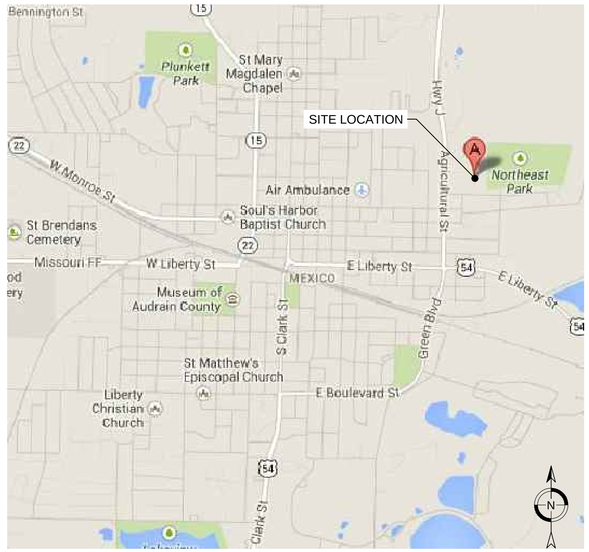
SOLAR ELECTRIC SYSTEM
FOR
MEXICO MCMILLAN ELEM. SCHOOL

VICINITY MAP



LOCAL MAP

SITE INFORMATION:

OWNER:	MEXICO MCMILLAN ELEM. SCHOOL 1101 EAST ANDERSON MEXICO, MO 65265
CLIENT CONTACT:	BRIGHTERGY, LLC 1617 MAIN ST. KANSAS CITY, MO 64108
UTILITY COMPANY:	AMEREN
ACCOUNT NUMBER:	57404-12115
METER NUMBER:	82360508

CONTACT INFORMATION:

PROPERTY REPRESENTATIVE:	KEVIN FREEMAN (573) 581-3773
PROJECT MANAGER:	MIKE RIEHL - BRIGHTERGY, LLC (314) 473-1545
GENERAL EXECUTIVE: AMEREN MISSOURI	LISA COSGROVE (314) 554-2649

SHEET INDEX:

APPROVALS:

THE FOLLOWING PARTIES HEREBY APPROVE AND ACCEPT THESE DOCUMENTS AND AUTHORIZE THE CONTRACTOR TO PROCEED WITH THE CONSTRUCTION DESCRIBED HEREIN. ALL DOCUMENTS ARE SUBJECT TO REVIEW BY THE LOCAL BUILDING DEPARTMENT AND MAY IMPOSE CHANGES OR SITE MODIFICATIONS.

BRIGHTERGY: _____ DATE: _____

CONTRACTOR / LEAD INSTALLER: _____ DATE: _____

NOTE:

CONTRACTOR SHALL NOT COMMENCE WORK UNTIL A PERMIT AND INTERCONNECTION APPROVAL HAS BEEN OBTAINED WITH NO EXCEPTIONS

Brightergy
SOLAR SOLUTIONS
1617 Main St.
Kansas City MO, 64108
PH. (816) 866-0555

PROJECT INFORMATION:

MEXICO MCMILLAN ELEM. SCHOOL
24.705kW PV System

1101 EAST ANDERSON
MEXICO, MO 65265

ISSUE DATE: 01/28/2014

REV:	DATE:	BY:

ENGINEER:

GERALD CHARLTON, P.E.
BRIGHTERGY, LLC
1617 MAIN STREET 3RD FLOOR
KANSAS CITY, MO 64108
PH. 816-866-0555

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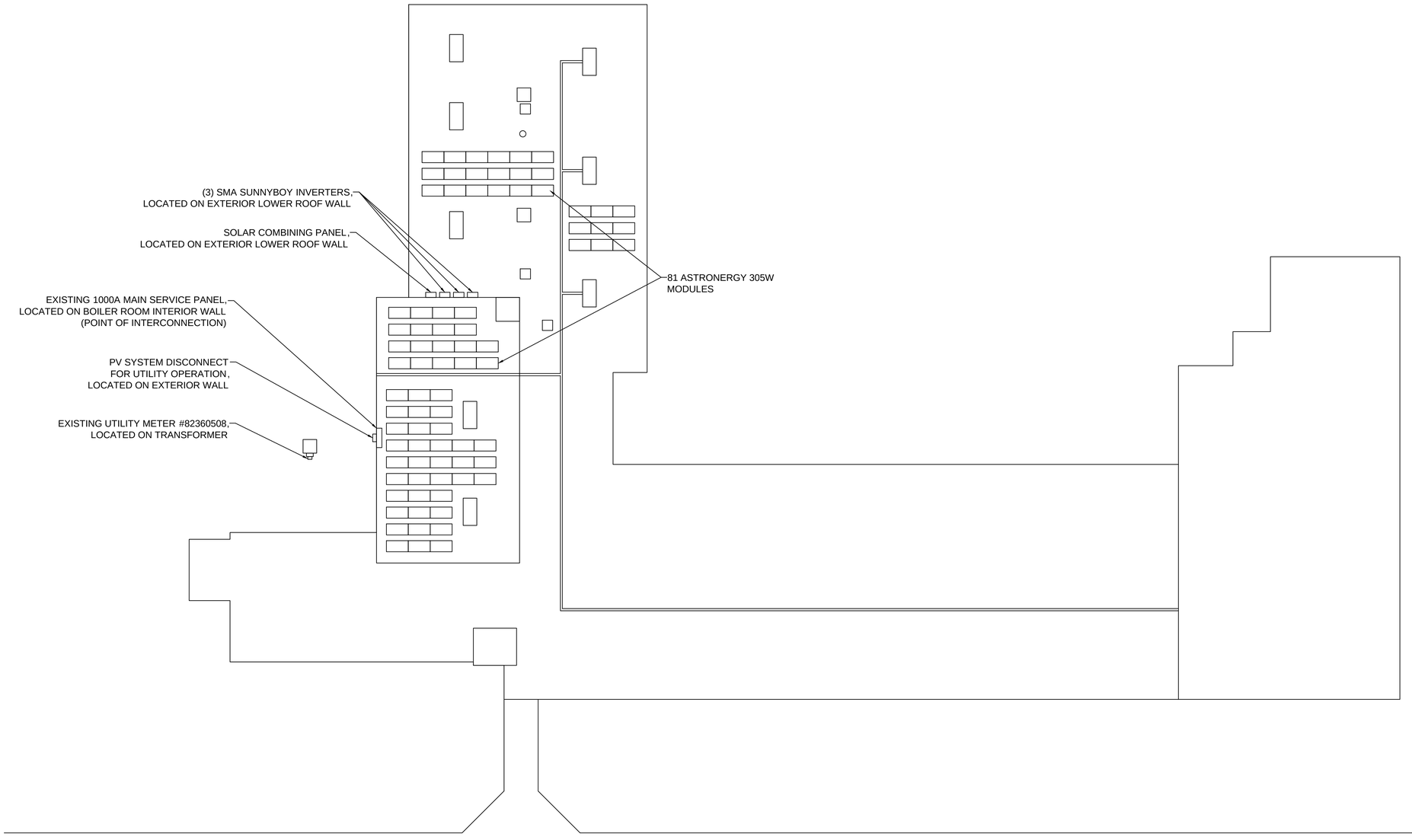
ALM	AJN	MR

STAMP:

SHEET TITLE: TITLE SHEET

SHEET NUMBER: T1



1 SITE PLAN

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

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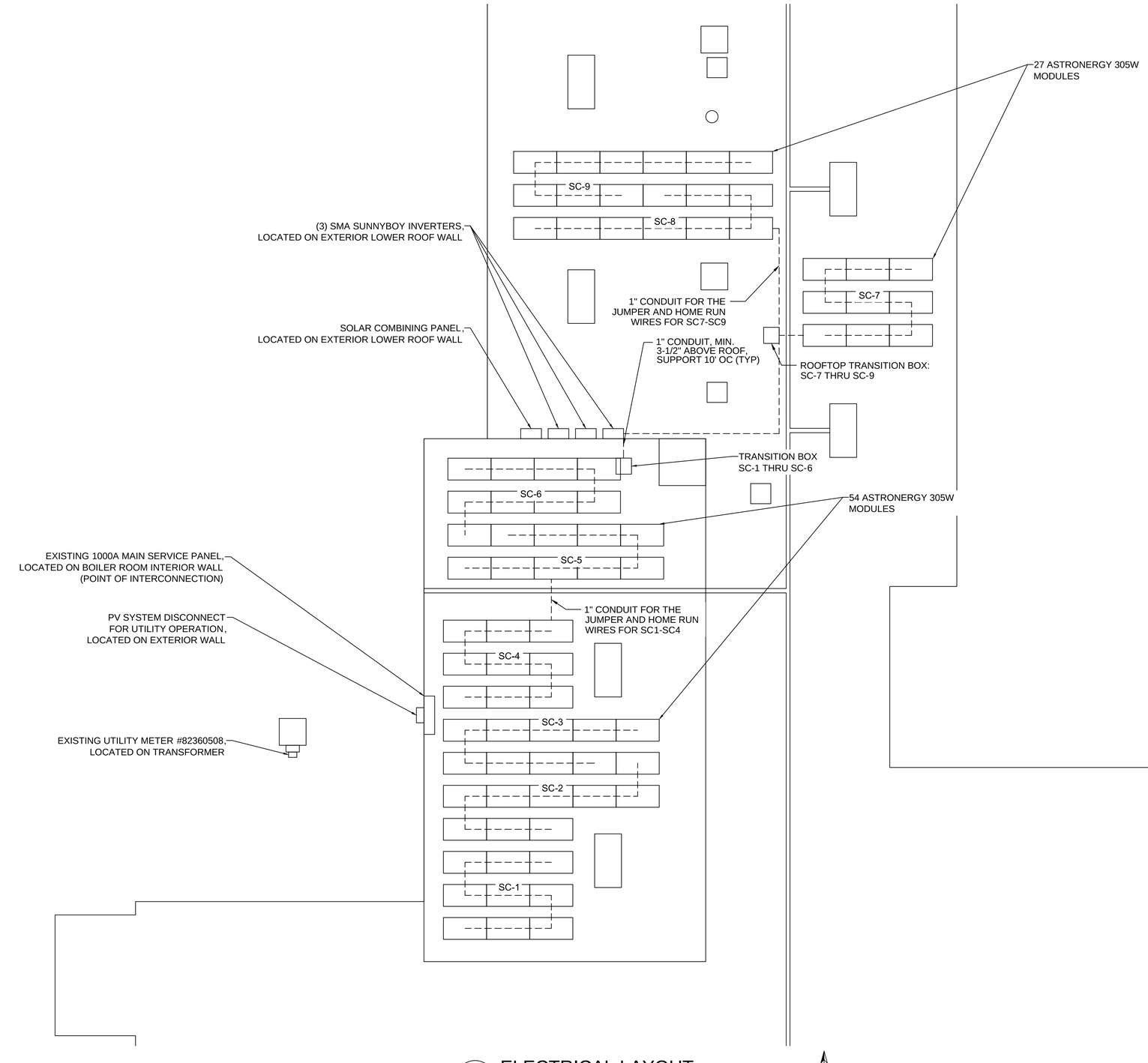
SITE
PLAN

