

# SOLAR ELECTRIC SYSTEM FOR MEXICO SCHOOL DISTRICT EUGENE FIELD ELEMENTARY



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

PROJECT INFORMATION:

**MEXICO SCHOOL  
DISTRICT  
EUGENE FIELD  
ELEMENTARY  
24.705kW PV  
System**

704 WEST BLVD  
MEXICO, MO 65265

ISSUE DATE:

**01/24/2014**

REV: \_\_\_\_\_ DATE: \_\_\_\_\_ BY: \_\_\_\_\_


ENGINEER:

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

DRAWN BY: \_\_\_\_\_ CHK.: \_\_\_\_\_ APV.: \_\_\_\_\_

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SHEET TITLE:

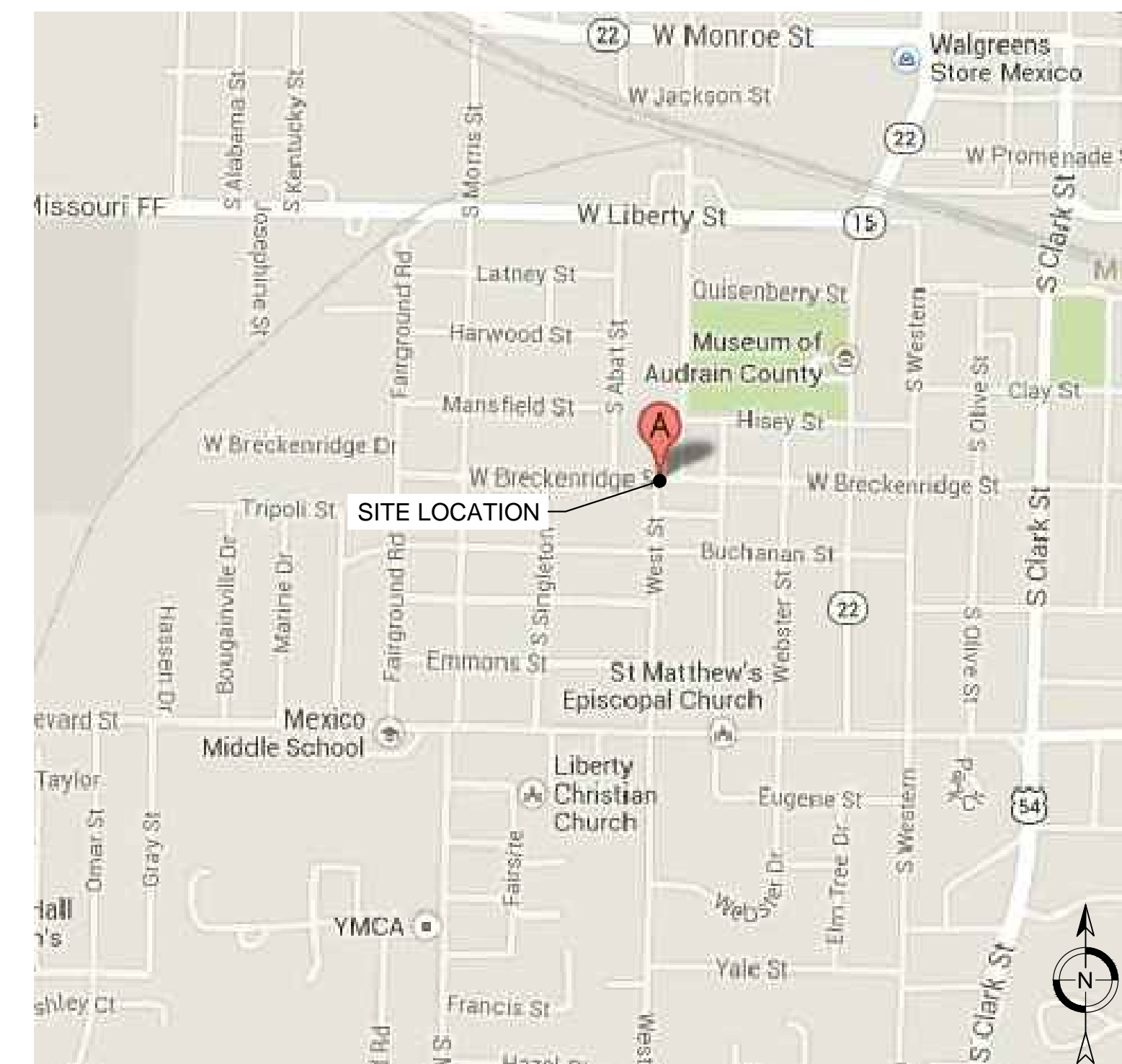
**TITLE  
SHEET**

SHEET NUMBER:

