GROUND MOUNT SOLAR PERMIT PACKAGE
REFRIGERATOR
22.000KW DC MINI OFF GRID TIED PHOTOVOLTAIC SYSTEM

XXXXXXXXXXXXXXXXXX

PV SYSTEM SUMMARY:

SYSTEM SIZE (DC)	:	STC: 550 x 40 = 22.000kW DC
	:	PTC: 515.6 x 40 = 20.6240kW DC
SYSTEM SIZE (AC)	:	66.000kW AC @ 480V
MODULES	:	(40) ZNSHINE SOLAR: ZXM7-SHDB144-550
INVERTER	:	SOLARK: 60K-3P-480V
TILT	:	20°
AZIMUTH	:	180°
ATTACHMENT TYPE	:	UNIRAC GROUNDMOUNT FIXED TILT SYSTEM
GENERATOR	:	(1) GENERAC 36KW BACKUP GENERATOR
BATTERY	:	(2) SOLARK: L3 HV-60KWH BATTERY

GENERAL GUIDELINES:

1. CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.
2. ALL SOLAR ENERGY SYSTEM EQUIPMENT SHALL BE SCREENED TO THE MAXIMUM EXTENT POSSIBLE AND SHALL BE PAINTED A COLOR SIMILAR TO THE SURFACE UPON WHICH THEY ARE MOUNTED.
3. MODULES SHALL BE TESTED , LISTED AND INDENTIFIED WITH FIRE CLASSIFICATION IN ACCORDANCE WITH UL 2703. SMOKE AND CARBON MONOXIDE ALARMS ARE REQUIRED PER SECTION R314 AND 315 TO BE VERIFIED AND INSPECTED BY INSPECTOR IN THE FIELD.
4. DIG ALERT (811) TO BE CONTACTED AND COMPLIANCE WITH EXCAVATION SAFETY PRIOR TO ANY EXCAVATION TAKING PLACE.
5. PHOTOVOLTAIC SYSTEM GROUND WILL BE TIED INTO EXISTING GROUND AT MAIN SERVICE FROM DC DISCONNECT/INVERTER AS PER 2014 AC SEC 250.166(A).
6. SOLAR PHOTOVOLTAIC SYSTEM EQUIPMENT WILL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF ART. 690 OF THE 2014 AC.
7. UTILITY COMPANY WILL BE NOTIFIED PRIOR TO ACTIVATION OF THE SOLAR PV SYSTEM.
8. TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION.
9. PHOTOVOLTAIC SYSTEM WILL COMPLY WITH 2022 CEC.
10. 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.

CODE INFORMATION

THE INSTALLATION OF SOLAR ARRAYS AND PHOTOVOLTAIC POWER SYSTEMS SHALL COMPLY WITH THE FOLLOWING CODES/REGULATIONS:

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 : SAN DIEGO COUNTY

WIND SPEED	:	110
SNOW LOAD	:	40
EXPOSURE CATEGORY	:	C

AERIAL VIEW

VICINITY VIEW

SHEET INDEX

PV-1.0	COVER PAGE
PV-2.0	SITE PLAN
PV-3.0	STRUCTURAL
PV-4.0	ELECTRICAL 3LD
PV-4.1	WIRE CALCULATIONS
PV-5.0	BOM
PV-6.0	SIGNAGE
PV-6.1	PLACARD
PV-7.0+	SPECS+

DESIGN BY :

SOLARVOLTAIC
ENGINEERING SERVICES

CONTRACTOR :

