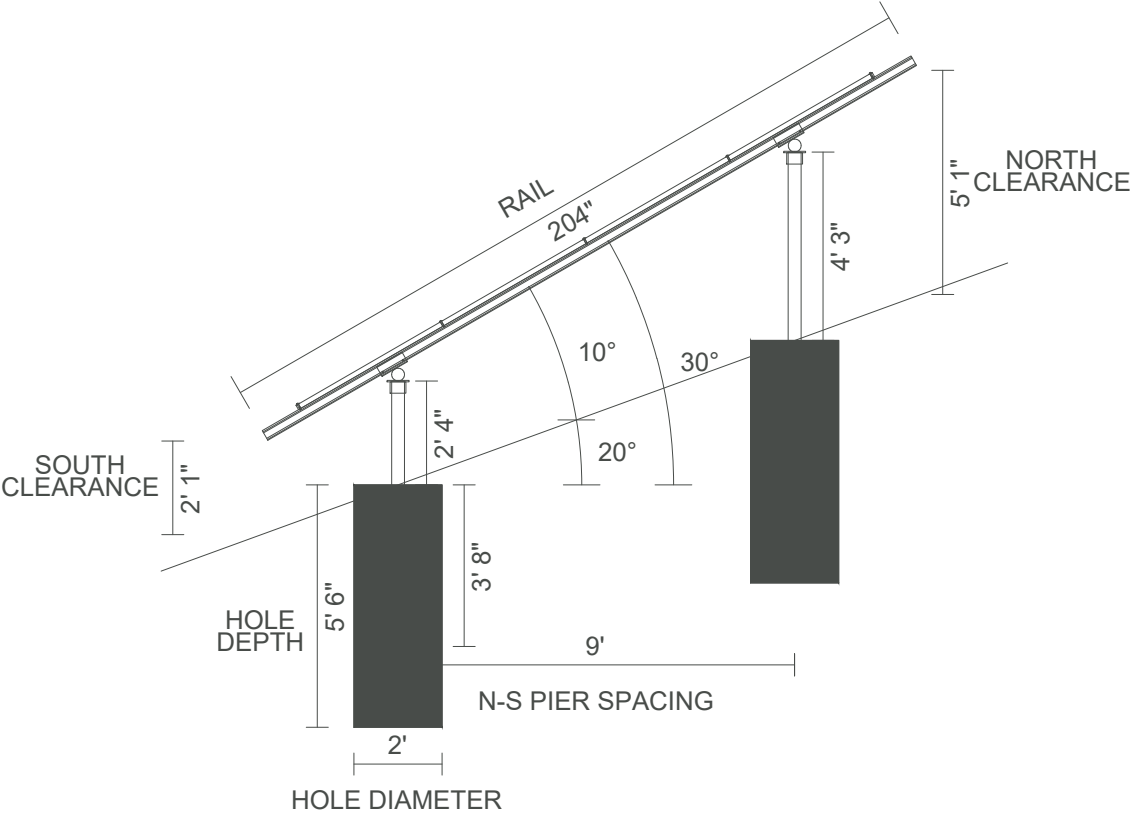
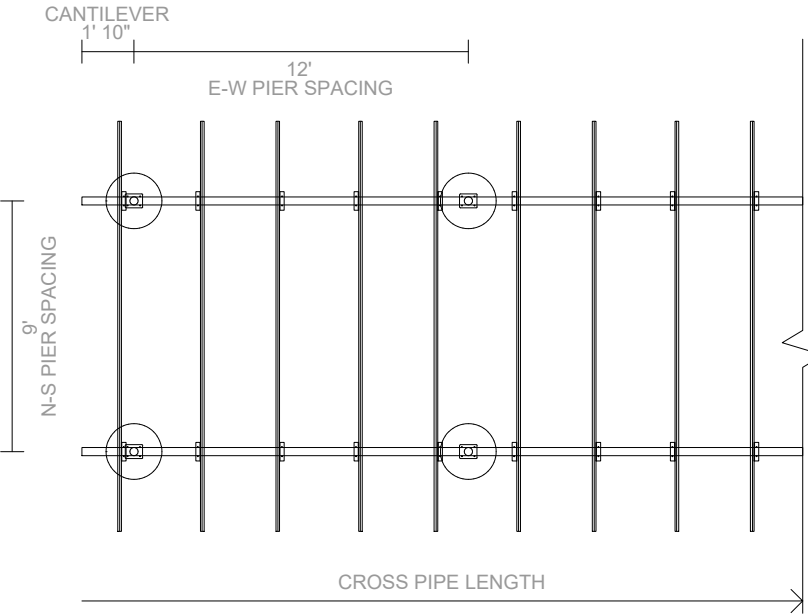
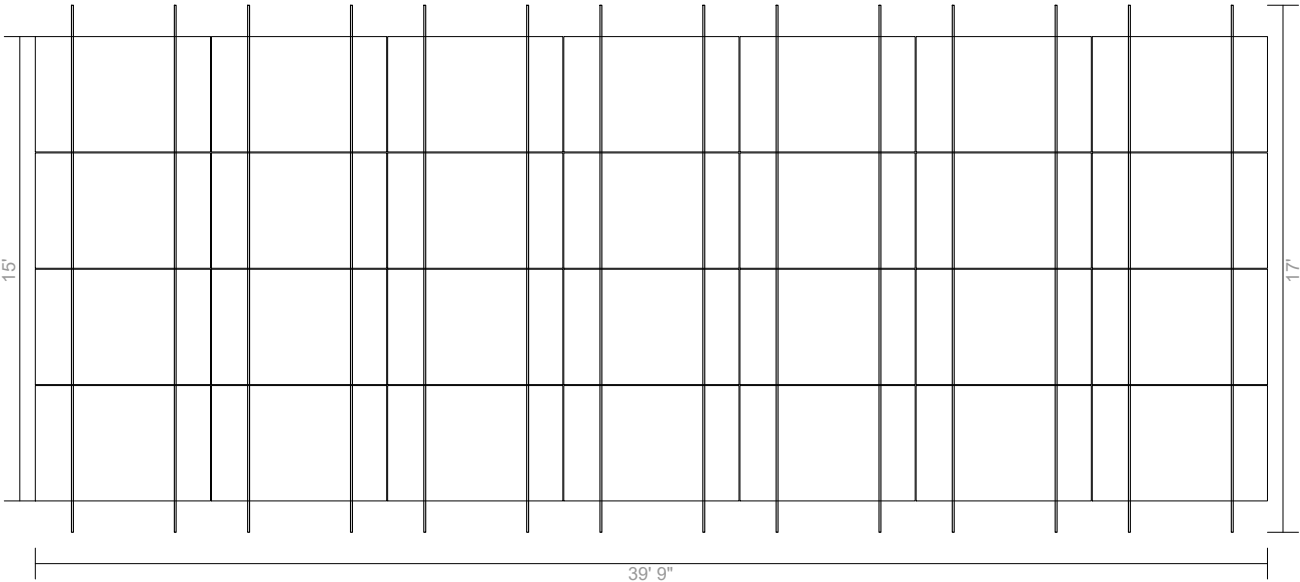
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TITLE
MOUNTING PLAN

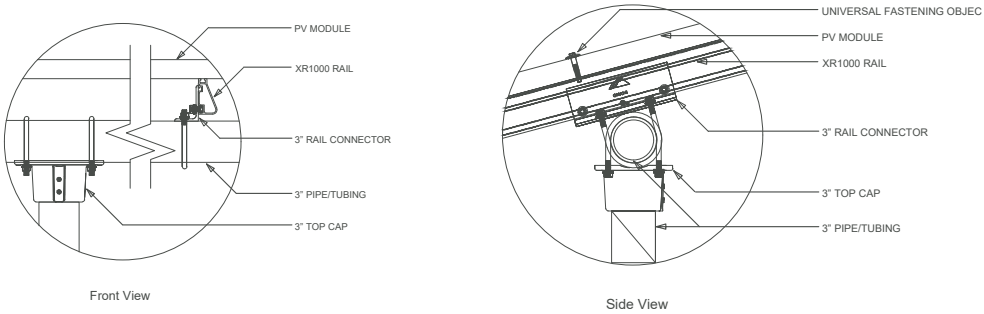


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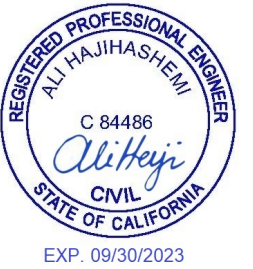
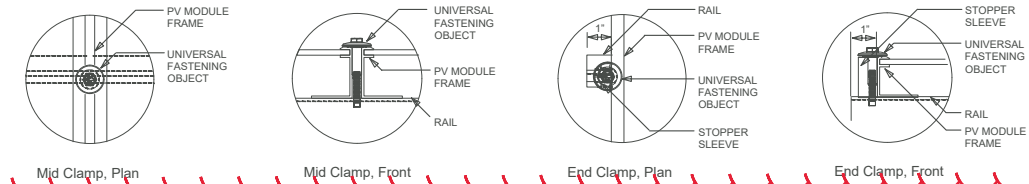
Rows	4	Columns	7	# Arrays	1
Area	39' 9" (EW) × 15' 2" (NS)	Rail type	XR1000	Diagonal bracing	no
E/W spacing	12'	Rail cantilever	3' 4"	Pipe cantilever	1' 10"
Piers/array	8	Total south piers	4 (6')	Total north piers	4 (7' 11")
Total cross pipes	2 (39' 9")	Total pipe length	135' 4"		
Shear	1,532 lbs	Moment	3,830 ft-lbs	Uplift	-1,321 lbs



XR1000 Rail



Clamp Detail



5/8/2023

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PHONE: (951)-405-1733
WWW.CRENG.CO

CONTRACTOR INFO



GREG ALBRIGHT

Greg Albright

FREEDOM FOREVER CALIFORNIA, LLC

43445 BUSINESS PARK DR #110,
TEMECULA, CA 92590

STATE OF CALIFORNIA
C10 – ELECTRICAL; B – GENERAL
BUILDING CONTRACTOR; C39 –
ROOFING; C46 – SOLAR 1029644

Solar Individual Permit Package

BRUCE GINN

**11.200KW Grid Tied
Photovoltaic System**

19 JAY CT,
ALAMO, CA 94507

Rev	Description	Date
A	INITIAL DESIGN	4/19/2023
A.1	UPDATED DESIGN	5/2/2023
A.2	UPDATED DESIGN	5/9/2023

OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-4.0

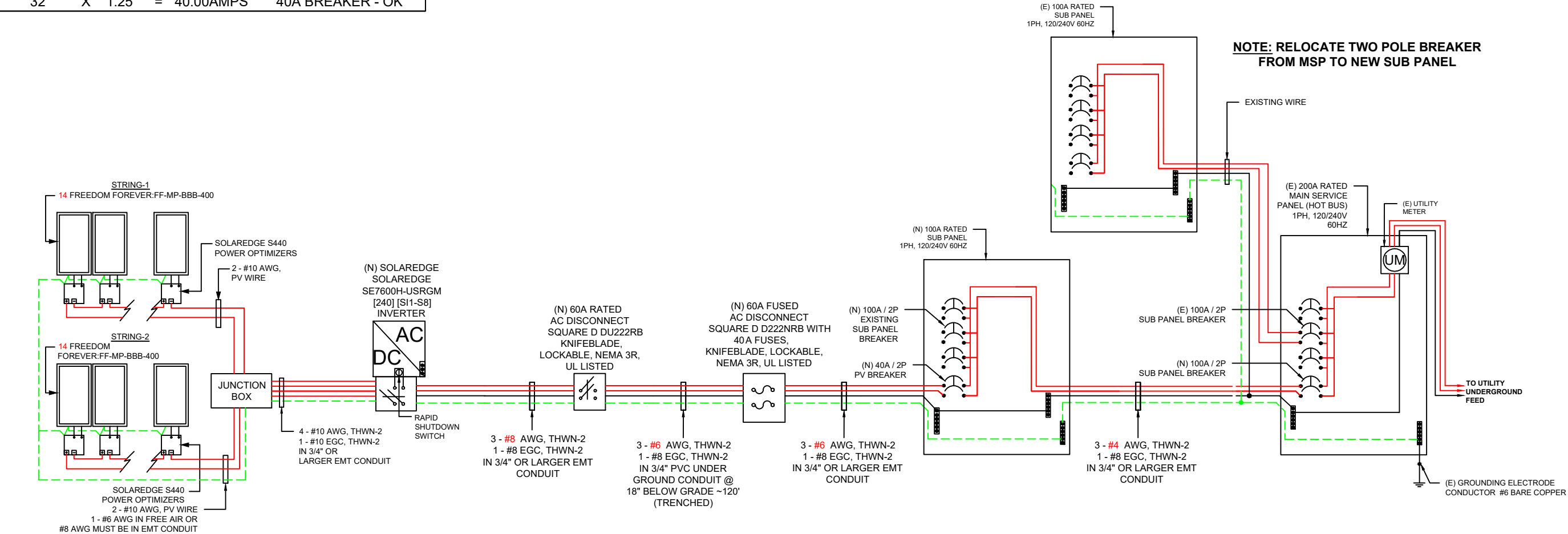
TITLE
STRUCTURAL

BACKFEED BREAKER SIZING				
MAX. CONTINUOUS OUTPUT 32A @ 240V				
32	X	1.25	=	40.00AMPS 40A BREAKER - OK

MODULE INFO	
MAKE/MODEL	FREEDOM FOREVER: FF-MP-BBB-400
VOC	37.07V
VMP	31.01V
ISC	13.79A
IMP	12.90A
STC RATING	400 W
PTC RATING	372.3 W

MAX DC CURRENT: I_{max} = 1.25 X (OPTIMIZER OUTPUT CURRENT) = 1.25 X 15 = 18.75A
MAX AC CURRENT: I_{max} = 1.25 X (SUM OF MAX CONTINUOUS OUTPUT CURRENT FROM INVERTERS)
= 1.25 X (32) = 40.00A

WIRE SCHEDULE														
RACEWAY #	EQUIPMENT				WIRE LOCATION	CONDUCTOR QTY.	AWG WIRE SIZE	STARTING ALLOWABLE AMPACITY 310.15(B)(16)	TEMPERATURE RATING (°C)	STARTING CURRENT APPLIED TO CONDUCTORS IN RACEWAY	TEMPERATURE CORRECTION FACTOR 310.15(B)(2)(a)	ADJUSTMENT FACTOR FOR MORE THAN 3 CONDUCTORS 310.15(B)(3)(a)	ADJUSTED CONDUCTOR AMPACITY	MAXIMUM CURRENT APPLIED TO CONDUCTORS IN RACEWAY
1	DC	MODULE	TO	OPTIMIZER	ROOF/FREE-AIR	2	10	40	90°	13.79	0.96	1	38.40	17.24
2	DC	OPTIMIZER	TO	JUNCTION BOX	ROOF/FREE-AIR	2	10	40	90°	15	0.96	1	38.40	18.75
3	DC	JUNCTION BOX	TO	INVERTER	EXTERIOR WALL	4	10	40	90°	15	0.96	0.8	30.72	18.75
4	AC	INVERTER	TO	AC DISCONNECT	EXTERIOR WALL	3	6	50	75°	32	0.96	1	48.00	40.00
5	AC	AC DISCONNECT	TO	FUSED AC DISCONNECT	PVC TRENCHING	3	6	50	75°	32	0.96	1	48.00	40.00
6	AC	FUSED AC DISCONNECT	TO	POI	EXTERIOR WALL	3	6	65	75°	32	0.96	1	62.40	40.00
7	AC	SUB PANEL	TO	MSP	EXTERIOR WALL	3	2	115	75°	80	0.96	1	110.40	100.00



NOTE:
1)CONDUIT AND CONDUCTORS SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.
2)ALL CONDUCTORS NOT UNDER ARRAY ARE TO BE IN CONDUIT MINIMUM 7/8" ABOVE ROOF WITH PROPER JUNCTION BOX AT EACH END PER 690.31A

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Solar Individual Permit Package

BRUCE GINN

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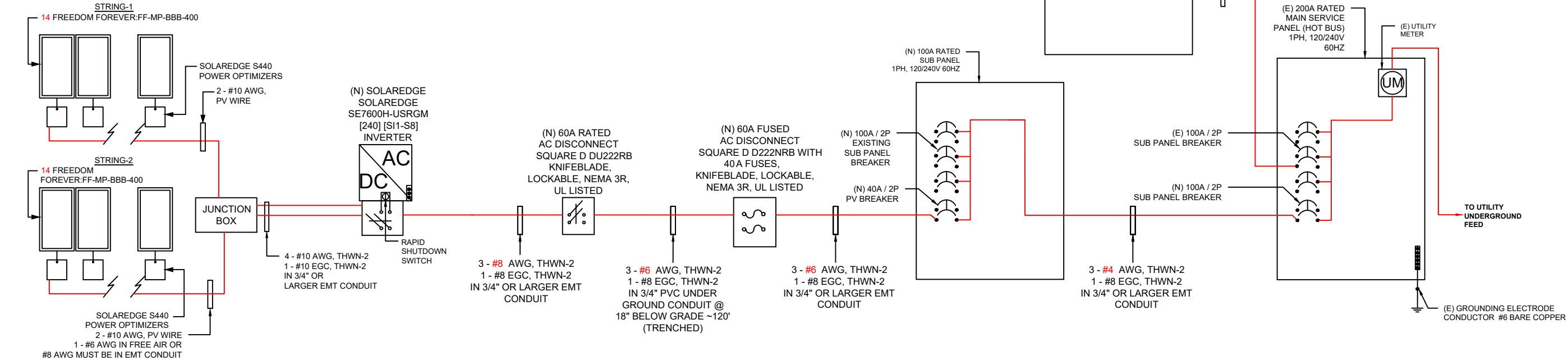
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Rev	Description	Date
A	INITIAL DESIGN	4/19/2023
A.1	UPDATED DESIGN	5/2/2023
A.2	UPDATED DESIGN	5/9/2023

OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-5.0

TITLE
ELECTRICAL 3LD

BACKFEED BREAKER SIZING				
MAX. CONTINUOUS OUTPUT 32A @ 240V				
32	X	1.25	=	40.00AMPS 40A BREAKER - OK



MODULE INFO	
MAKE/MODEL	FREEDOM FOREVER: FF-MP-BBB-400
VOC	37.07V
VMP	31.01V
ISC	13.79A
IMP	12.90A
STC RATING	400 W
PTC RATING	372.3 W

MAX DC CURRENT: I_{max} = 1.25 X (OPTIMIZER OUTPUT CURRENT) = 1.25 X 15 = 18.75A
MAX AC CURRENT: I_{max} = 1.25 X (SUM OF MAX CONTINUOUS OUTPUT CURRENT FROM INVERTERS)
= 1.25 X (32) = 40.00A

NOTE:
1)CONDUIT AND CONDUCTORS SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.
2)ALL CONDUCTORS NOT UNDER ARRAY ARE TO BE IN CONDUIT MINIMUM 7/8" ABOVE ROOF WITH PROPER JUNCTION BOX AT EACH END PER 690.31A

WIRE SCHEDULE														
RACEWAY #	EQUIPMENT				WIRE LOCATION	CONDUCTOR QTY.	AWG WIRE SIZE	STARTING ALLOWABLE AMPACITY 310.15(B)(16)	TEMPERATURE RATING (°C)	STARTING CURRENT APPLIED TO CONDUCTORS IN RACEWAY	TEMPERATURE CORRECTION FACTOR 310.15(B)(2)(a)	ADJUSTMENT FACTOR FOR MORE THAN 3 CONDUCTORS 310.15(B)(3)(a)	ADJUSTED CONDUCTOR AMPACITY	MAXIMUM CURRENT APPLIED TO CONDUCTORS IN RACEWAY
1	DC	MODULE	TO	OPTIMIZER	ROOF/FREE-AIR	2	10	40	90°	13.79	0.96	1	38.40	17.24
2	DC	OPTIMIZER	TO	JUNCTION BOX	ROOF/FREE-AIR	2	10	40	90°	15	0.96	1	38.40	18.75
3	DC	JUNCTION BOX	TO	INVERTER	EXTERIOR WALL	4	10	40	90°	15	0.96	0.8	30.72	18.75
4	AC	INVERTER	TO	AC DISCONNECT	EXTERIOR WALL	3	6	50	75°	32	0.96	1	48.00	40.00
5	AC	AC DISCONNECT	TO	FUSED AC DISCONNECT	PVC TRENCHING	3	6	50	75°	32	0.96	1	48.00	40.00
6	AC	FUSED AC DISCONNECT	TO	POI	EXTERIOR WALL	3	6	65	75°	32	0.96	1	62.40	40.00
7	AC	SUB PANEL	TO	MSP	EXTERIOR WALL	3	2	115	75°	80	0.96	1	110.40	100.00

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Greg Albright
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BRUCE GINN

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OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-6.0

TITLE
ELECTRICAL SLD

MATERIAL LIST

ELECTRICAL EQUIPMENTS

QTY.	PART	PART #	DESCRIPTION
28	MODULE	FF-MP-BBB-400	FREEDOM FOREVER: FF-MP-BBB-400
28	OPTIMIZER	S440	SOLAREEDGE S440 POWER OPTIMIZERS
1	JUNCTION BOX	480-276	600VDC NEMA 3R UL LISTED JUNCTION BOX
1	INVERTER	SOLAREEDGE SE7600H-USRGM [240] [SI1-S8]	SOLAREEDGE SOLAREEDGE SE7600H-USRGM [240] [SI1-S8] 240V
1	AC DISCONNECT	DU222RB	60A RATED 240VAC NEMA 3R UL LISTED
1	FUSED AC DISCONNECT	D222NRB	60A RATED 240VAC NEMA 3R UL LISTED
1	SUB PANEL	100A SUB PANEL	100A DEDICATED SUB PANEL

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Gay Albert

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OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-7.0

TITLE	BOM
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EXISTING SERVICE PANEL PHOTOS