**T1**



VICINITY MAP



LOCAL MAP

**SITE INFORMATION:**

**OWNER:** MEXICO SCHOOL DISTRICT EUGENE FIELD ELEMENTARY  
704 WEST BLVD  
MEXICO, MO 65265  
AUDRAIN

**CLIENT CONTACT:** BRIGHTERGY, LLC  
1617 MAIN ST.  
KANSAS CITY, MO 64108

**UTILITY COMPANY:** AMEREN  
**ACCOUNT NUMBER:** 57404-12115  
**METER NUMBER:** 05413707

**SHEET INDEX:**

- T1 TITLE SHEET
- ST1 SITE PLAN
- E1 ELECTRICAL LAYOUT
- E2 ELECTRICAL DETAILS
- E3 ELECTRICAL LINE DIAGRAM
- E4 NEC REQUIRED LABELS
- S1 RACKING LAYOUT
- S2 RACKING DETAIL

**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:** \_\_\_\_\_

**CONTACT INFORMATION:**

**PROPERTY REPRESENTATIVE:** KEVIN FREEMAN  
(573)-581-3773

**PROJECT MANAGER:** MIKE RIEHL - BRIGHTERGY, LLC  
(816) 866-0555

**GENERAL EXECUTIVE:** LISA COSGROVE  
AMEREN MISSOURI (314) 554-2649

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



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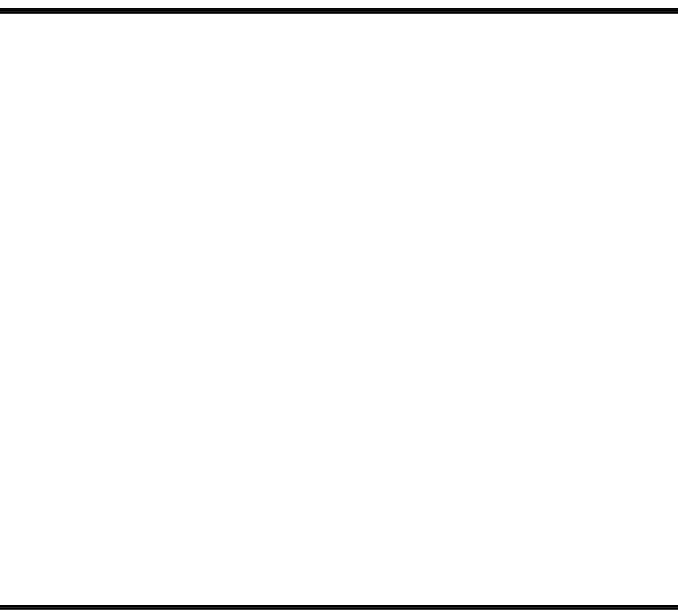
704 WEST BLVD  
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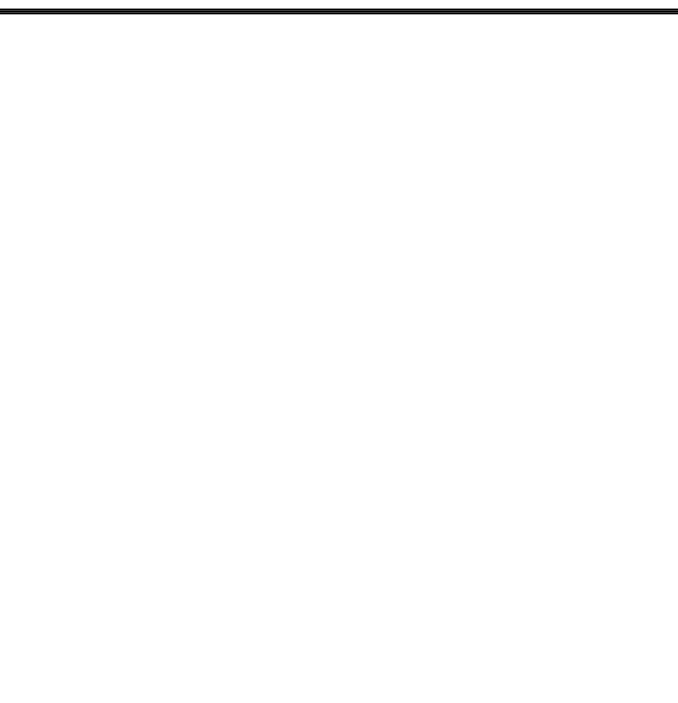