xxxx REFRIGERATOR

22.000KW DC PHOTOVOLTAIC SYSTEM

XXXXXXX

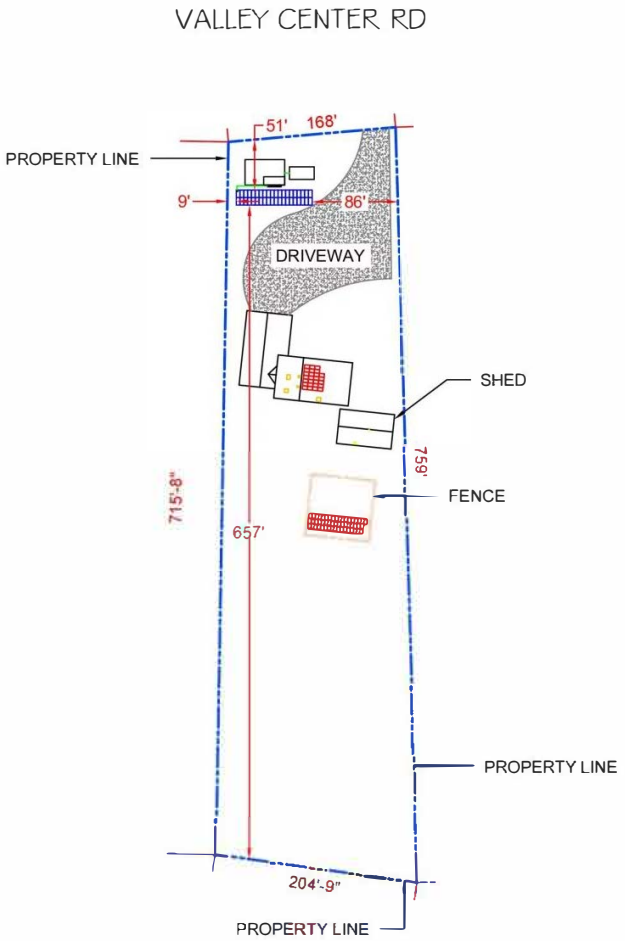
Rev	Description	Date
A	INITIAL DESIGN	xxxx
A.1	UPDATED DESIGN	xxxxx

OPPORTUNITY	xxx REFRIGERATOR N/A
PROJECT #	
DATE DRAWN	xxxx
DRAWN BY	xxxx
SHEET #	PV-1.0

TITLE

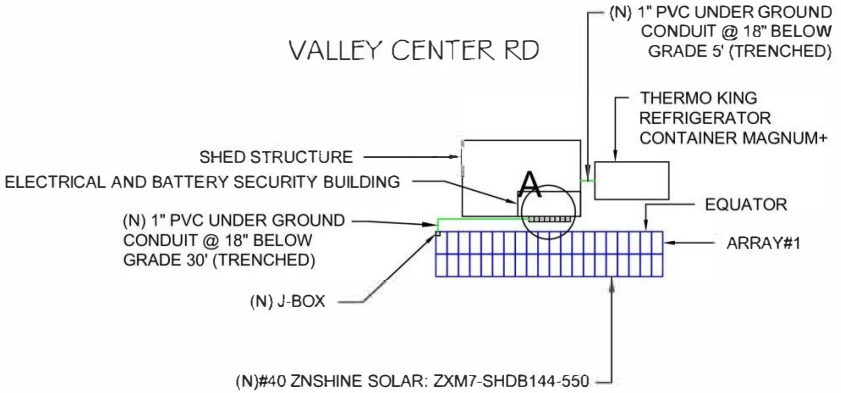
COVER PAGE

SHADE STRUCTURE AREA STATEMENT				
ARRAY	AZIMUTH	PITCH	# OF MODULES	ARRAY AREA (Sq. Ft.)
#1	180	20	40	1112.00



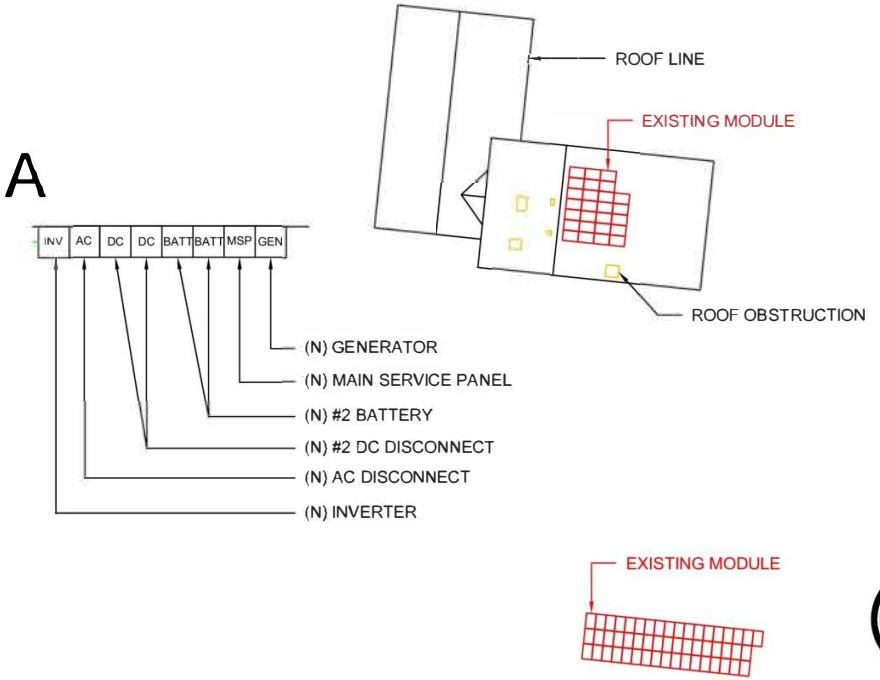
1 **SITE PLAN**

SCALE: 1/16" = 1'-0"