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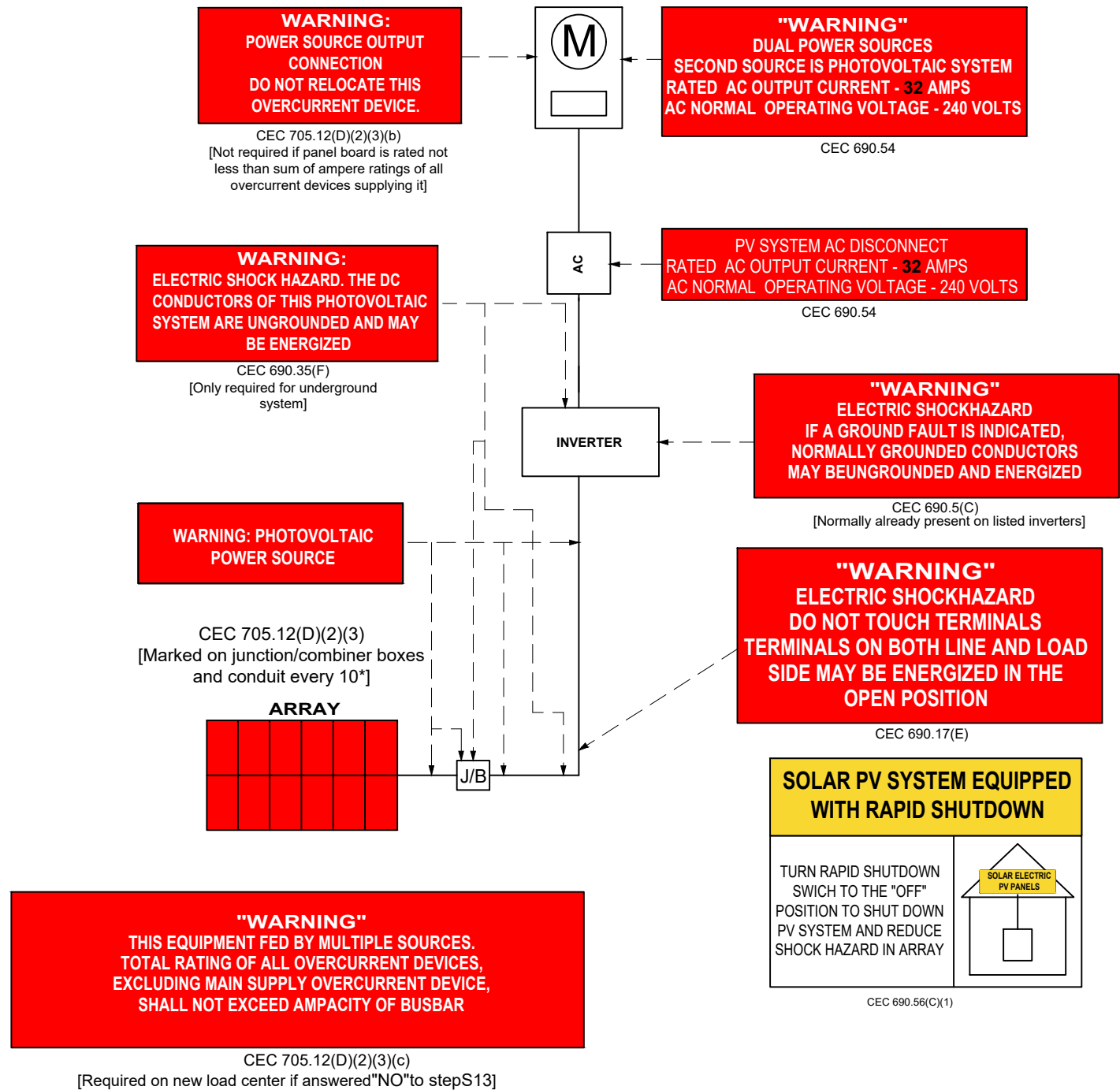
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DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-8.0

TITLE
**ELECTRICAL
PHOTOS**



NOTES:

- CEC ARTICLES 690 AND 705 AND CEC SECTION R324 MARKINGS SHOWN HEREON.
- ALL MARKING SHALL CONSIST OF THE FOLLOWING:
 - UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING.
 - RED BACKGROUND COLOR WHITE TEXT AND LINE WORK.
 - AERIAL FONT.
- ALL SIGNS SHALL BE SIZED APPROPRIATELY AND PLACED IN THE LOCATIONS SPECIFIED. SIGNAGE CANNOT BE HAND-WRITTEN.
- SIGNS SHALL BE ATTACHED TO THE SERVICE EQUIPMENT WITH POP-RIVETS OR SCREWS.

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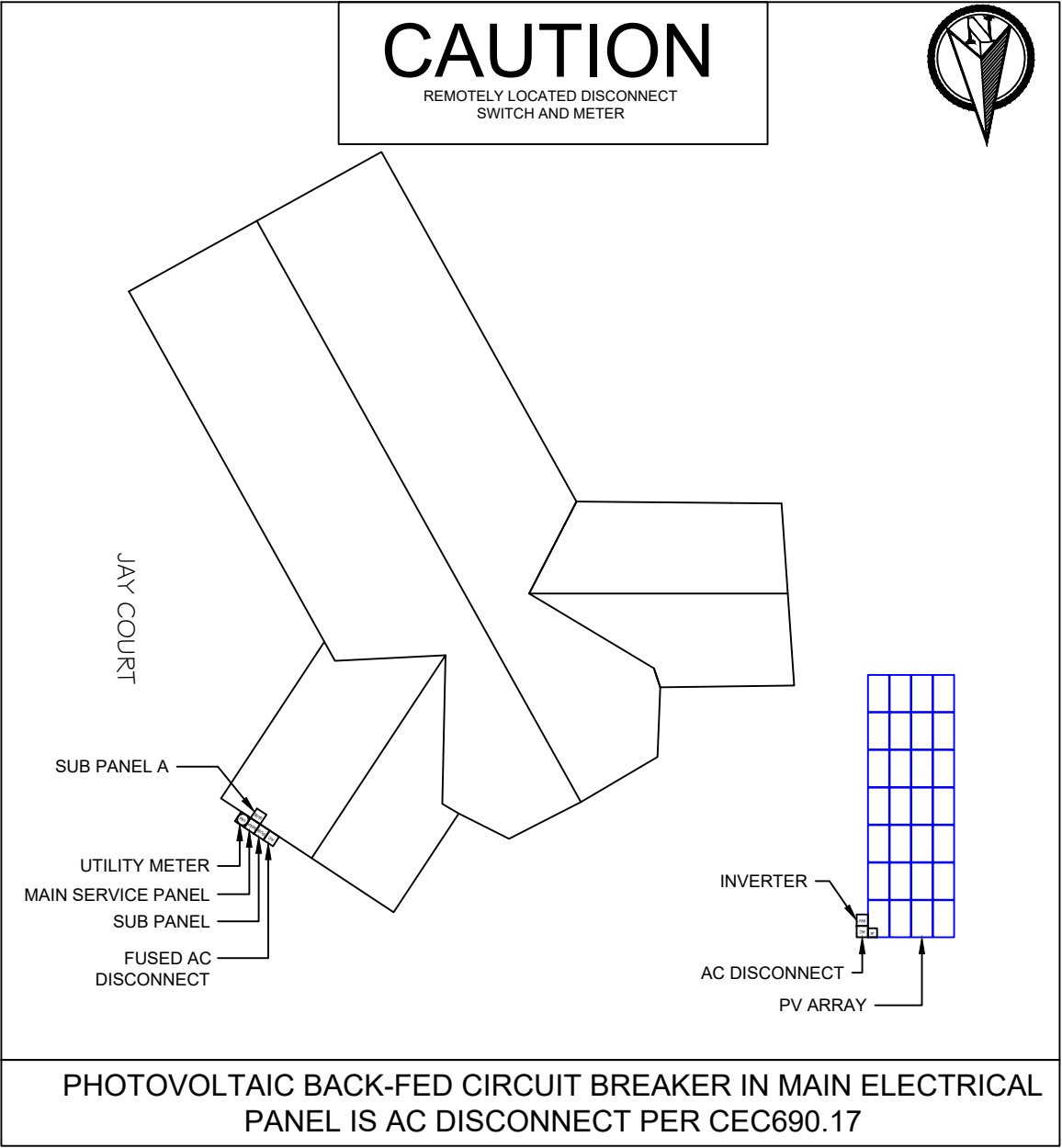
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OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-9.0

TITLE
SIGNAGE



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OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-9.1

TITLE

PLACARD

1-10 11-20 21-30 31-40 41-50 51-60

1

2

3

4

5

6

7

○

0

10

JB

AC

INV

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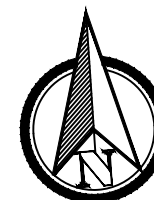
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DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-10.0

TITLE

OPTIMIZER CHART



SAFETY PLAN

INSTRUCTIONS:

- 1. USE SYMBOLS IN KEY TO MARK UP THIS SHEET.
- 2. SAFETY PLAN MUST BE MARKED BEFORE JOB STARTS AS PART OF THE PRE-PLAN
- 3. DOCUMENT ALL ADDITIONAL HAZARDS ON THIS PAGE & MAKE NOTES ON THE JHA SHEET

IN CASE OF EMERGENCY

NEAREST HOSPITAL OR OCCUPATIONAL/INDUSTRIAL CLINIC

NAME: _____

ADDRESS: _____

SAFETY COACH CONTACT INFORMATION

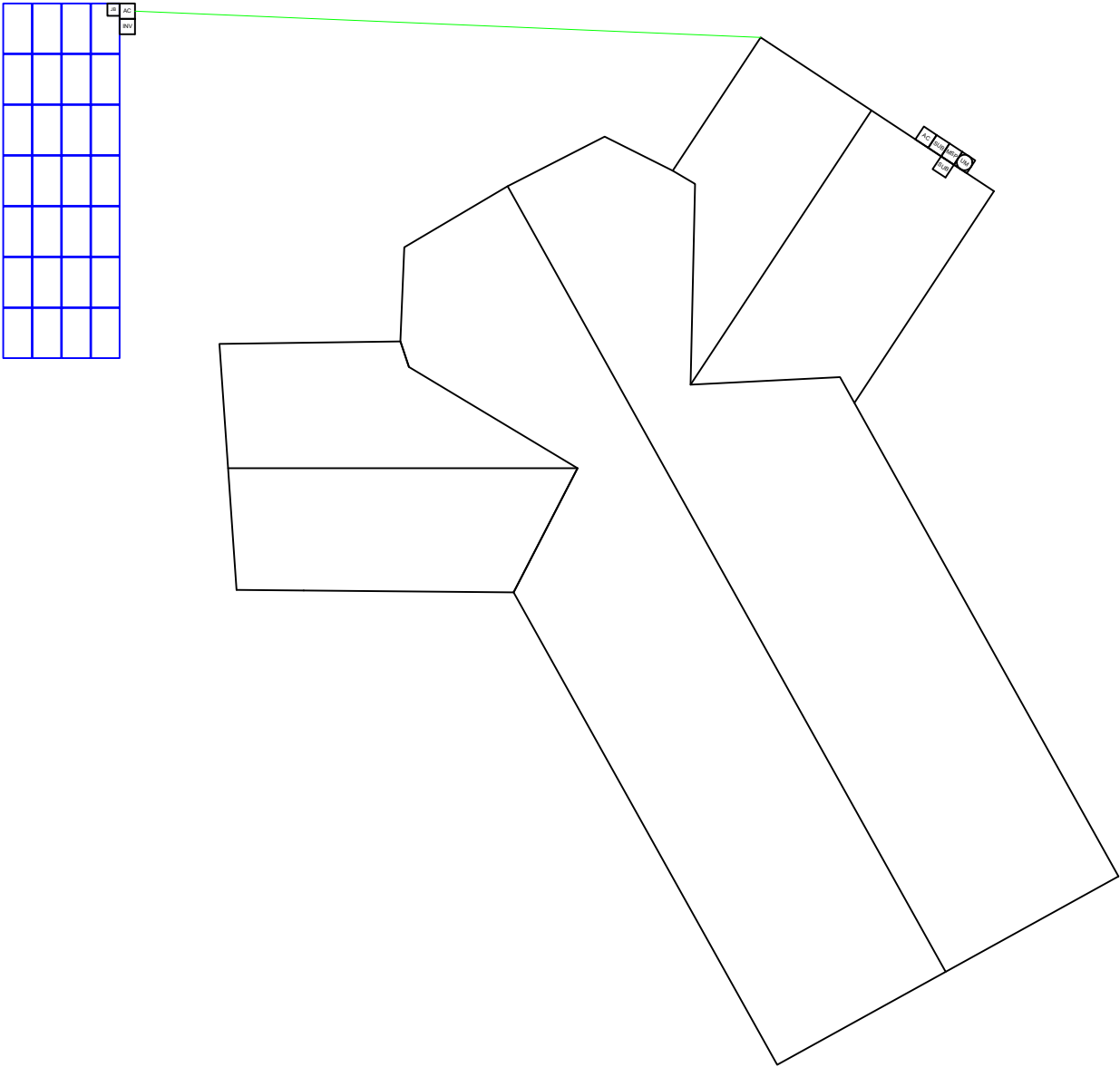
NAME: _____

ADDRESS: _____

ALL EMPLOYEES ON SITE SHALL BE MADE AWARE OF THE SAFETY PLAN AND SIGN INDICATING THAT THEY ARE AWARE OF THE HAZARDS ON-SITE AND THE PLAN FOR WORKING SAFELY.