SHEET NUMBER:

ST1



1 ELECTRICAL LAYOUT

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

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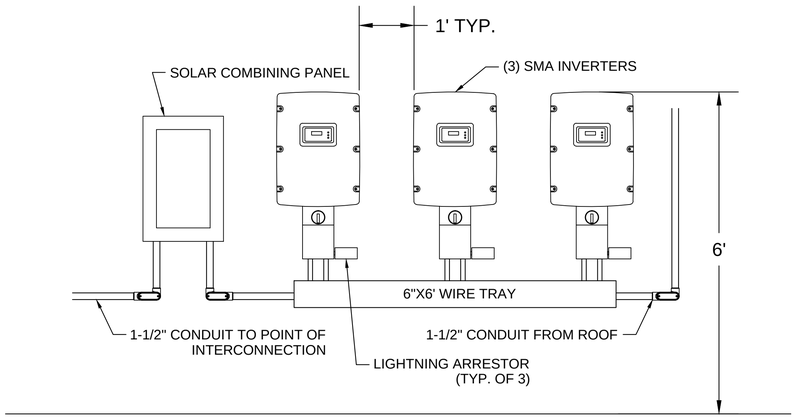
ELECTRICAL LAYOUT

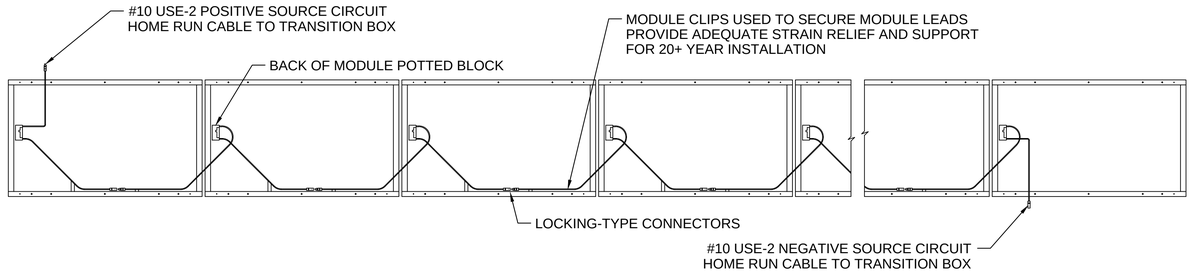
SHEET NUMBER:

E1



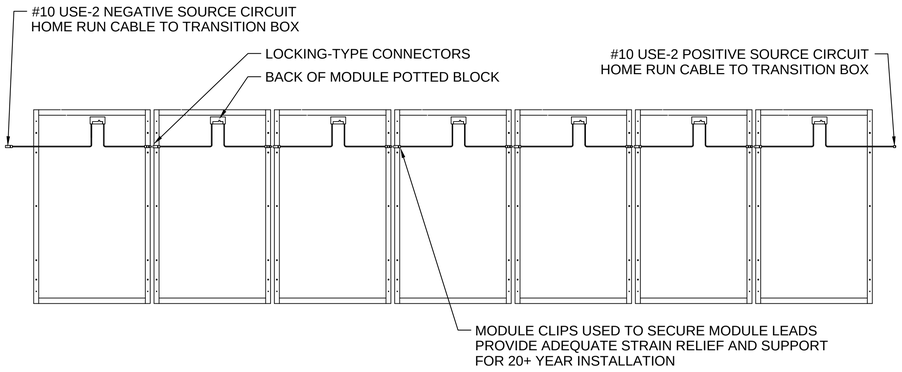
1 EQUIPMENT ELEVATION

SCALE: 3/4" = 1'-0"