LEGEND

MSP	MAIN SERVICE PANEL
INV	INVERTER
AC	AC DISCONNECT
DC	DC DISCONNECT
GEN	GENERATOR
JB	JUNCTION BOX
	MODULE
	TRENCH CONDUIT



EXISTING MODULE

DESIGN BY :

SOLARVOLTAIC ENGINEERING SERVICES

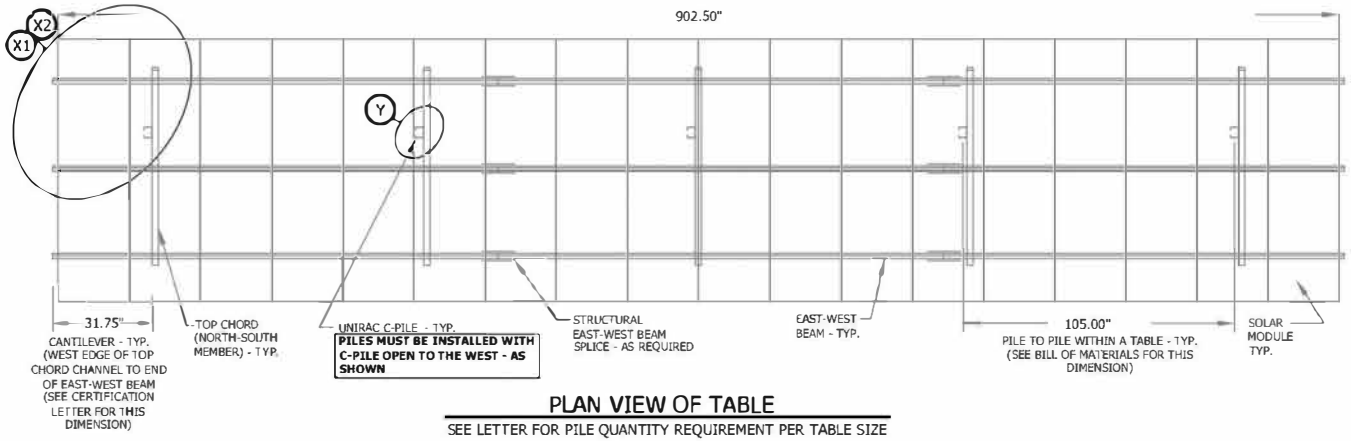
CONTRACTOR :

Rev	Description	Date
A	INITIAL DESIGN	4/6/2024
A.1	UDPATED DESIGN	4/13/2024

OPPORTUNITY	ZGROUP REFRIGERATOR
PROJECT #	N/A
DATE DRAWN	4/13/2024
DRAWN BY	
SHEET #	PV-2.0

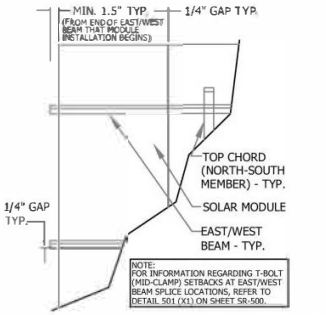
TITLE

SITE PLAN



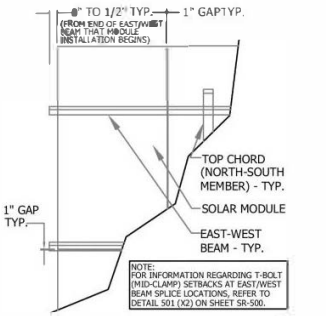
PLAN VIEW OF TABLE

SEE LETTER FOR PILE QUANTITY REQUIREMENT PER TABLE SIZE



X1 DETAILED VIEW STANDARD CLAMPS

(SEE ALSO SHEET SR-500, DETAIL 501 (X1) AND 502 (X1))