NAME	SIGNATURE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

DATE: _____ TIME: _____



MARK UP KEY

-  SUB PANEL
-  INVERTER
-  AC DISCONNECT
-  MAIN SERVICE PANEL
-  UTILITY METER
-  PERMANENT ANCHOR
-  JUNCTION BOX
-  TEMPORARY ANCHOR
-  INSTALLER LADDER
-  STUB-OUT
-  SKYLIGHT
-  NO LADDER ACCESS (STEEP GRADE OR GROUND LEVEL OBSTRUCTIONS)
-  RESTRICTED ACCESS
-  TRENCH CONDUIT
-  GAS SHUT OFF
-  WATER SHUT OFF
-  SERVICE DROP
-  POWER LINES

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OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-11.0

TITLE

SAFETY PLAN

JOB HAZARD ANALYSIS

Crew leader to fill out all sections below, hold a pre-job safety meeting with all personnel, and upload this completed document and the Safety Plan to Site Capture

Ladder Access

- Ladders must be inspected before each use.
 - Extension ladders must be set up on a firm and level surface at a 4-to-1 rise to run angle (or 75 degrees) and the top must be secured to the structure. Extension style ladders placed on uneven, loose or slippery surfaces must additionally have the base firmly anchored or lashed so the base will not slip out.
 - Extension ladders must be used with walk-through devices or the ladder must extend 36" above the stepping off point.
 - A-frame ladders must only be climbed with the ladder spreader bars locked in the open position; A-frame ladders shall not be climbed while in the closed position (ex, closed and used while leaned against a structure).
- Additional notes:

Mobile Equipment

- Only Qualified operators will operate equipment; operators must maintain a certification on their person for the equipment being operated.
- Type(s) of mobile equipment (Type/Make/Model):

- Qualified operator(s):

Material Handling and Storage

- Materials will be staged/stored in a way that does not present a hazard to client, personnel or public. Materials stored on the roof will be physically protect from failing or sliding off.

Fall Protection

- A site-specific plan for fall prevention and protection is required prior to starting work and must remain onsite at all times until work is complete; a fall rescue plan must be outlined and discussed among the crew prior to work start.
 - First-person-Up (FPU) must install their anchor and connect before any other task, including installing other anchors. The Last-Person-Down (LPD) must be the only person on a roof uninstalling fall protection.
- FPCP (name and title):

- FPU and LPD (name and title):

Electrical Safety

- The Electrical Qualified Person (EQP) is required onsite to perform electrical work.
 - All electrical work will be performed with equipment in an electrically safe condition (de-energized) unless approval has been granted prior to work.
 - Service drops and overhead electrical hazards will be identified and protected from contact, as neccessary.
- EQP (name and tile):

Public Protection

- The safety of the Client and the Public must be maintained at all times.
 - The Client and the Public shall be prevented from entering the work zone through the use of barriers and/or signage, as required.
 - Company, Client and Public property shall be protect from falling objects.
 - Pets (including dogs) shall be secured by their owners prior to work start.
 - The client should not leave pets, family members, or others in the charge or care of Employees, Contractors, or Temporary Workers.
- Crew leader responsible for communication with the client:

- Client and public is excluded from work area by barricades (N/A, Yes, No):

Training and Pre-Job Safety Briefing

- All employees onsite shall be made aware of the specific hazards of this project and review this HJA during a pre-job briefing, and their signature indicates awareness of site conditions and the plan to eliminate any hazards identified prior to and during the project.

- Crew leader (name/title):
- Crew member (name/title):
- Crew member (name/title):
- Crew member (name/title):
- Crew member (name/title):
- Crew member (name/title):

Airborne Contaminants:

- Asbestos-containing (Transite) piping (ACP) - Do not disturb (move, drill, cut fracture, etc.)
- Asbestos-containing thermal insulation (ACI) and Asbestos-containing duct wrapping (ACW) - do not disturb, no attic or crawlspace access is allowed if work to be performed could cause exposure to personnel, client or public.

- If yes, list specific tasks and protection in place:

Weather and Environment

- The site supervisor shall forecast the weather conditions at the job site, prior to crew arrival, in order to mitigate any hazards associated with inclement weather (heat, cold, wind, rain, etc.)
 - The site supervisor will utilized a portable wind meter (anemometer) to verify actual onsite wind conditions, by checking at the ground and on any elevated work surface (ex, rooftop) prior to work start, at midday and prior to solar panel staging on a roof.
 - Elevated work involving the moving or maneuvering of solar panels shall cease at 25mph (sustained wind) until wind subsides.
- Forecasted weather maximum temp (degrees F):

Heat Related Illness Prevention

- Employees shall have access to potable drinking water that is fresh, pure, and suitably cool. The water shall be located as close as practicable to the areas where employees are working. Water shall be supplied in sufficient quantity at the beginning of the work shift to provide at least one quart per employee per hour for drinking for the entire shift. Employees may begin the shift with smaller quantities of water if they identify the location and have effective means for replenishment during the shift to allow employees to drink on quart or more per hour. The frequent drinking of water shall be encouraged.
- Shade shall be present when temperature exceeds 80 degrees Fahrenheit. When the outdoor temperature in the work exceeds 80 degrees Fahrenheit, employees shall have and maintain one or more areas with shade at all times.
- New employees must be acclimatized. New employees will be monitored by their Crew Leader (site supervisor) for the first two (2) weeks of employment or longer when necessary.
- Employees will be allowed and encouraged to implement scheduled breaks during each shift. Employees must take cool-down breaks in the shade any time they feel the need to do so to protect them from overheating. Supervisors are REQUIRED to allow employees any break period they need during high heat conditions.
- Cool Vests are encouraged for all employees at all times during periods of high heat.
- Identify the location of the closet Occupational/Industrial Clinic or Hospital in case a crew member becomes ill.

- What is the specific plan to provide and replenish sufficient water for all employees on site?
- If offsite replenish is necessary, where will you go to replenish water (location/address):
- Who will replenish the drinking water (name):

Restroom facilities

- Employees shall have access to restroom facilities with hand-washing stations. Use of onsite restroom is at the client's discretion (location is annotated below). If client does not give permission, location of suitable restroom facilities with hand-washing stations offsite will be provided. The onsite supervisor will identify location and make arrangements to ensure all employees have access at any point.
- Restroom facilities will be (circle one): Onsite - Offsite
 - If Offsite, add location name and address:

Incident Reporting Procedure

- Contact your Site Supervisor

- Name:
- Phone:
- Contact your Manager
- Name:
- Phone:
- Contact your Site Supervisor
- Name:
- Phone:

With: Your full name, phone number, office location, brief description of what happen and when.

NOTE ADDITIONAL HAZARDS NOT ADDRESSED ABOVE
(add as many as necessary by using additional sheets)

Define the Hazard:	Method/steps to prevent incident:
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STATE OF CALIFORNIA
C10 – ELECTRICAL; B – GENERAL BUILDING CONTRACTOR; C39 – ROOFING; C46 – SOLAR 1029644

Solar Individual Permit Package

BRUCE GINN

11.200KW Grid Tied Photovoltaic System

19 JAY CT,
ALAMO, CA 94507

Rev	Description	Date
A	INITIAL DESIGN	4/19/2023
A.1	UPDATED DESIGN	5/2/2023
A.2	UPDATED DESIGN	5/9/2023

OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/9/2023
DRAWN BY	E.R
SHEET #	PV-12.0

TITLE
SAFETY PLAN



MACH 2 400W MODULE

FF-MP-BBB-400

High module conversion efficiency up to 20.48%

Excellent weak light performance

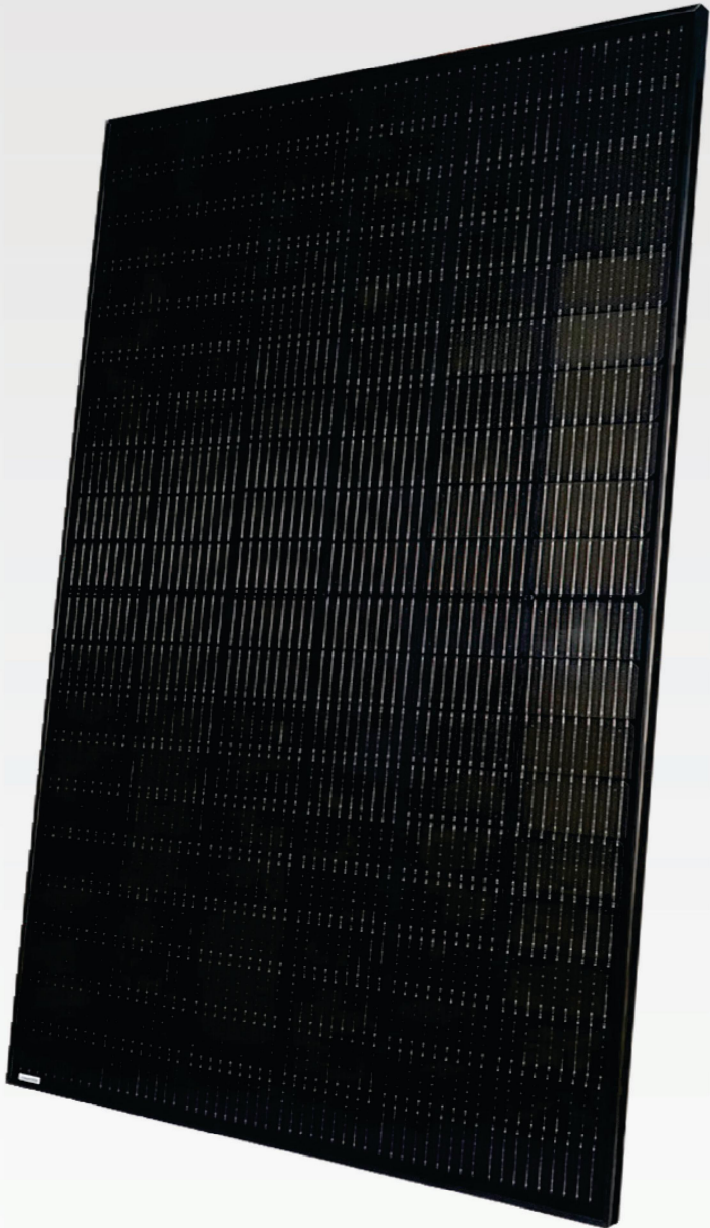
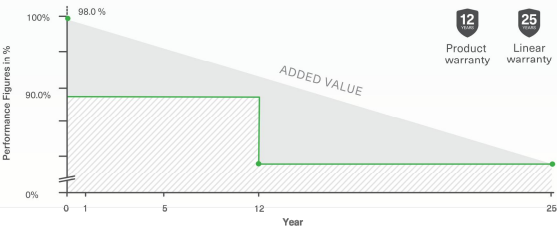
Withstanding harsh environment

Lower operating temperature

Extreme weather loading

12-year material & workmanship

25-year linear power output



MODULE SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

Characteristics	FF-MP-BBB-400
Maximum Power (Pmax)	400W
Maximum Power Voltage (Vmp)	31.01V
Maximum Power Current (Imp)[A]	12.90A
Open Circuit Voltage (Voc)[V]	37.07V
Short Circuit Current (Isco)[A]	13.79A
Module Efficiency	20.48%
Power Tolerance	0/+5W
STC	Irradiance of 1000W/m², AM1.5, cell Temperature 25°C

MECHANICAL CHARACTERISTICS

Cell Type	Mono perc, 182 mm-half cells, 108 (6x9+6x9)
Weight	22.1 kgs (48.7 lbs)
Dimension	1722 x 1134 x 35 mm (67.80 x 44.65 x 1.38)
Front Glass	3.2 mm (.13 in), High Transmission, Low Iron & Semi-Tempered Glass
Junction Box	IP68 (3 Bypass Diodes)
Output Cables	1200 mm (47 in)
Connector	Staubli EVO2
Frame & Installation	Anodized aluminum profile

OPERATIONS CHARACTERISTICS

Operational Temperature	-40°C~+85°
Max System Voltage	1500V
Max Series Fuse Rating	25A
Safety Class	Class II
Fire Rating	Type 1

MECHANICAL LOADING

Snow Load	5,400Pa (113lb/ft2)
Rear Side Design Load	2,400Pa (50lb/ft2)