ENGINEER:



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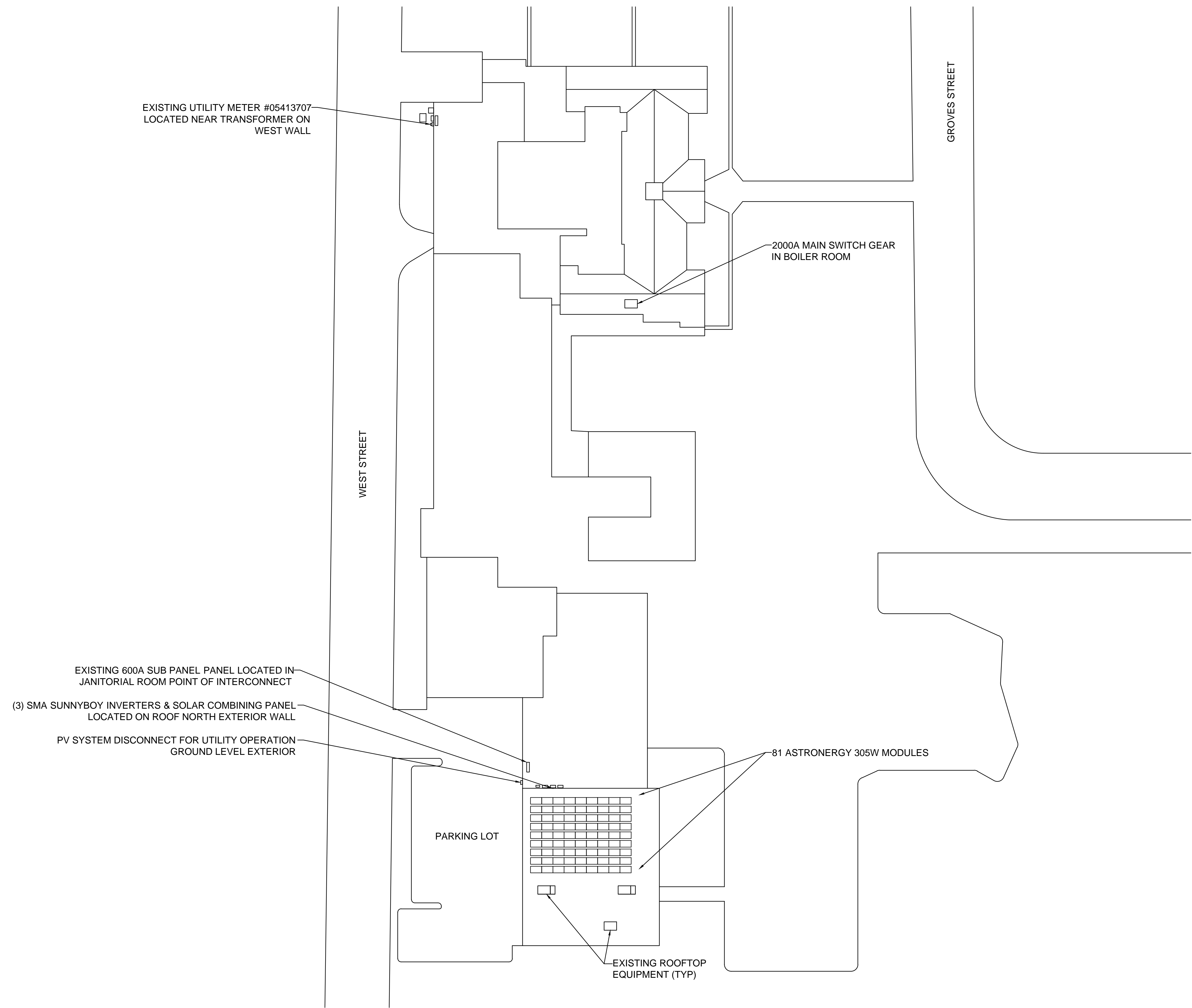


SHEET TITLE:

SITE  
PLAN

SHEET NUMBER:

ST1



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





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SHEET TITLE:

ELECTRICAL  
LAYOUT

SHEET NUMBER:

E1

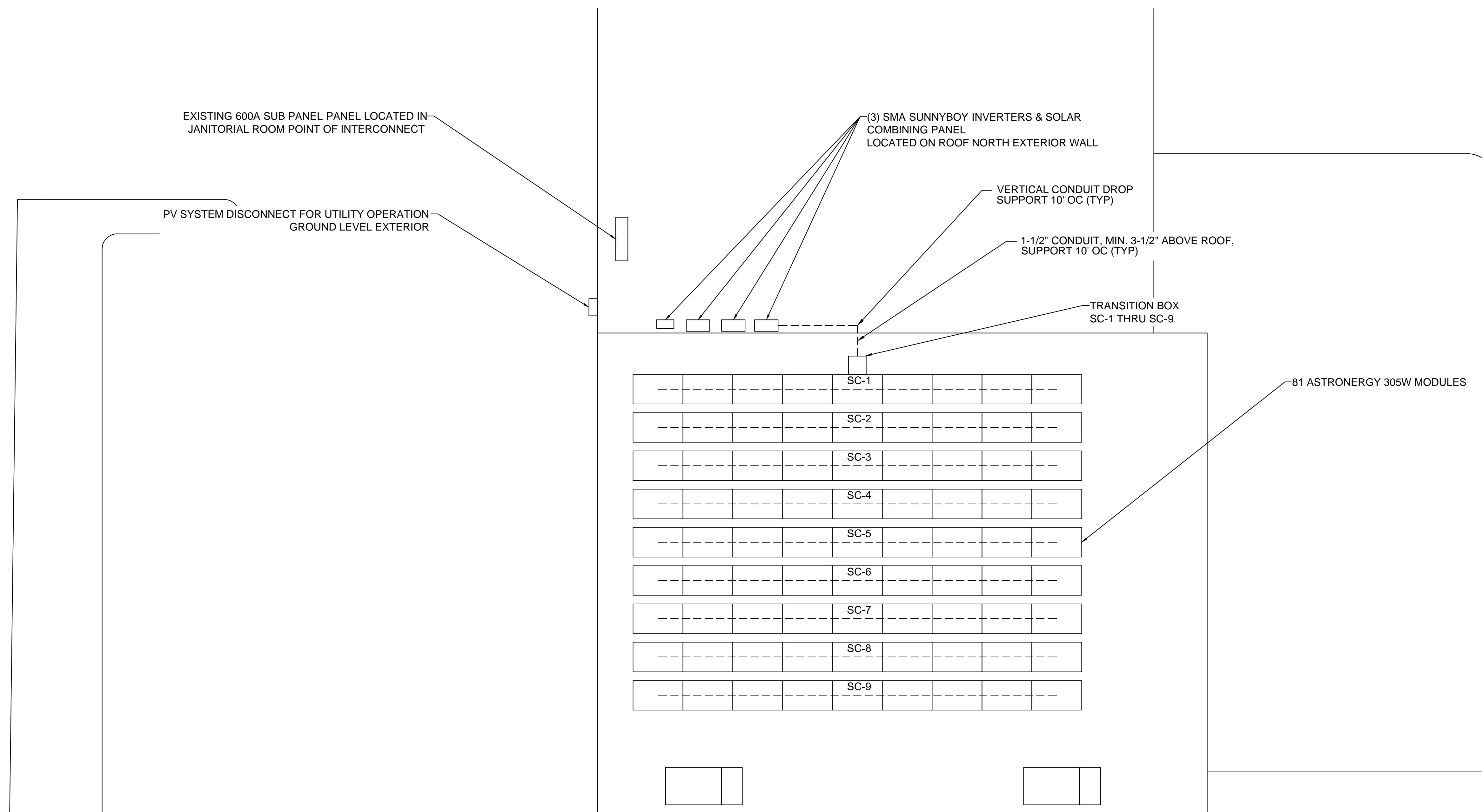
WIRING NOTES:

ROOF SURFACE:

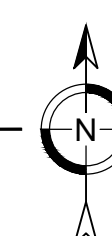
- EXPOSED WIRING SHALL BE SUNLIGHT RESISTANT AND SECURED FIRMLY IN A CLEAN AND WORKMANLIKE MANOR.
- SURFACE CONDUIT CONNECTING SUB ARRAYS CONTAINING SOURCE CIRCUIT HOME RUN WIRES, SHALL BE 1" IN SIZE AND NOT CONTAIN MORE THAN (6) #10AWG CONDUCTORS AND (1) #6AWG BARE COPPER GROUND.
- CONDUIT SHALL BE SUPPORTED EVERY 10' O.C., MINIMUM OF 3-1/2" ABOVE ROOF SURFACE, AND ROUTED ALONG WALLS AND PARAPETS TO MINIMIZE SUN EXPOSURE AND TRIP HAZARDS.