X2 DETAILED VIEW PRO SERIES CLAMPS

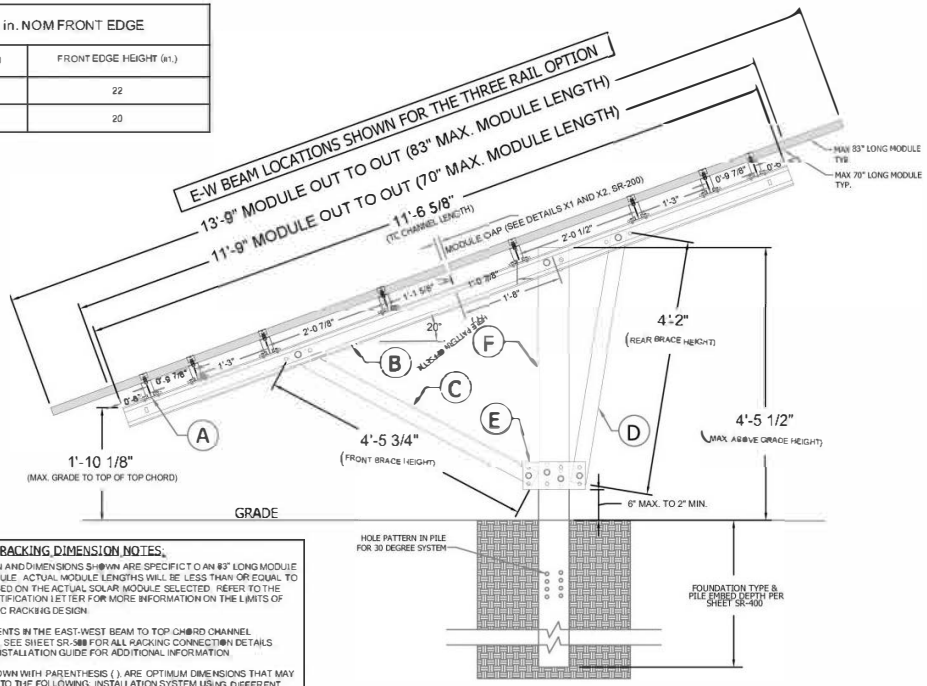
(SEE ALSO SHEET SR-500, DETAIL 501 (X2) AND 502 (X2))

PILES MUST ALWAYS BE INSTALLED WITH C-PILES OPEN TO THE WEST

N

Y DETAILED VIEW

20° 20-24 in. NOM FRONT EDGE	
MODULE LENGTH (in.)	FRONT EDGE HEIGHT (in.)
77	22
83	20



RACKING DIMENSION NOTES:

1. THIS CROSS SECTION AND DIMENSIONS SHOWN ARE SPECIFIC TO AN 83" LONG MODULE AND A 70" LONG MODULE. ACTUAL MODULE LENGTHS WILL BE LESS THAN OR EQUAL TO WHAT IS SHOWN BASED ON THE ACTUAL SOLAR MODULE SELECTED. REFER TO THE STATE SPECIFIC CERTIFICATION LETTER FOR MORE INFORMATION ON THE LIMITS OF THIS REGION SPECIFIC RACKING DESIGN.
2. FINE TUNE ADJUSTMENTS IN THE EAST-WEST BEAM TO TOP CHORD CHANNEL CONNECTIONS EXIST. SEE SHEET SR-500 FOR ALL RACKING CONNECTION DETAILS. REFER TO THE GFT INSTALLATION GUIDE FOR ADDITIONAL INFORMATION.
3. ALL DIMENSIONS SHOWN WITH PARENTHESIS ( ), ARE OPTIMUM DIMENSIONS THAT MAY VARY SLIGHTLY DUE TO THE FOLLOWING; INSTALLATION SYSTEM USING DIFFERENT HOLE OPTIONS, VARIANCE IN THE PILE STICK-UP HEIGHT, MODULE SELECTION, OR VARIANCE IN THE FINISHED/EXISTING GRADE. ALL OTHER DIMENSIONS ARE FIXED.

SECTION VIEW OF GFT TABLE - 20° TILT

GFT PARTS LIST				
REF NUMBER	PART DESCRIPTION	CATALOG #	GUAGE/ THICKNESS	FINISH
A	ALUMINUM E-W BEAM (166" OR 246")	411166M OR 411246M	SEE SHEET SR-100	
B	TOP CHORD CHANNEL	404036	SEE SHEET SR-100	
C	FRONT DIAGONAL BRACE (20°)	404031	SEE SHEET SR-100	
D	REAR DIAGONAL BRACE (20°)		SEE SHEET SR-100	
E	DIAGONAL BRACE PLATE		SEE SHEET SR-100	
F	C-PILE (12.5 FT OR 15 FT)	404001 OR 404002	SEE SHEET SR-100	

DESIGN BY :