PACKAGING INFORMATION

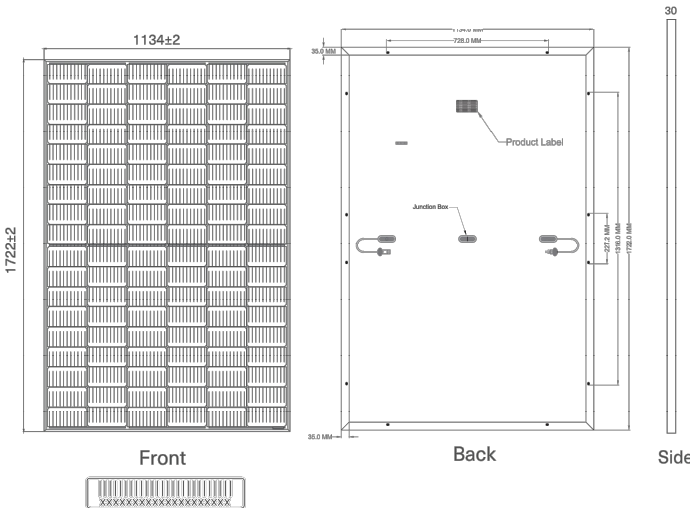
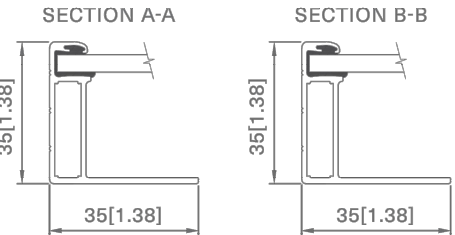
Container	20' GP	40' HC
Pallets per Container	6	26
Panels per Container	186	806

TEMPERATURE RATINGS

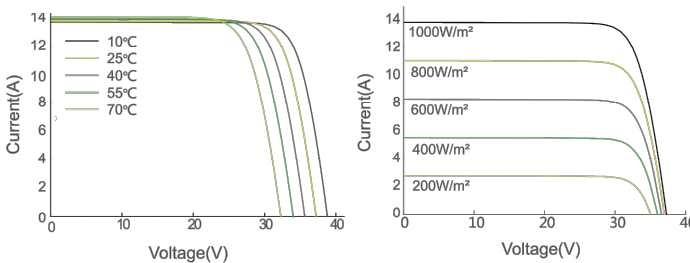
Temperature Coefficient of Pmax	-0.350%/°C
Temperature Coefficient of Voc	-0.275%/°C
Temperature Coefficient of Isc	+0.045%/°C
Nominal Operating cell Temperature (NOCT)	42°C±2°C

Freedom 400W Module Datasheet
Version No: FF-MP-BBB-400

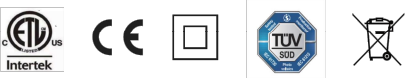
FRAME PROFILE



CURRENT-VOLTAGE CURVE



CERTIFICATIONS AND STANDARDS PENDING



UL 61730 | UL 61215 | ISO 9001 | ISO 14001



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Solar Individual Permit Package

BRUCE GINN

**11.200KW Grid Tied
Photovoltaic System**

19 JAY CT,
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Rev	Description	Date
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OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/2/2023
DRAWN BY	E.R
SHEET #	PV-13.0

TITLE
**MODULE
SPEC**

Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US



INVERTERS

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking 99% weighted efficiency
- Quick and easy inverter commissioning directly from a smartphone using the SolarEdge SetApp
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014, NEC 2017 and NEC 2020 per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Small, lightweight, and easy to install both outdoors or indoors
- Built-in module-level monitoring
- Optional: Faster installations with built-in consumption metering (1% accuracy) and production revenue grade metering (0.5% accuracy, ANSI C12.20)

solaredge.com



Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXXXH-XXXXXBXX4							
OUTPUT								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5 ¹							Hz
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A
Power Factor	1, Adjustable - 0.85 to 0.85							
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
INPUT								
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @208V	-	5100	-	7750	-	-	15500	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380							Vdc
Maximum Input Current @240V ⁽²⁾	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Maximum Input Current @208V ⁽²⁾	-	9	-	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600k Ω Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%
Nighttime Power Consumption	< 2.5							W

(1) For other regional settings please contact SolarEdge support
(2) A higher current source may be used; the inverter will limit its input current to the values stated

Single Phase Inverter with HD-Wave Technology for North America

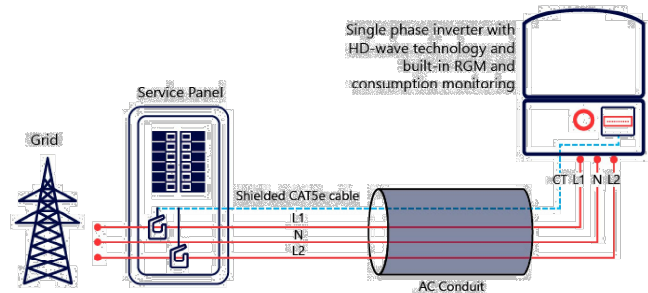
SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US
ADDITIONAL FEATURES							
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)						
Revenue Grade Metering, ANSI C12.20	Optional ⁽³⁾						
Consumption metering							
Inverter Commissioning	With the SetApp mobile application using Built-in Wi-Fi Access Point for Local Connection						
Rapid Shutdown - NEC 2014, NEC 2017 and NEC 2020, 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect						
STANDARD COMPLIANCE							
Safety	UL1741, UL1741 SA, UL16998, CSA C22.2, Canadian AFCI according to T.L.L. M-07						
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (H)						
Emissions	FCC Part 15 Class B						
INSTALLATION SPECIFICATIONS							
AC Output Conduit Size / AWG Range	1" Maximum / 14-6 AWG				1" Maximum /14-4 AWG		
DC Input Conduit Size / # of Strings / AWG Range	1" Maximum / 1-2 strings / 14-6 AWG				1" Maximum / 1-3 strings / 14-6 AWG		
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174				21.3 x 14.6 x 7.3 / 540 x 370 x 185		
Weight with Safety Switch	22 / 10	25.1 / 11.4		26.2 / 11.9		38.8 / 17.6	
Noise	< 25				<50		
Cooling	Natural Convection						
Operating Temperature Range	-40 to +140 / -40 to +60 ⁽⁴⁾						
Protection Rating	NEMA 4X (Inverter with Safety Switch)						
	°F / °C						

(3) Inverter with Revenue Grade Meter P/N: SE3000H-US0008NCA; Inverter with Revenue Grade Production and Consumption Meter P/N: SE3000H-US0008N4 . For consumption metering, current transformers should be ordered separately: SEACT07050-200NA-20 or SEACT07050-400NA-20, 20 units per box
(4) Full power up to at least 50°C / 122°F; for power de-rating information refer to: <https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf>

How to Enable Consumption Monitoring

By simply wiring current transformers through the inverter's existing AC conduits and connecting them to the service panel, homeowners will gain full insight into their household energy usage helping them to avoid high electricity bills



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Solar Individual Permit Package

BRUCE GINN

11.200KW Grid Tied Photovoltaic System

19 JAY CT, ALAMO, CA 94507

Rev	Description	Date
A	INITIAL DESIGN	4/19/2023
A.1	UPDATED DESIGN	5/2/2023
A.2	UPDATED DESIGN	5/9/2023

OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/2/2023
DRAWN BY	E.R
SHEET #	PV-13.1

TITLE
INVERTER SPEC

Power Optimizer
For Residential Installations

S440, S500



POWER OPTIMIZER

Enabling PV power optimization at the module level

- Specifically designed to work with SolarEdge residential inverters
- Mitigates all types of module mismatch loss, from manufacturing tolerance to partial shading
- Detects abnormal PV connector behavior, preventing potential safety issues*
- Faster installations with simplified cable management and easy assembly using a single bolt
- Module-level voltage shutdown for installer and firefighter safety
- Flexible system design for maximum space utilization
- Superior efficiency (99.5%)
- Compatible with bifacial PV modules

* Functionality subject to inverter model and firmware version

solaredge.com



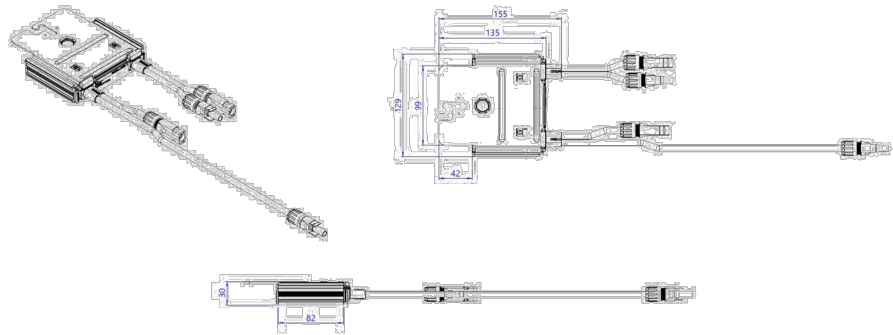
Power Optimizer
For Residential Installations
S440, S500

	S440	S500	UNIT
Rated Input DC Power ⁽¹⁾	440	500	W
Absolute Maximum Input Voltage (Voc)	60		Vdc
MPPT Operating Range	8 - 60		Vdc
Maximum Short Circuit Current (Isc) of Connected PV Module	14.5	15	Adc
Maximum Efficiency	99.5		%
Weighted Efficiency	98.6		%
Overvoltage Category	II		
OUTPUT DURING OPERATION			
Maximum Output Current	15		Adc
Maximum Output Voltage	60		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM INVERTER OR INVERTER OFF)			
Safety Output Voltage per Power Optimizer	1		Vdc
STANDARD COMPLIANCE			
EMC	FCC Part 15 Class B, IEC61000-6-2, IEC61000-6-3, CISPR11, EN-55011		
Safety	IEC62109-1 (class II safety), UL1741		
Material	UL94 V-0, UV Resistant		
RoHS	Yes		
Fire Safety	VDE-AR-E 2100-712:2013-05		
INSTALLATION SPECIFICATIONS			
Maximum Allowed System Voltage	1000		Vdc
Dimensions (W x L x H)	129 x 155 x 30		mm
Weight (including cables)	655 / 1.5		gr / lb
Input Connector	MC4 ⁽²⁾		
Input Wire Length	0.1		m
Output Connector	MC4		
Output Wire Length	(+) 2.3, (-) 0.10		m
Operating Temperature Range ⁽³⁾	-40 to +85		°C
Protection Rating	IP68 / NEMA6P		
Relative Humidity	0 - 100		%

(1) Rated power of the module at STC will not exceed the Power Optimizer Rated Input DC Power. Modules with up to +5% power tolerance are allowed
(2) For other connector types please contact SolarEdge
(3) For ambient temperature above +70°C / +158°F power de-rating is applied. Refer to [Power Optimizers Temperature De-Rating Technical Note](#) for more details

PV System Design Using a SolarEdge Inverter		Single Phase HD-Wave	Three Phase	Three Phase for 277/480V Grid	
Minimum String Length (Power Optimizers)	S440, S500	8	16	18	
Maximum String Length (Power Optimizers)		25	50		
Maximum Nominal Power per String ⁽⁴⁾		5700	11250 ⁽⁵⁾	12750 ⁽⁶⁾	W
Parallel Strings of Different Lengths or Orientations		Yes			

(4) If the Inverters rated AC power ≤ maximum nominal power per string, then the maximum power per string will be able to reach up to the Inverters maximum input DC power Refer to: <https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf>
(5) For the 230/400V grid: it is allowed to install up to 13,500W per string when the maximum power difference between each string is 2,000W
(6) For the 277/480V grid: it is allowed to install up to 15,000W per string when the maximum power difference between each string is 2,000W
(7) It is not allowed to mix S-series and P-series Power Optimizers in new installations



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PROJECT #	321175
DATE DRAWN	5/2/2023
DRAWN BY	E.R
SHEET #	PV-13.2