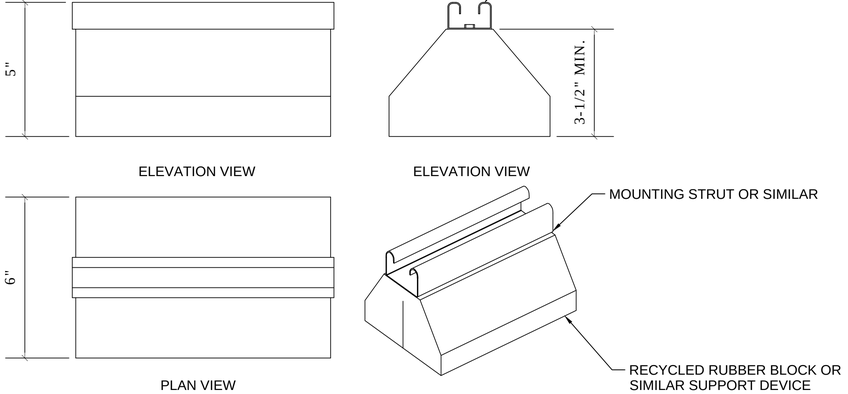
2 PV STRING WIRING DETAIL

NTS



3 PV STRING WIRING DETAIL

NTS



5 CONDUIT SUPPORT DETAIL

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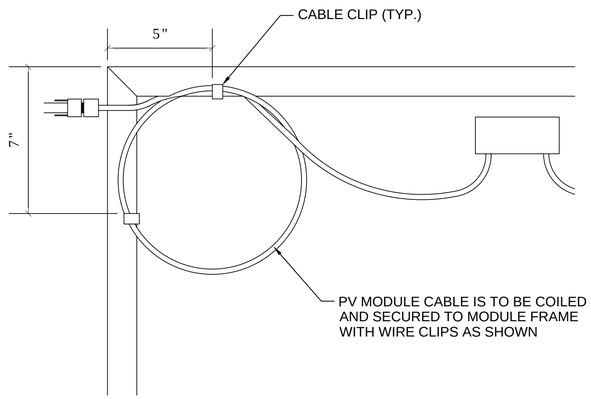

4 PV WIRE MANAGEMENT DETAIL

NTS

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ELECTRICAL DETAILS

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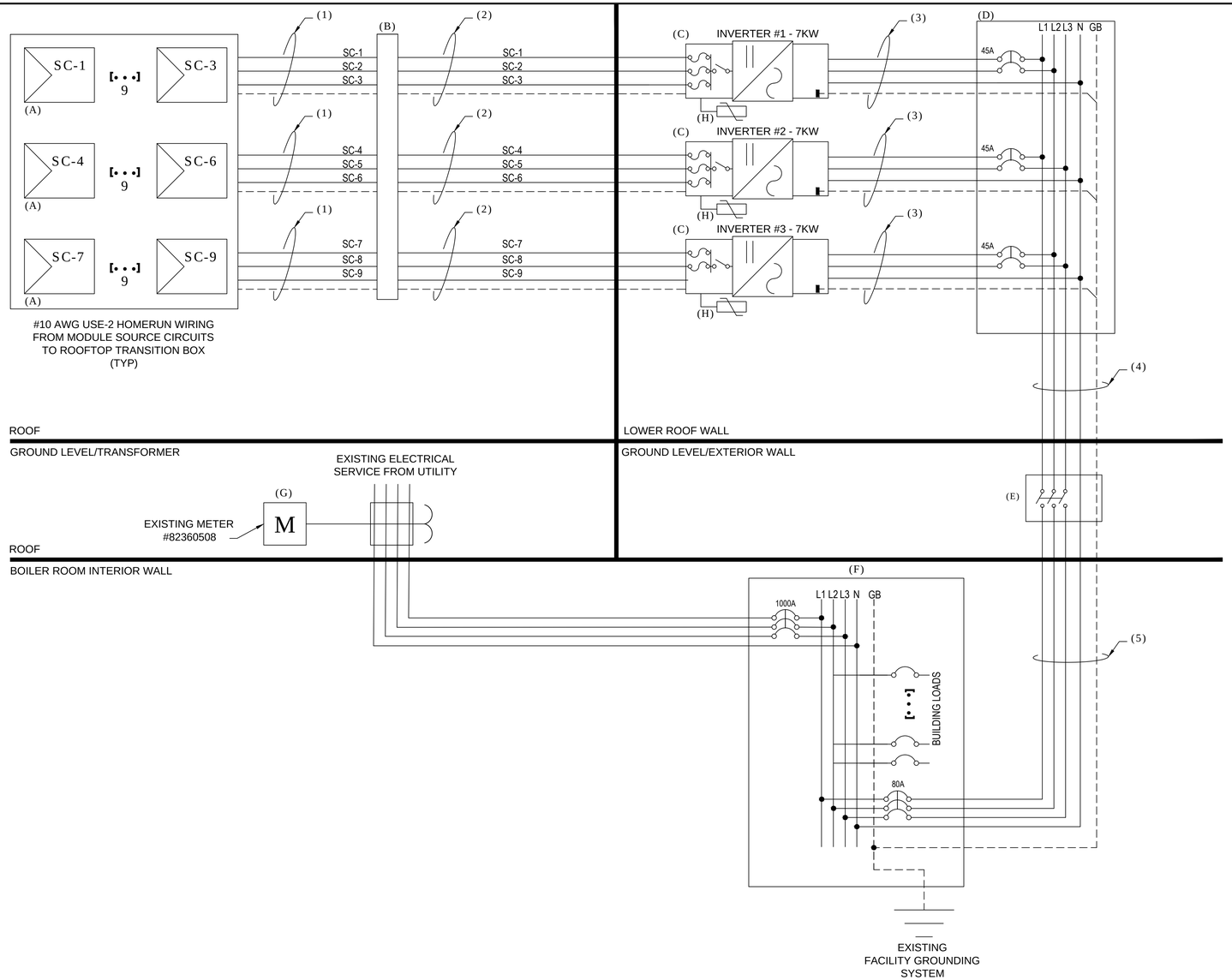
E2