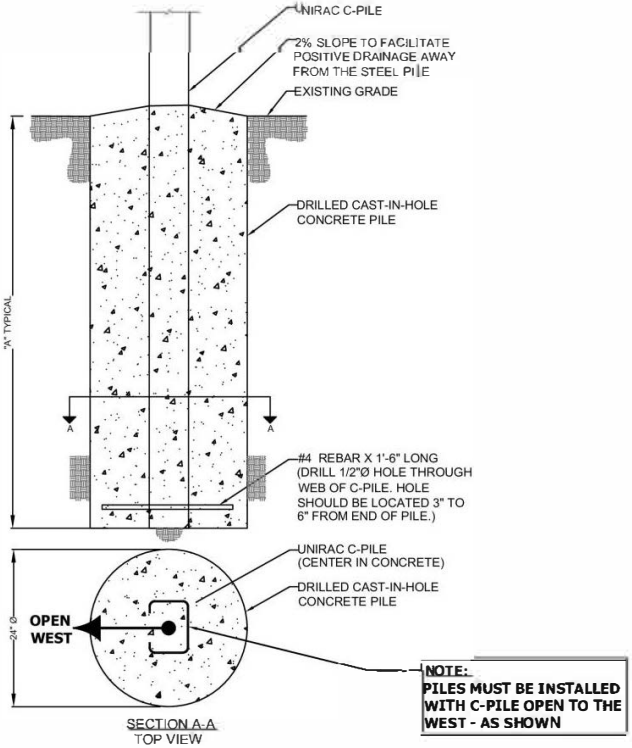
SOLARVOLTAIC ENGINEERING SERVICES

Rev	Description	Date
A	INITIAL DESIGN	4/8/2024
A.1	UPDATED DESIGN	4/13/2024

OPPORTUNITY	ZGROUP REFRIGERATOR
PROJECT #	N/A
DATE DRAWN	4/13/2024
DRAWN BY	
SHEET #	PV-3.0

TITLE

STRUCTURAL



400 DRILLED CAST-IN-HOLE CONCRETE PILE FOUNDATION (ALTERNATE OPTION)

NOT TO SCALE

FOUNDATION 400: DRILLED CAST-IN-HOLE CONCRETE PILE FOUNDATION

1. THE FOUNDATION MUST BE EXCAVATED WITH LITTLE TO NO LOOSE MATERIAL IN THE BOTTOM.
2. THE FOUNDATION CANNOT BE BELOW THE GROUND WATER UNLESS WRITTEN APPROVAL FROM UNIRAC.
3. IN SOFT OR UNSTABLE SOILS, A TEMPORARY CASING TO STABILIZE THE EXCAVATION IS PERMITTED.
4. THE PILE SHALL HAVE A #4 REBAR PLACED THROUGH THE BOTTOM OF THE PILE.
5. THE PILE MUST BE CENTERED IN THE HOLE WITH EQUAL AMOUNTS OF CONCRETE AROUND THE CASING.
6. CONCRETE SHALL CONFORM TO THE CONCRETE SPECIFICATIONS LISTED ON SR-100.
7. CONCRETE DEPTH SHALL CONFORM TO THE DEPTHS LISTED IN THE TABLE ON THIS SHEET.
8. THE TOP OF THE CONCRETE MUST BE ABOVE GRADE.
9. THE CORE OF THE CONCRETE CAST IN-DRILLED HOLE PILE WILL CONSIST OF THE UNIRAC C-PILES AS DEPICTED IN THE FIGURE.

20 DEGREE UNIRAC STEEL C-PILE FOUNDATION DEPTHS

(REFER TO SHEET SR-200 FOR PILE STICK-UP HEIGHT) (c)

FOUNDATION TYPE	DETAIL NUMBER	NO FROST DEPTH			FROST DEPTH = 3.5 FT OR LESS			FROST DEPTH = 5.0 FT		
		DIMENSION "A"	DIMENSION "B"	DIMENSION "C"	DIMENSION "A"	DIMENSION "B"	DIMENSION "C"	DIMENSION "B"	DIMENSION "E"	DIMENSION "F"
FULL CAST IN PLACE CONCRETE	#00	6'-0" (a)	—	—	6'-0" (a)	—	—	6'-0"	—	—
CAST IN PLACE CONCRETE	#01	—	—	—	6'-0" (a)	—	—	6'-0"	—	—
PARTIAL DRIVEN PILE WITH FROST BREAK (b)	#02	—	—	—	—	5'-0"	5'-0"	—	5'-0"	—
FULLY DRIVEN PILE (b)	#03	—	—	—	—	—	5'-0"	—	—	10'-0"

(a) TO 5'-6" EMBEDMENT REQUIRES CUTTING 24" BFF OF THE BOTTOM OF A 12'-0" LONG C-PILE. (DO NOT CUT THE END OF PILE WITH PRE-PUNCHED HOLES.) // CUTTING IS NOT PREFERRED. AN 8'-0" CONCRETE FOUNDATION IS ACCEPTABLE

(b) SHALLOWER EMBEDMENT DEPTHS ARE POSSIBLE, HOWEVER, PILE TESTING AND/OR APPROVAL FROM A GEOTECHNICAL OR PROFESSIONAL ENGINEER ARE REQUIRED.