TITLE
OPTIMIZER SPEC



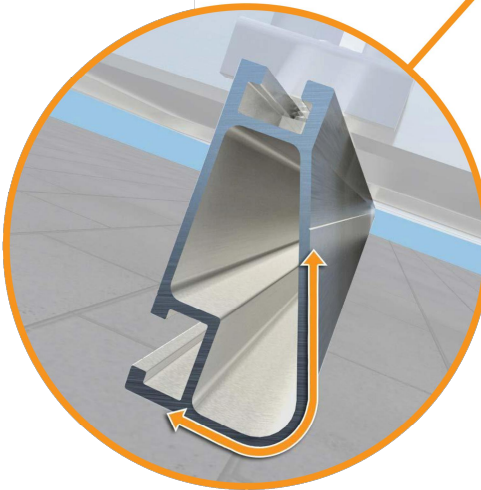
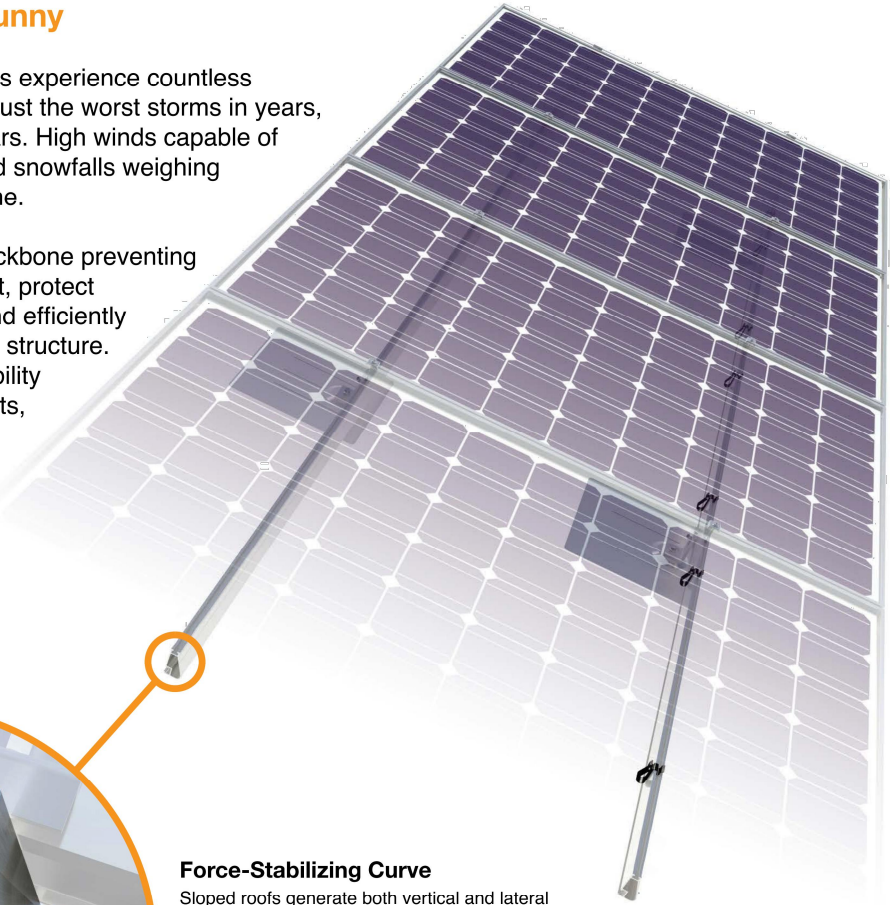
Tech Brief

XR Rail Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs



XR Rails are compatible with FlashFoot and other pitched roof attachments.



IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of marine-grade aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.



XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.



XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

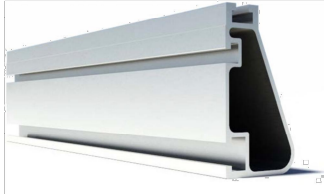
- 6' spanning capability
- Moderate load capability
- Clear anodized finish
- Internal splices available



XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available



XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100	XR10		XR100		XR1000	
	120						
	140						
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

Tech Brief

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DRAWN BY	E.R
SHEET #	PV-13.3

TITLE
**RAIL
SPEC**



Ground Mount System

Datasheet



Mount on all terrains, in no time.

The IronRidge Ground Mount System combines our XR1000 rails with locally-sourced steel pipes, or mechanical tubing, to create a cost-effective structure capable of handling any site or terrain challenge. Installation is simple with only a few structural components and no drilling, welding, or heavy machinery required. In addition, the system works with a variety of foundation options, including concrete piers and driven piles.



Rugged Construction

Engineered steel and aluminum components ensure durability.



Simple Assembly

Just a few simple components and no heavy equipment.



Flexible Architecture

Multiple foundation and array configuration options.



PE Certified

Pre-stamped engineering letters available in most states.



Design Software

Online tool generates engineering values and bill of materials.



20 Year Warranty

Twice the protection offered by competitors.



Datasheet



360° Product Tour
Visit [ironridge.com](https://www.ironridge.com)

Substructure

Top Caps



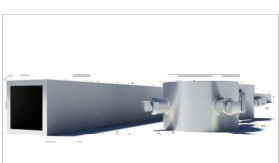
Connect vertical and cross pipes.

Rail Connectors



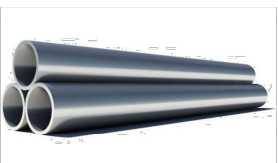
Attach Rail Assembly to horizontal pipes.

Diagonal Braces



Optional Brace provides additional support.

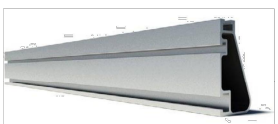
Cross Pipe & Piers



Steel pipes or mechanical tubing for substructure.

Rail Assembly

XR1000 Rails



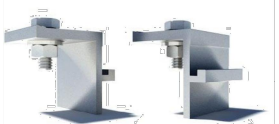
Curved rails increase spanning capabilities.

Top-Down Clamps



Secure modules to rails and substructure.

Under Clamps



Alternative clamps for pre-attaching modules to rails.

Accessories



Wire Clips and End Caps provide a finished look.

Resources



Design Assistant
Go from rough layout to fully engineered system. For free.
[Go to ironridge.com/gm](https://www.ironridge.com/gm)



NABCEP Certified Training
Earn free continuing education credits, while learning more about our systems.
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CONTRACTOR INFO



GREG ALBRIGHT

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TEMECULA, CA 92590

STATE OF CALIFORNIA
C10 – ELECTRICAL; B – GENERAL
BUILDING CONTRACTOR; C39 –
ROOFING; C46 – SOLAR 1029644

Solar Individual Permit Package

BRUCE GINN

**11.200KW Grid Tied
Photovoltaic System**

19 JAY CT,
ALAMO, CA 94507

Rev	Description	Date
A	INITIAL DESIGN	4/19/2023
A.1	UPDATED DESIGN	5/2/2023
A.2	UPDATED DESIGN	5/9/2023

OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/2/2023
DRAWN BY	E.R
SHEET #	PV-13.4

TITLE
**ATTACHMENT
SPEC**



28357 Industrial Blvd.
Hayward, CA 94545
1-800-227-9523
IronRidge.com

Attn: Sean McDonald, CEO, IronRidge Inc.
Date: November 16th, 2022

Re: Structural Certification and Span Tables for the IronRidge Flush Mount System

This letter addresses the structural performance and code compliance of IronRidge's Flush Mount System. The contents of the letter shall be read in its entirety before applying to any project design. The Flush Mount System is a proprietary rooftop mounting system used to support photovoltaic (PV) modules installed in portrait or landscape orientation and set parallel to the underlying roof surface. PV modules are supported by extruded aluminum XR Rails and secured to the rails with IronRidge mounting clamps. The XR Rails are side mounted to a selected roof attachment with 3/8" stainless steel bonding hardware and then attached directly to the roof structure or to a stanchion that is fastened to the underlying roof structure. Assembly details of a typical Flush Mount installation and its core components are shown in Exhibit EX-0015.

The IronRidge Flush Mount System is designed and certified to the structural requirements of the reference standards listed below, for the load conditions and configurations tabulated in the attached span tables.

- ASCE/SEI 7-16 Minimum Design Loads for Buildings and Other Structures (ASCE 7-16)
- 2021 International Building Code (IBC-2021)
- 2022 California Building Code (CBC-2022)
- 2020 Aluminum Design Manual (ADM-2020)
- Report SEAOC (Structural Engineer Association of California) PV2-2017 Wind Design for Solar Arrays

The tables included in this letter provide the maximum allowable spans of XR Rails in the Flush Mount System for the respective loads and configurations listed, covering wind exposure categories B, C, & D, roof zones provided in ASCE 7-16 for gable & hip roof profiles, and roof slopes of 8° to 45°. The tabulated spans are applicable when the following conditions are met:

- Span* is the distance between two adjacent roof attachment points (measured at the center of the attachment fastener).
- Each module shall be supported by 2 rails (2 rail system) or 3 rails (3 rail system). Spans are calculated based on 2 rail systems, and conservatively deemed acceptable for 3 rail systems.
- The underlying roof slope, measured between the roof surface and horizontal plane, is 8° to 45°.
- The *mean roof height*, defined as the average of the roof eave height and the roof ridge height measured from grade, does not exceed 30 feet.
- A clearance from the underside of the array to the roof surface of 2" minimum shall be provided and the height of the array, the distance from the module top surface to the roof surface (defined as h_2), shall not exceed 10".
- Module length and area shall not exceed the maximum values listed on the respective span tables.
- All Flush Mount components shall be installed in a professional workmanlike manner per IronRidge's *Flush Mount Installation Manual* and other applicable standards for the general roof construction practice.



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Hayward, CA 94545
1-800-227-9523
IronRidge.com

The parameters and adjustments allowed in the span tables are defined as the following:

- The Flush Mount System is designed as a Risk Category II structure as defined by ASCE 7-16 Table 1.5-1.
- Wind speed shall conform to ASCE 7-16 Fig. 26.5-1B (for Risk Category II) and applicable state & local county/city amendments to the IBC. No special wind topographic features are included and both topographic coefficient (K_{zt}) and wind ground elevation factor (K_e) are taken as 1.0.
- Snow load used in the span tables is the *ground snow* and shall conform to ASCE 7-16 Fig. 7.2-1 and applicable state & local county/city amendments to the IBC. If the local jurisdiction specified snow load is in the format of a *flat roof snow*, it shall first be converted to a *ground snow* following the local building code/ amendments before the application of the attached span tables. No special snow conditions are considered including unbalanced, drifting, sliding, retention, or ponding snow. No rain-on-snow surcharge load is considered. The span tables do not apply to buildings which are intentionally kept below freezing, kept just above freezing, or unheated.
- The span tables reflect the ASCE 7 prescribed earthquake loads with the maximum magnitudes being:
 - For ground snow no greater than 42psf: $S_s \leq 2.0g$ for Site Class A, B, C, & D.
 - For ground snow greater than 42psf and less than 65psf: $S_s \leq 1.0g$ for Site Class A, B, C, & D.
 - For ground snow between 65psf and 100psf: $S_s \leq 1.5g$ for Site Class A, B, C, & D.
- Roof zones are defined by ASCE 7-16 Figure 30.3-2A to Figure 30.3-2I and are organized into three *groups* in which the zones share the same External Pressure Coefficients ($G C_p$). Roof zones comprising each *group* along with each roof zone's size and location are depicted in Figures 2 and 3 below each span table.
- The maximum rail cantilever length, measured from the rail end to the nearest attachment point, shall be the lesser of the following two conditions: 40% of the allowable span provided for the respective load & configuration condition from the span tables, or 36".
- Allowable span length in the charts may be multiplied by a factor of 1.08 if the rails are continuous over a minimum of three spans.
- No splices are allowed in the rail cantilever. For each XR splice type install per the following requirements:
 - XR Bonded Splice cannot be installed in the center 1/3 of interior spans, or the outer 2/3 of end spans.
 - BOSS Splice can be installed at any location within a span.
- Shaded cells of the span tables indicate conditions in which UFO Mid Clamp connection capacity is exceeded. If such conditions are encountered contact techsupport@ironridge.com.