SITE CONDITIONS:	
LOCATION:	MEXICO, MO
MAX AVG. TEMP:	37°C
EXTREME MIN TEMP	-20°C
INFO OBTAINED FROM ASHRAE	
PV ARRAY CONFIGURATION:	
MODULE MFR.:	ASTRONERGY
MODULE MFR. MODELS:	CHSM6612P-305
MODULES PER SOURCE CIRCUIT:	9
TOTAL SOURCE CIRCUITS:	9
TRANSITION BOX QTY.:	1
PV MODULE OUTPUT FOR ASTRONERGY CHSM6612P-305*	
VOC:	45.29 Vdc
TEMP. COEFFICIENT OF Voc	-0.322 %/°C
ISC	8.95 Adc
VMP	35.77 Vdc
IMP	8.53 Adc
PV SOURCE CIRCUIT OUTPUT FOR SC-1 THRU SC-9*	
VOC:	407.6 Vdc
TEMP. ADJUSTED	469.3 Vdc
ISC	8.95 Adc
VMP	321.3 Vdc
IMP	8.53 Adc
INDIVIDUAL 7KW INVERTER OUTPUT	
TYPE"	SMA SB 7000US
RATED POWER:	7.0 KWac
OPERATING AC VOLTAGE:	208 Vac
MAX. CURRENT:	34 Aac
OUTPUT FREQUENCY	60 Hz
*BASED ON MODULE PERFORMANCE AT STANDARD TEST CONDITIONS (STC)	

TABLE 1: PHOTOVOLTAIC SYSTEM EQUIPMENT SCHEDULE

ID	DESCRIPTION	QTY
(A)	ASTRONERGY CHSM6612P-305 (305W) MODULES, NEGATIVE GROUNDED	81
(B)	TRANSITION BOX, SIZE: 12"x12"x6", NEMA 4, ADJACENT TO ARRAY	1
(C)	SMA SUNNYBOY 7.0 kW UTILITY INTERACTIVE DC-TO-AC INVERTER: 1-PHASE, 3-WIRE, 208 VAC, NEMA 3R W/ INTEGRAL DC COMBINER	3
(D)	SOLAR COMBINING PANEL: 225A, 208V, 3-PHASE, NEMA 3R	1
(E)	PV SYSTEM DISCONNECT FOR UTILITY OPERATION: 100A, 250V, NEMA 3R	1
(F)	EXISTING MAIN DISTRIBUTION PANEL : 1000A, 208V, 3-PHASE, 4-WIRE	1
(G)	EXISTING BILLING METER TO BE SWAPPED AFTER UTILITY INSPECTION	1
(H)	LIGHTNING SUPPRESSOR(S) - PART #LA602 (DC)	3

NOTES

(1) ALL HOMERUN WIRES TO TRANSITION BOXES ARE #10 AWG USE-2/RHW-2 DUAL RATED WIRES. ROUTED AS REQUIRED.
(2) ALL CONDUIT TO BE EMT, UNLESS OTHERWISE SPECIFIED BY LOCAL AHJ.
(3) ALL EQUIPMENT TO BE LABELLED PER NEC REQUIREMENTS.
(4) SYSTEM TO BE INSTALLED WITH ADEQUATE AC AND DC TRANSIENT VOLTAGE SURGE SUPPRESSION.
(5) POINT OF INTERCONNECTION:
(A) LOAD SIDE: THE SUM OF THE AMPERE RATINGS OF OVERCURRENT DEVICES IN CIRCUITS SUPPLYING POWER TO A BUSBAR OR CONDUCTOR SHALL NOT EXCEED 120 PERCENT OF THE RATING OF THE BUSBAR OR CONDUCTOR. NEC 705.12(D)2.
(B) SUPPLY SIDE: THE SUM OF THE RATINGS OF ALL OVERCURRENT DEVICES CONNECTED TO POWER PRODUCING SOURCES SHALL NOT EXCEED THE RATING OF THE SERVICE. NEC 705.12(A).