(c) BASED ON THE PILE STICK-UP HEIGHT FOR A STANDARD 20 DEGREE SFT TABLE. ALL PILE EMBEDMENT DEPTHS THAT ARE 5'-1" OR GREATER REQUIRE A 15 FT LONG PILE.

Parameters Used for Design

BUILDING CODE	ASCE 7-10
BASIC WIND SPEED	110.00mph
GROUND SNOW LOAD	0.00psf
RISK CATEGORY	I
SEISMIC FACTOR, SS	1.224
SEISMIC FACTOR, S1	0.472
ELEVATION	1405.00ft
WIND EXPOSURE	C
WIND ON ICE	0.00mph
ICE THICKNESS	0.00"
FROST DEPTH	0.00ft
VELOCITY PRESSURE, QZ	21.64psf

Inspection

PRODUCT	GFT
MODULE MANUFACTURER	Znshinesolar
MODEL	40 - ZXM7-SH144-550W
MODULE WATTS	550 watts
MODULE LENGTH	89.72"
MODULE WIDTH	44.65"
MODULE THICKNESS	1.38"
MODULE WEIGHT	62.83lbs
RAILS DIRECTION	EW
RAILS ARRANGEMENT TYPE	Four Rail
TOP CHORD LENGTH	138.59 ft
TILT	20 degrees
CLAMP SELECTION	Universal AF Clamps
FOUNDATION TYPE	Driven
PILE LENGTH ABOVE GROUND	4.54 ft
PILE LENGTH BELOW GROUND	7.96 ft
FRONT EDGE HEIGHT	2.00ft
TOTAL PILE LENGTH	12.50ft
MINIMUM ARRAY TO ARRAY DISTANCE IN NS DIRECTION	126.48"

DESIGN BY :

SOLARVOLTAIC ENGINEERING SERVICES

Rev	Description	Date
A	INITIAL DESIGN	4/6/2024
A.1	UDPATED DESIGN	4/13/2024

OPPORTUNITY	ZGROUP REFRIGERATOR
PROJECT #	N/A
DATE DRAWN	4/13/2024
DRAWN BY	
SHEET #	PV-3.1

TITLE

STRUCTURAL

MODULE INFO	
MAKE/MODEL	ZNSHINE SOLAR: ZXM7-SHDB144-550
VOC	50.20V
VMP	41.90V
ISC	13.89A
IMP	13.13A
STC RATING	550 W
PTC RATING	515.6 W
EFFICIENCY	20.70%
MAXIMUM SYSTEM VOLTAGE	1500VDC

MPPT 1

STRING-1
10 ZNSHINE SOLAR:ZXM7-SHDB144-550

STRING-2
10 ZNSHINE SOLAR:ZXM7-SHDB144-550

4 - #10 AWG, PV WIRE
1 - #6 AWG IN FREE AIR OR #8 AWG MUST BE IN PVC CONDUIT

JUNCTION BOX

4 - #10 AWG, THWN-2
1 - #10 EGC, THWN-2
IN 1" PVC UNDER GROUND CONDUIT @ 18" BELOW GRADE 30' (TRENCHED)

MPPT 2

STRING-1
10 ZNSHINE SOLAR:ZXM7-SHDB144-550

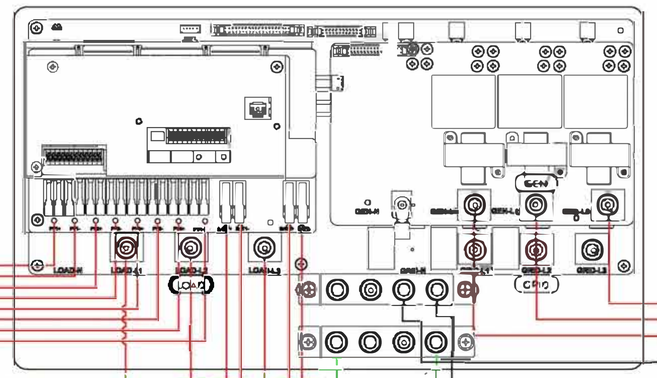
STRING-2
10 ZNSHINE SOLAR:ZXM7-SHDB144-550

4 - #10 AWG, THWN-2
1 - #10 EGC, THWN-2
IN 1" PVC UNDER GROUND CONDUIT @ 18" BELOW GRADE 30' (TRENCHED)