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Solar Individual Permit Package

BRUCE GINN

**11.200KW Grid Tied
Photovoltaic System**

**19 JAY CT,
ALAMO, CA 94507**

Rev	Description	Date
A	INITIAL DESIGN	4/19/2023
A.1	UPDATED DESIGN	5/2/2023
A.2	UPDATED DESIGN	5/9/2023

OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/2/2023
DRAWN BY	E.R
SHEET #	PV-13.5

TITLE
CERTIFICATION



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IronRidge.com



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IronRidge.com

10. Systems using CAMO module clamps shall be installed with the following guidance:
- a) For single module installations (orphan modules) using modules with a length greater than 67.5", CAMO clamps shall not be installed in regions that experience ground snow loads of 70psf and greater. Such scenarios are shown by asterisks in the applicable span tables.
 - b) CAMO will function within a module's design load ratings. Be sure the specific module being used with CAMO meets the dimensional requirements shown in the figure below and that the module selected is suitable for the environmental conditions of a particular project.

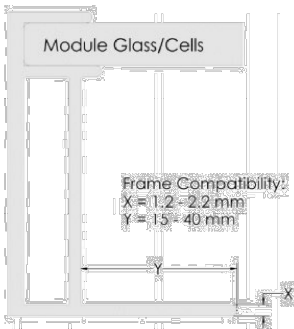


Figure 1: CAMO Module Frame Dimensional Requirements

Span values for *Exposed* and *Edge* module conditions, as defined below, are included in the attached span tables and shall be used when each condition exists. The maximum allowable span for *Exposed* or *Edge* modules shall be the lesser of the following two: (1) The span value for the *Exposed* or *Edge* module condition; (2) The span value determined by site wind speed and ground snow load. Additionally, irrespective of the lesser span, the shaded cells for the *Exposed* and *Edge* module conditions which reflect the UFO clamp usage limitation detailed in note 9 of page 2 shall apply to the respective condition.

1. Exposed Module conditions:

A module is defined as *Exposed* (per Section 29.4.4 of ASCE 7-16) if the distance from any of its free edges (an edge with no connectivity to other modules) to its facing roof edge (such as eave, ridge, rake, or hip) is greater than $0.5h$ (h is ASCE defined building height) AND if the distance from its free edge to any other adjacent array or panel is greater than 4 feet.

The allowable spans and cantilever shall only be applied to the portion of rail directly under *Exposed* Modules.

2. Edge Module conditions:

A module is defined as an *Edge Module* when its distance from any side of the module to its facing perimeter roof edge (such as eave, ridge, rake, or hip) is less than 2 times the height of the array ($2h_2$) where h_2 is measured from the roof surface to the top surface of the module.

The allowable spans and cantilever shall only be applied to the portion of rail directly under *Edge Modules*. Additionally, if the roof edge is the eave or ridge, only the rail nearest to that roof edge shall be considered for this span adjustment.

The span tables provided in this letter are certified based on the structural performance of IronRidge XR Rails only with no consideration of the structural adequacy of the chosen roof attachments, PV modules, or the underlying roof supporting members. It is the responsibility of the installer or system designer to verify the structural capacity and adequacy of the aforementioned system components in regards to the applied or resultant loads of any chosen array configuration. This letter certifies the IronRidge products referenced within this document and provides no determination of the project specific conditions including site loads, building profile, & roof zones, which remain the responsibility of the installer or system designer.

Sincerely,



Gang Xuan, SE
Senior Structural Engineer

Digitally signed
by Gang Xuan
Date: 2022.11.18
10:55:51 -08'00'

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Solar Individual Permit Package

BRUCE GINN

**11.200KW Grid Tied
Photovoltaic System**

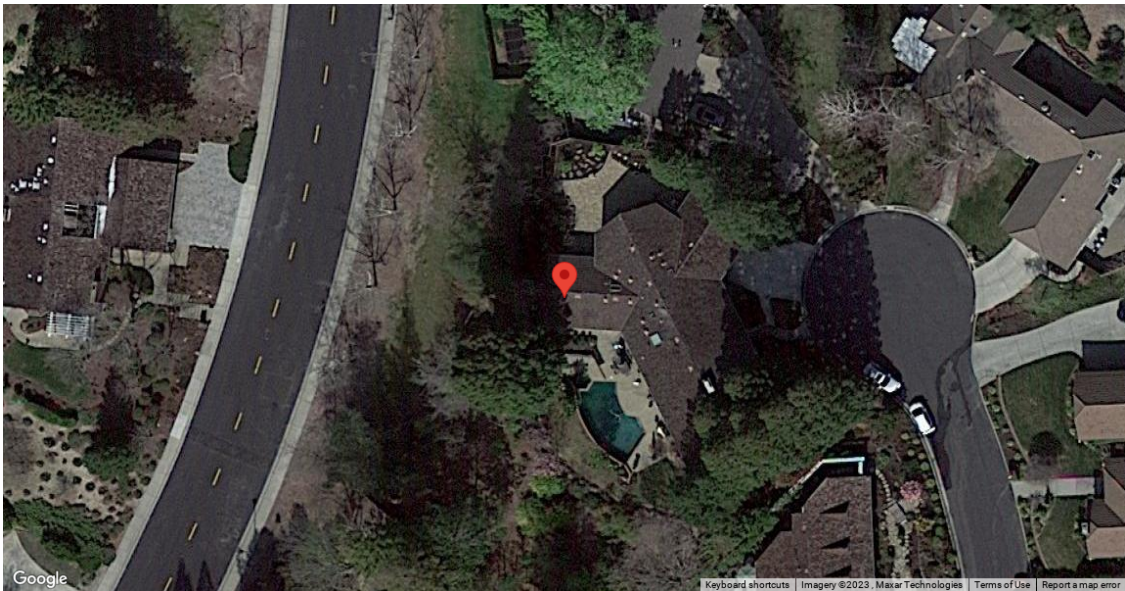
19 JAY CT,
ALAMO, CA 94507

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A.2	UPDATED DESIGN	5/9/2023

OPPORTUNITY	BRUCE GINN
PROJECT #	321175
DATE DRAWN	5/2/2023
DRAWN BY	E.R
SHEET #	PV-13.6

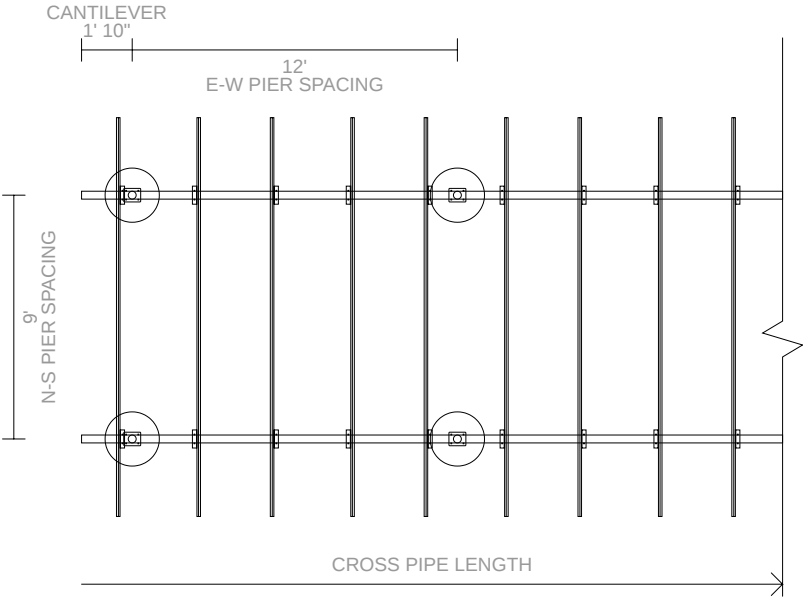
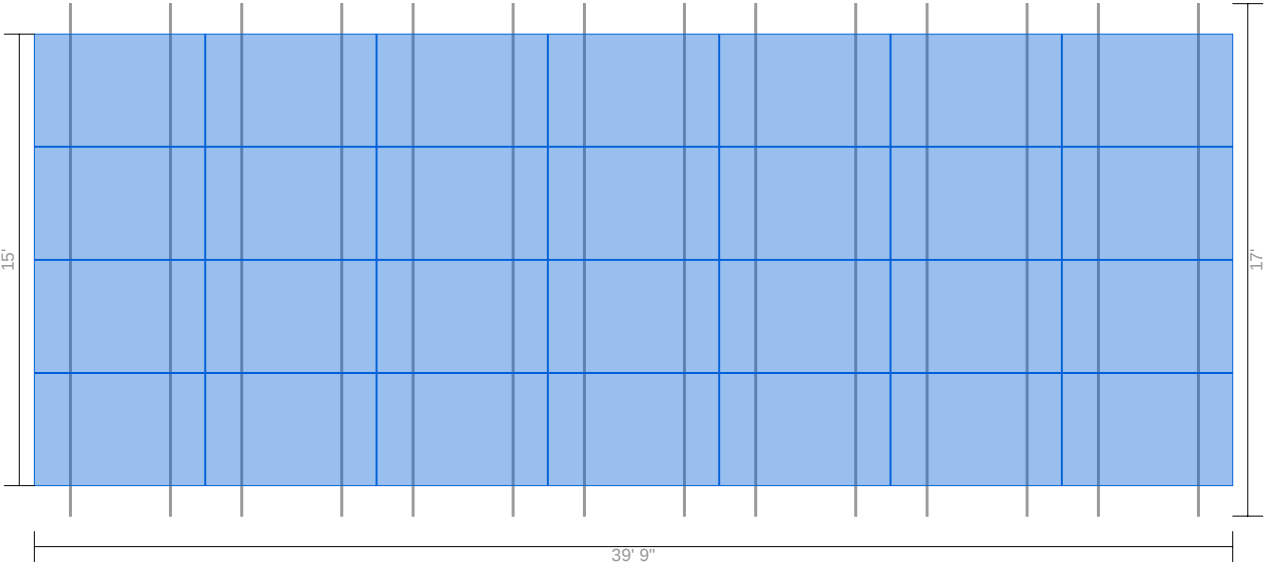
CERTIFICATION

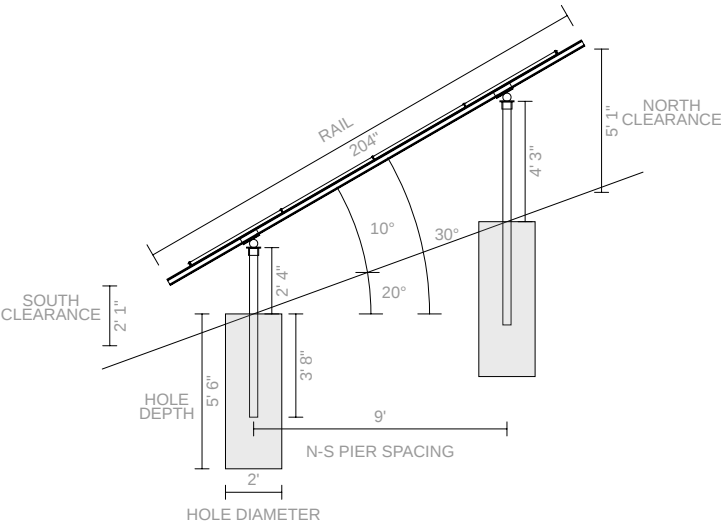
Project Details			
Name	19 Jay Court	Date	05/08/2023
Location	19 Jay Court, Alamo, CA 94507	ASCE code	7.16
Total modules	28	Wind speed	90 mph
Module	Custom Panels: FF-MP-BBB-400	Snow load	0 psf
Dimensions	Dimensions: 67.8" x 44.65" x 1.38" (1722.0mm x 1134.0mm x 35.0mm)	Wind exposure	C
Total watts	11,200 kW	Piers	8
		Concrete	5.12 yd³



Substructure & Foundation			
Tilt	30°	South facing grade	20°
Pipe/tubing diameter	3"	Soil class	4
Foundation type	Concrete	Hole diameter	24"