TABLE 2: CONDUIT AND WIRING SCHEDULE

ID	MAX AMPERAGE	EST. MAX LENGTH	# OF WIRES	WIRE SIZE (AWG)	VOLTAGE DROP	GROUND SIZE	CONDUIT SIZE
(1)	13.96 Adc	80'	6	#10 USE-2		#6	FREE AIR
(2)	13.96 Adc	25'	6	#10 THWN-2		#10	1-1/2"
(3)	42.5 Aac	10'	3	#8 THWN-2	0.20	#8	1-1/2"
(4)	73.5 Aac	60'	4	#4 THWN-2	0.60	#6	1-1/2"
(5)	73.5 Aac	10'	4	#4 THWN-2	0.10	#6	1-1/2"

* ALL DC CURRENTS ARE SHORT CIRCUIT VALUES.
* ALL AC CURRENTS ARE NOMINAL PER-PHASE VALUES.
* WIRE AMPACITY IS BASED ON NUMBER OF WIRES PER CONDUIT AND HEIGHT ABOVE. ROOF. IF CONDUITS ARE INSTALLED DIFFERENTLY THAN SHOWN ABOVE WIRE SIZES MAY BE AFFECTED.
* ALL CONDUCTORS ARE COPPER 90° C RATED.
* DUAL RATED (THHN/THWN-2) CONDUCTORS ARE FAVORABLE.

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SHEET TITLE:
ELECTRICAL
LINE DIAGRAM

SHEET NUMBER:
E3

INVERTERS (3), AC DISCONNECT (1), MAIN DISTRIBUTION PANEL (1), SOLAR COMBINING PANEL (1), & TRANSITION BOX (1) SHALL REQUIRE THE FOLLOWING LABEL (7)

AUTHORIZED PERSONNEL ONLY

1 2 3 5 6 8

THE UTILITY INTERACTIVE INVERTER(S) SHALL BE LABELED WITH THE FOLLOWING PER NEC ARTICLE 690.5(C) (3 REQUIRED)

WARNING
ELECTRIC SHOCK HAZARD
IF A GROUND FAULT IS INDICATED, NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED

1

THE DC COMBINERS / DC DISCONNECTS & AC DISCONNECTS SHALL BE LABELED WITH THE FOLLOWING PER NEC ARTICLE 690.14(C)(2) & 690.17 (4 REQUIRED)

WARNING!
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

1 5

THE PV DAS SHALL BE LABELED WITH THE FOLLOWING INFORMATION PER NEC ARTICLE 690.4(D) (1 REQUIRED)

PHOTOVOLTAIC SYSTEM DATA
ACQUISITION SYSTEM
AUTHORIZED PERSONNEL ONLY

AC COMBINING PANEL SHALL REQUIRE THE FOLLOWING LABELING (1 REQUIRED PER BRANCH CIRCUIT)

SOLAR FED BREAKER
INVERTER #1 2

SOLAR FED BREAKER
INVERTER #2 2

SOLAR FED BREAKER
INVERTER #3 2

PHOTOVOLTAIC SYSTEM INTERCONNECTION PANELBOARD SHALL REQUIRE THE FOLLOWING LABEL (1 REQUIRED)

SOLAR FED BREAKER 3

PHOTOVOLTAIC SYSTEM INTERCONNECTION TO MDP & SOLAR COMBINING PANEL SHALL REQUIRE THE FOLLOWING LABELING 690.54 (2 REQUIRED)

PHOTOVOLTAIC INTERACTIVE SYSTEM
POINT OF INTERCONNECTION

OPERATING AC VOLTAGE: 208Vac, 3-PHASE
RATED AC OUTPUT CURRENT: 58.8Aac

2 3

PHOTOVOLTAIC SYSTEM AC DISCONNECTS SHALL REQUIRE THE FOLLOWING LABELING 690.14(C)(2) & 690.54 (1 REQUIRED)

PHOTOVOLTAIC SYSTEM AC DISCONNECT

OPERATING AC VOLTAGE: 208Vac, 3-PHASE
MAXIMUM OPERATING CURRENT: 58.8Aac

5

INVERTER #1
GRID TIED PHOTOVOLTAIC POWER SOURCE

1) MAXIMUM POWER-POINT CURRENT:	25.59Adc
2) MAXIMUM POWER-POINT VOLTAGE:	321.3Vdc
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED):	461.1Vdc
4) SHORT CIRCUIT CURRENT (ADJUSTED):	33.56Adc

1

INVERTER #2
GRID TIED PHOTOVOLTAIC POWER SOURCE

1) MAXIMUM POWER-POINT CURRENT:	25.59Adc
2) MAXIMUM POWER-POINT VOLTAGE:	321.3Vdc
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED):	461.1Vdc
4) SHORT CIRCUIT CURRENT (ADJUSTED):	33.56Adc

1

INVERTER #3
GRID TIED PHOTOVOLTAIC POWER SOURCE

1) MAXIMUM POWER-POINT CURRENT:	25.59Adc
2) MAXIMUM POWER-POINT VOLTAGE:	321.3Vdc
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED):	461.1Vdc
4) SHORT CIRCUIT CURRENT (ADJUSTED):	33.56Adc

1

WHEN PANELBOARD IS RATED FOR LESS THAN THE SUM OF THE AMPERE RATINGS OF ALL OCPD'S SUPPLYING IT, PV INTERCONNECT BREAKER SHALL BE LABELED AS FOLLOWS, PER NEC 705.12(D)6 (1 REQUIRED)

WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

3

MARKING: 2012 INTERNATIONAL FIRE CODE (IFC) 605.11.1

- THE FOLLOWING LABEL IS REQUIRED ON ALL INTERIOR AND EXTERIOR DIRECT CURRENT (DC) CONDUIT, ENCLOSURES, RACEWAYS AND CABLE ASSEMBLIES EVERY 10 FEET, WITHIN 1 FOOT OF TURNS OR BENDS AND WITHIN 1 FOOT ABOVE AND BELOW PENETRATIONS OF ROOF/CEILING ASSEMBLIES, WALLS OR BARRIERS.