JUNCTION BOX

4 - #10 AWG, PV WIRE
1 - #6 AWG IN FREE AIR OR #8 AWG MUST BE IN PVC CONDUIT

(N) SOLARK: 60K-3P-480V HYBRID INVERTER



(N) 100A RATED AC DISCONNECT SQUARE D DU323RB KNIFEBLADE, LOCKABLE, NEMA 3R, UL LISTED

3 - #4 AWG, THWN
1 - #8 EGC,THWN
IN 1" OR LARGER PVC CONDUIT

(N) 36 kW GENERAC GENERATOR 60 hz

(N) 100A/2P BREAKER

(N) 125A RATED MAIN SERVICE PANEL 3PH, 480V 60HZ

(N) 70A/2P BREAKER

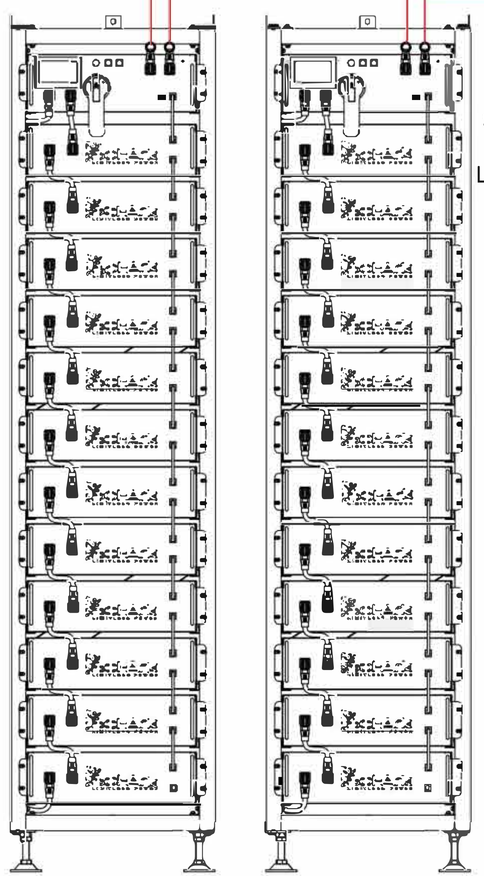
THERMO KING CORPORATION MEGNUM+

(2) (N) 60A RATED DC DISCONNECT SQUARE D HU362RB KNIFEBLADE, LOCKABLE, NEMA 3R, UL LISTED

4 - #6 AWG, THWN
IN 1" OR LARGER PVC CONDUIT

4 - #3 AWG, THWN
1 - #8 EGC, THWN
IN 1 1/4" OR LARGER PVC CONDUIT

3 - #4 AWG, THWN
1 - #8 EGC, THWN
IN 1-1/4" OR LARGER PVC CONDUIT



(N) (2) SOLARK: L3 HV-60KWH

DESIGN BY :

SOLARVOLTAIC ENGINEERING SERVICES

CONTRACTOR :

xxx REFRIGERATOR

22.000KW DC PHOTOVOLTAIC SYSTEM

xxxxxxxxxx

Rev	Description	Date
A	INITIAL DESIGN	
A.1	UDPATED DESIGN	

OPPORTUNITY	Zxxx REFRIGERATOR N/A
PROJECT #	
DATE DRAWN	xxxx
DRAWN BY	xxx
SHEET #	PV-4.0

TITLE

ELECTRICAL 3LD

MODULE INFO	
MAKE/MODEL	ZNSHINE SOLAR: ZXM7-SHDB144-550
VOC	50.20V
VMP	41.90V
ISC	13.89A
IMP	13.13A
STC RATING	550 W
PTC RATING	515.6 W
EFFICIENCY	20.70%
MAXIMUM SYSTEM VOLTAGE	1500VDC

WIRE SCHEDULE

RACEWAY #	EQUIPMENT				WIRE LOCATION	CONDUCTOR QTY.	AWG/ KCMIL 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	JUNCTION BOX	FREE-AIR	2	10	40	90°	13.89	1	1	40	17.36
2	DC	JUNCTION BOX	TO	INVERTER	TRENCH	4	10	40	90°	9.56	1	0.8	40	11.95
3	AC	INVERTER	TO	MSP	INTERIOR WALL	4	3	100	75°	72.3	1	1	100	90.38
4	AC	GENERATOR	TO	INVERTER	INTERIOR WALL	4	4	85	75°	60	1	1	85	75.00
5	DC	BATTERY	TO	INVERTER	INTERIOR WALL	2	6	65	75°	50	1	1	65	62.50
6	AC	MSP	TO	MEGNUM +	TRENCH	4	4	85	75°	56	1	1	85	70.00