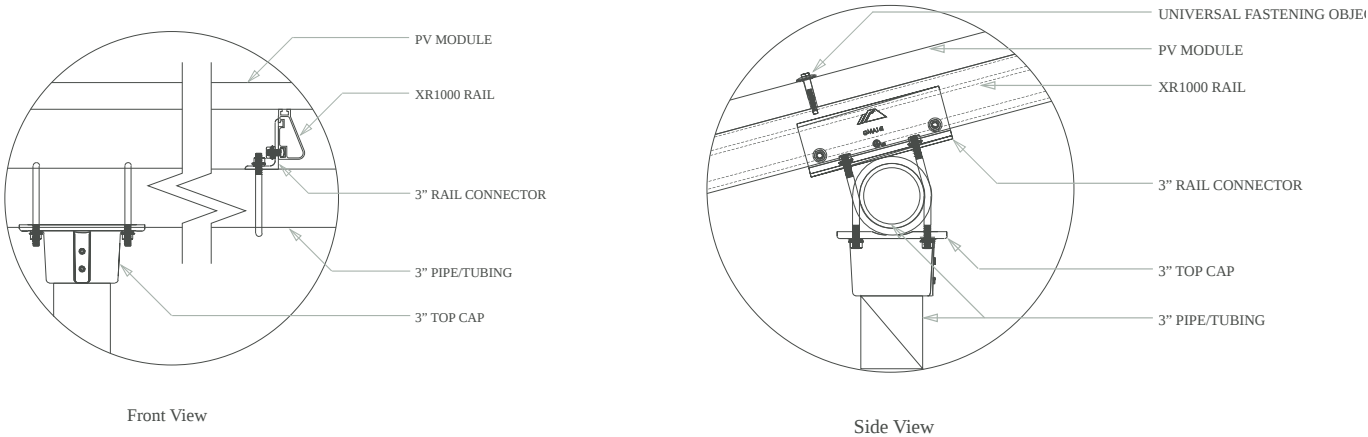
Sub array #1					
Rows	4	Columns	7	# Arrays	1
Area	39' 9" (EW) × 15' 2" (NS)	Rail type	XR1000	Diagonal bracing	no
E/W spacing	12'	Rail cantilever	3' 4"	Pipe cantilever	1' 10"
Piers/array	8	Total south piers	4 (6')	Total north piers	4 (7' 11")
Total cross pipes	2 (39' 9")	Total pipe length	135' 4"		
Shear	1,532 lbs	Moment	3,830 ft-lbs	Uplift	-1,321 lbs



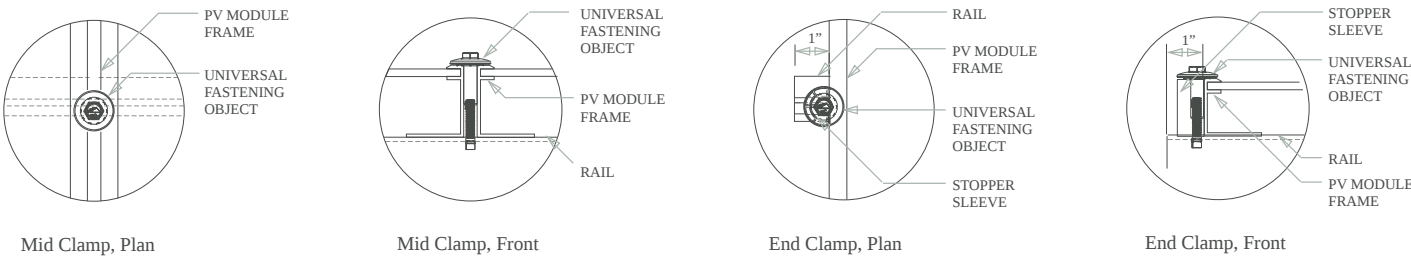


Pipe Fitting Detail

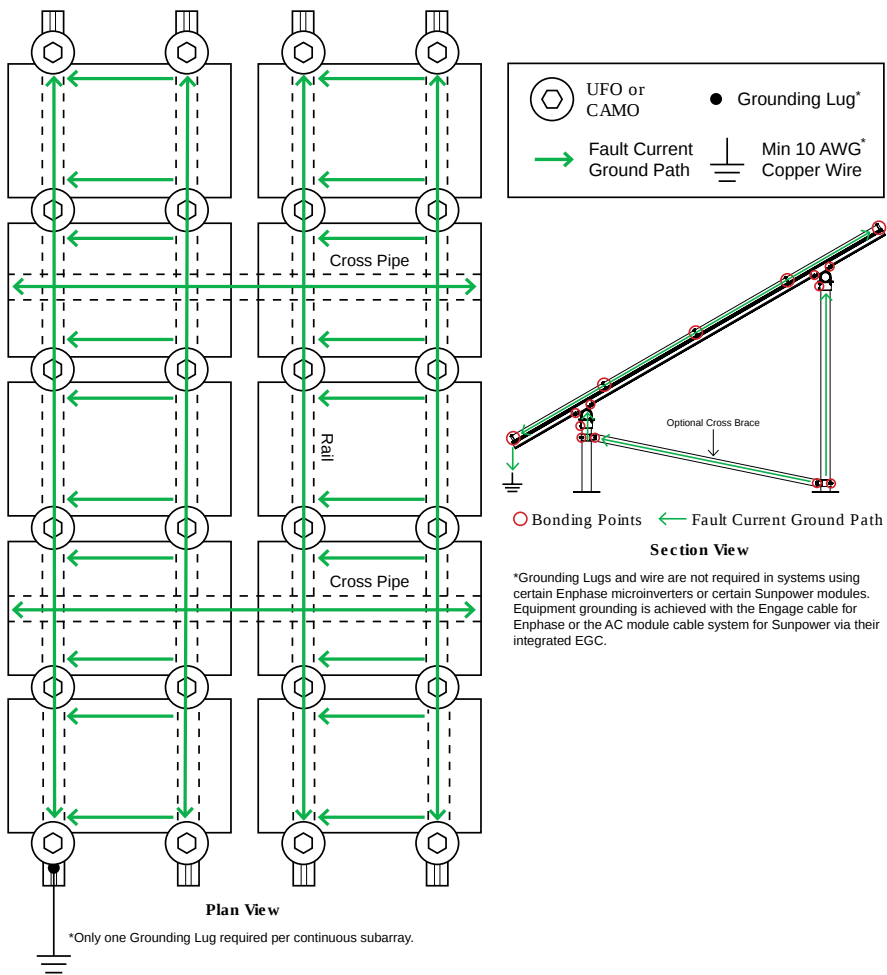
XR1000 Rail



Clamp Detail



Grounding Diagram



Bill of Materials		
Part	Spares	Total Qty
Rails		
XR-1000-204A XR1000, Rail 204" Clear	0	14
Clamps & Grounding		
UFO-CL-01-A1 Universal Module Clamp, Clear	0	70
UFO-STP-35MM-M1 Stopper Sleeve, 35MM, Mill	0	28
XR-LUG-03-A1 Grounding Lug, Low Profile	0	1
Substructure		
70-0300-SGA SGA Top Cap at 3"	0	8
GM-BRC3-01-M1 Ground Mount Bonded Rail Connector - 3"	0	28

CHECKLIST

PRE-INSTALLATION

- ☐ Verify module compatibility. See [Page 14](#) for info.
- ☐ Purchase 2" or 3" Pipe or Mechanical Tubing

Pipe: 2" or 3" (NPS) ASTM A53 Grade B SCH 40 Pipe, galvanized to a min of ASTM A653 G90 or ASTM A123 G35.

Mechanical Tubing: 2.375" x 12 ga (O.D) or 3.500" x 8 ga (O.D.) Mechanical Tubing with one of the following Galvinizations (ASTM A1057).

- Allied Gatorshield
- Allied Flo-Coat Coating
- Wheatland ThunderCoat

TOOLS REQUIRED

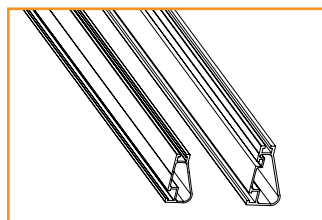
- ☐ Post Hole Digger or Powered Auger
- ☐ Socket Drive (7/16", 9/16", 15/16" and 1/2" Sockets)
- ☐ Torque Wrenches (0-240 in-lbs and 10-40 ft-lbs)
- ☐ Transit, String Line, or Laser Level
- ☐ 3/16" Allen Head

TORQUE VALUES

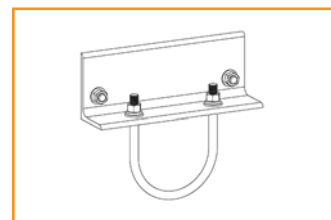
Top Cap Set Screws (3/16" Allen Head)

- ☐ 2" or 3" NPS Schedule 40 Grade B Pipe: 20 ft-lbs
- ☐ 2.375" x 12 ga OD Mechanical Tubing: 11 ft-lbs
- ☐ 3.500" x 8 ga OD Mechanical Tubing: 16 ft-lbs
- ☐ For Ground Screw to Pipe Connection Hardware see [Page 5](#).
- ☐ Top Cap U-Bolt Nuts (9/16" Socket): 15 ft-lbs
- ☐ Rail Connector Bracket Nuts (9/16" Socket): 21 ft-lbs
- ☐ Rail Connector U-Bolt Nuts (9/16" Socket): 60 in-lbs
- ☐ Rail Grounding Lug Nut (7/16" Socket): 80 in-lbs
 - ☐ Rail Grounding Lug Terminal Screws (7/16" Socket): 20 in-lbs
- ☐ Module Grounding Lug Nut (3/8" Socket): 60 in-lbs
 - ☐ Module Grounding Lug Terminal Screws (1/2" Socket): 20 in-lbs
- ☐ Universal Fastening Objects (7/16" Socket): 80 in-lbs
- ☐ Diagonal Brace Set Screws (1/2" Socket): 15 ft-lbs
- ☐ Diagonal Brace Bolts (1/2" Socket): 40 ft-lbs
- ☐ Microinverter Kit Nuts (7/16" Socket): 80 in-lbs
- ☐ Frameless Module Kit Nuts (7/16" Socket): 80 in-lbs
- If using previous version of: Integrated Grounding Mid Clamps, Grounding Lug and End Clamps please refer to Alternate Components Addendum (Version 1.90).
- If installing on a low slope roof please refer to Ground Mount for Flat Roof Applications Addendum (Version 3.30).
- Unless otherwise noted, all components have been evaluated for multiple use. They can be uninstalled and reinstalled in the same or new location.

IRONRIDGE COMPONENTS



XR100 & XR1000 Rail



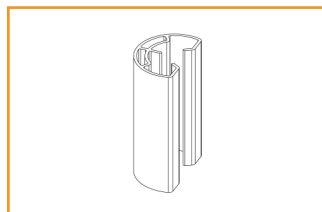
Rail Connector



Top Cap



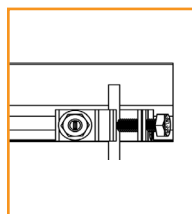
UFO (30-46mm)



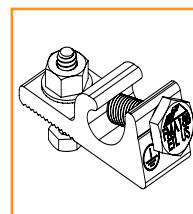
Stopper Sleeve



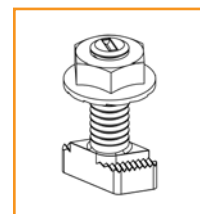
CAMO



Rail Grounding Lug



Module Grounding Lug



Microinverter Kit



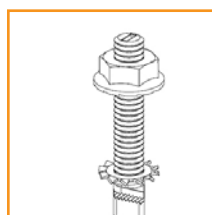
Diagonal Brace



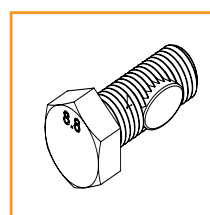
End Cap



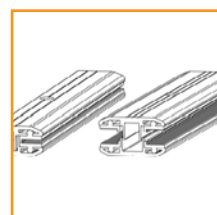
Wire Clip



Frameless Module Kit



Hex Head Set Screw



Frameless End/Mid Clamp