- LABELS ALSO REQUIRED ON ALL DIRECT CURRENT (DC) JUNCTION BOXES, COMBINER BOXES, AND DISCONNECTS.

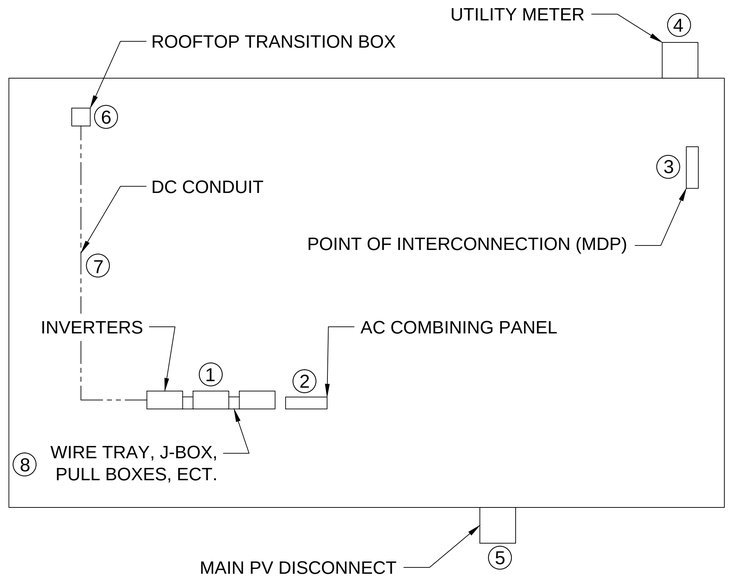
- AN ADDITIONAL LABEL SHALL BE PLACED ADJACENT TO THE MAIN SERVICE DISCONNECT IN A LOCATION CLEARLY VISIBLE FROM THE LOCATION WHERE THE DISCONNECT IS OPERATED.

- MATERIAL SHALL BE REFLECTIVE, WEATHER RESISTANT AND SUITABLE FOR THE ENVIRONMENT. LETTERS SHALL BE CAPITALIZED WITH A MIN. HEIGHT OF 3/8" (9.5MM) WHITE ON RED BACKGROUND.

WARNING:
PHOTOVOLTAIC POWER SOURCE

6 7 8

SAMPLE LAYOUT FOR REFERENCE ONLY



UTILITY BILLING METER, POINT OF INTERCONNECTION (& MDP, IF SEPARATE), AC COMBINING PANEL, & MAIN PV DISCONNECT SHALL RECEIVE A PERMANENT LABEL, DENOTING ALL ELECTRICAL POWER SOURCES PER NEC ARTICLE 705.12(D)(4) & 705.10 (4 REQUIRED)

EQUIPMENT FED BY TWO SOURCES:
UTILITY AND PHOTOVOLTAIC SYSTEM,
WITH PV PANELS ON ROOF, AND
INVERTERS LOCATED ON
EXTERIOR NORTH LOWER ROOF WALL

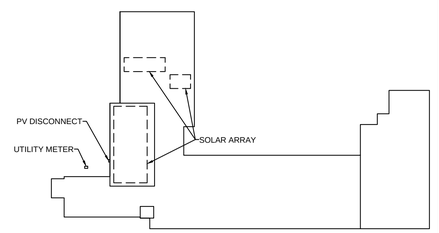
2 3 4 5

UTILITY ACCESSIBLE DISCONNECT SHALL RECEIVE A PERMANENT ENGRAVED PLAQUE, 3/8" MIN. LETTERING, PER UTILITY REQUIREMENTS (1 REQUIRED)

PV SYSTEM DISCONNECT
FOR UTILITY OPERATION 5

A SITE DIRECTORY PLAQUE SHALL BE LOCATED ON OR BESIDE THE BI-DIRECTIONAL UTILITY BILLING METER PER NEC ARTICLE 705.10 (1 REQUIRED) 4