DESIGN BY :

SOLARVOLTAIC
ENGINEERING SERVICES

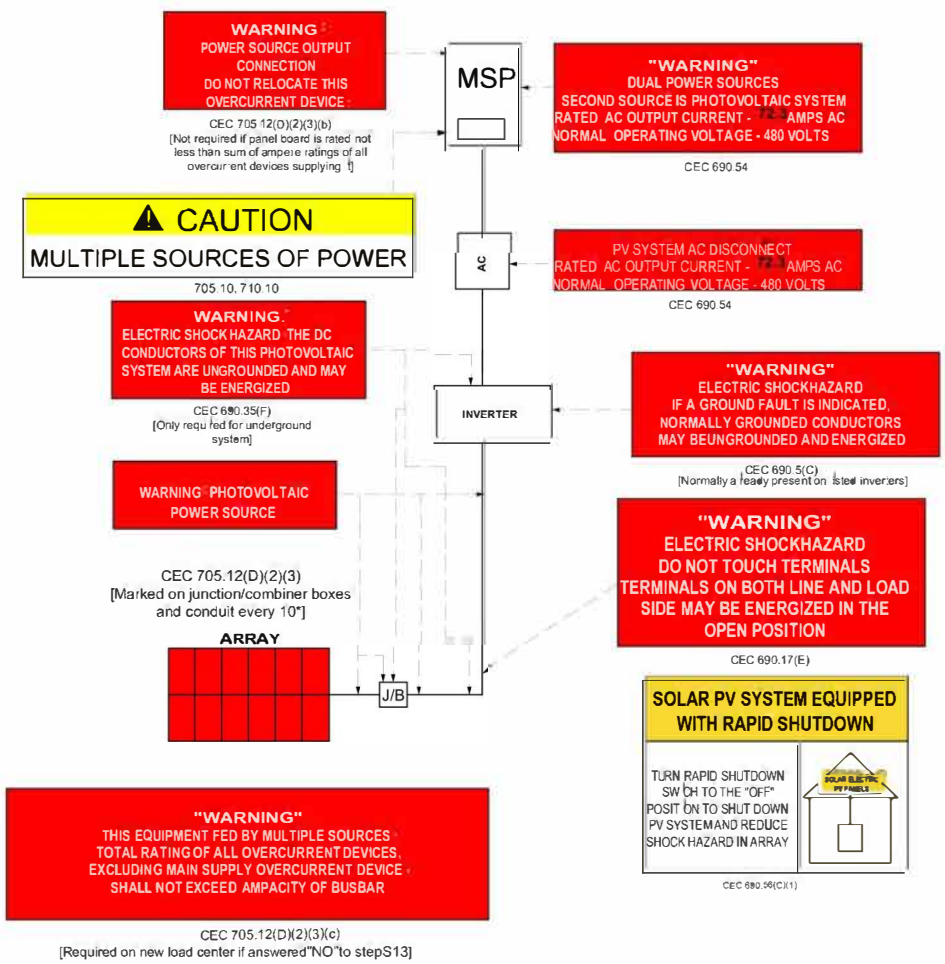
CONTRACTOR :

Rev	Description	Date
A	INITIAL DESIGN	4/6/2024
A.1	UDPATED DESIGN	4/13/2024

OPPORTUNITY	ZGROUP REFRIGERATOR
PROJECT #	N/A
DATE DRAWN	4/13/2024
DRAWN BY	
SHEET #	PV-4.1

TITLE

WIRE CALCULATIONS



NOTES:

THIS TECHNICAL SPECIFICATION SETS OUT DESIGN REQUIREMENTS FOR PHOTOVOLTAIC (PV) ARRAYS INCLUDING D.C ARRAY WIRING, ELECTRICAL PROTECTION DEVICES, SWITCHING AND EARTHING PROVISIONS. THE SCOPE INCLUDES ALL PARTS OF THE PV ARRAY UP TO BUT NOT INCLUDING ENERGY STORAGE DEVICES, POWER CONVERSION EQUIPMENT OR LOADS.

DESIGN BY :

SOLARVOLTAIC ENGINEERING SERVICES

CONTRACTOR :

Rev	Description	Date
A	INITIAL DESIGN	4/6/2024
A.1	UDPATED DESIGN	4/13/2024

OPPORTUNITY	ZGROUP REFRIGERATOR
PROJECT #	N/A
DATE DRAWN	4/13/2024
DRAWN BY	
SHEET #	PV-6.0

TITLE

SIGNAGE