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



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NEC REQUIRED LABELS

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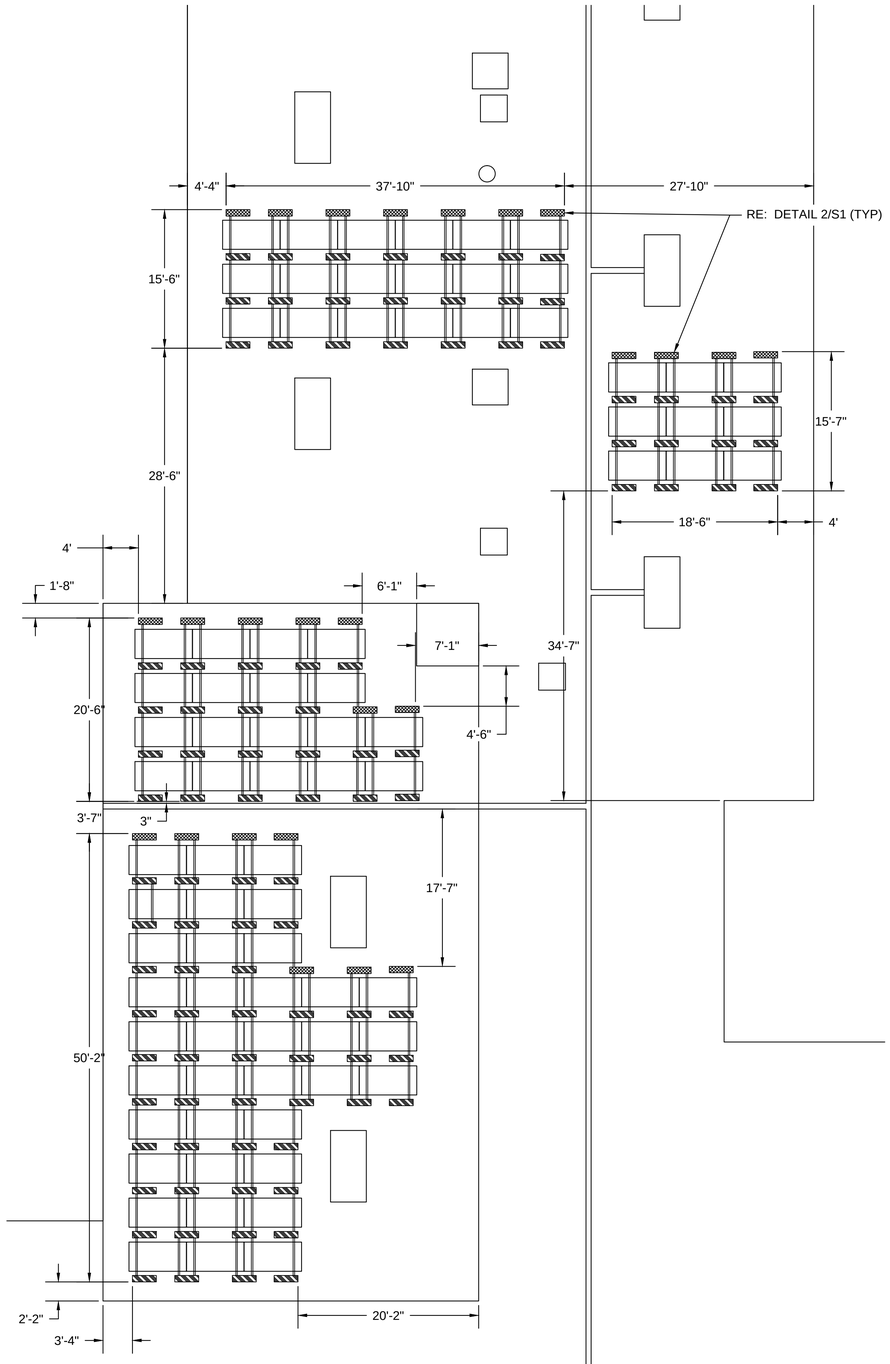


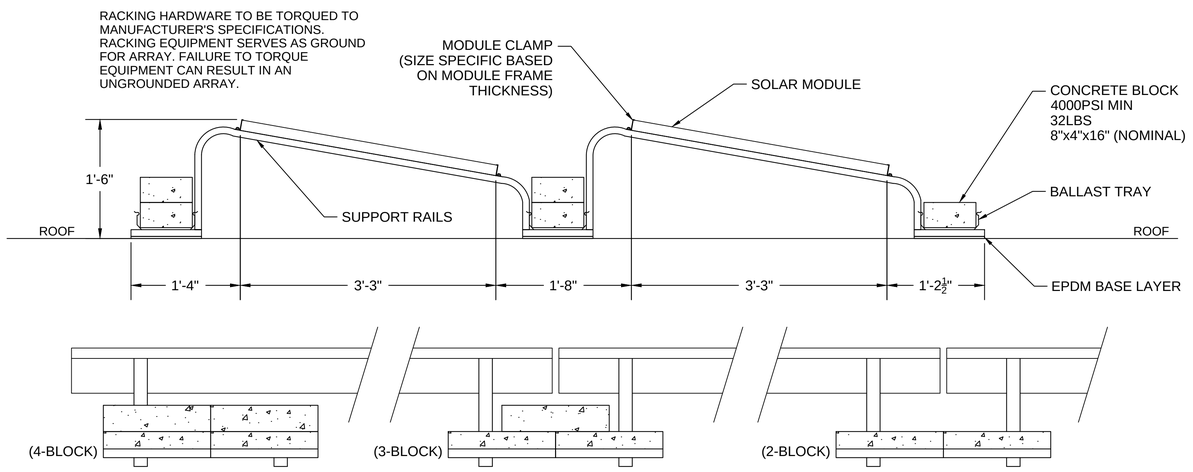
1 ROOF BALLAST PLAN

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

BALLAST LEGEND

3-BLOCKS

2-BLOCKS



2 RACKING ELEVATION

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