BUILDING INTERIOR:

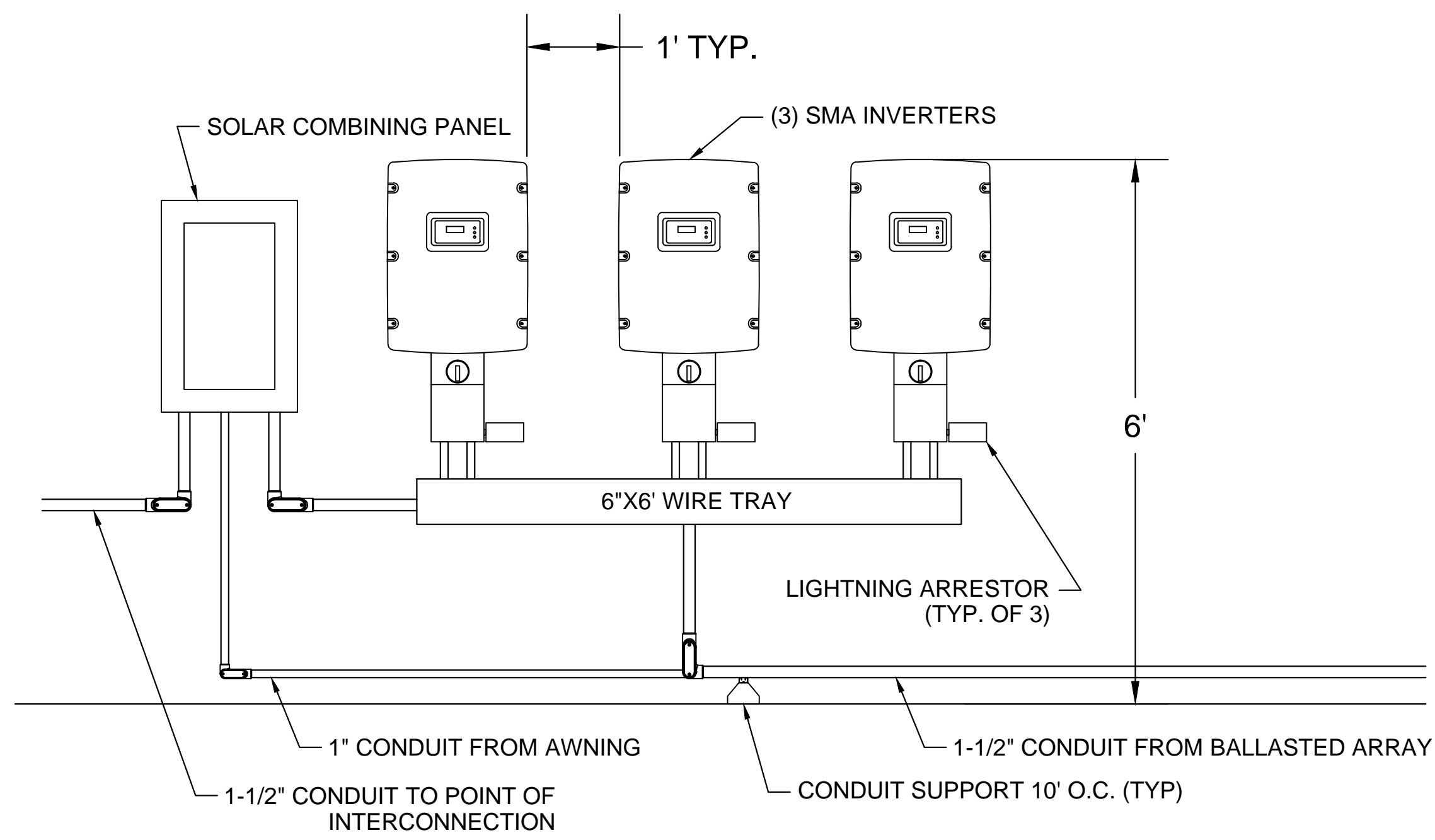
- WIRING SHALL BE CONTAINED IN METAL RACEWAYS, TYPE "MC" METAL-CLAD CABLE, THAT PROVIDES AN EFFECTIVE GROUND-FAULT CURRENT PATH PER NEC 250.118(10).
- CIRCUIT WIRING BENEATH THE ROOF SURFACE SHALL NOT BE INSTALLED WITHIN 10" OF THE ROOF DECKING OR SHEATHING, EXCEPT WHERE LOCATED DIRECTLY BELOW THE ROOF SURFACE COVERED BY PV MODULES PER NEC 690.31(E)(1).



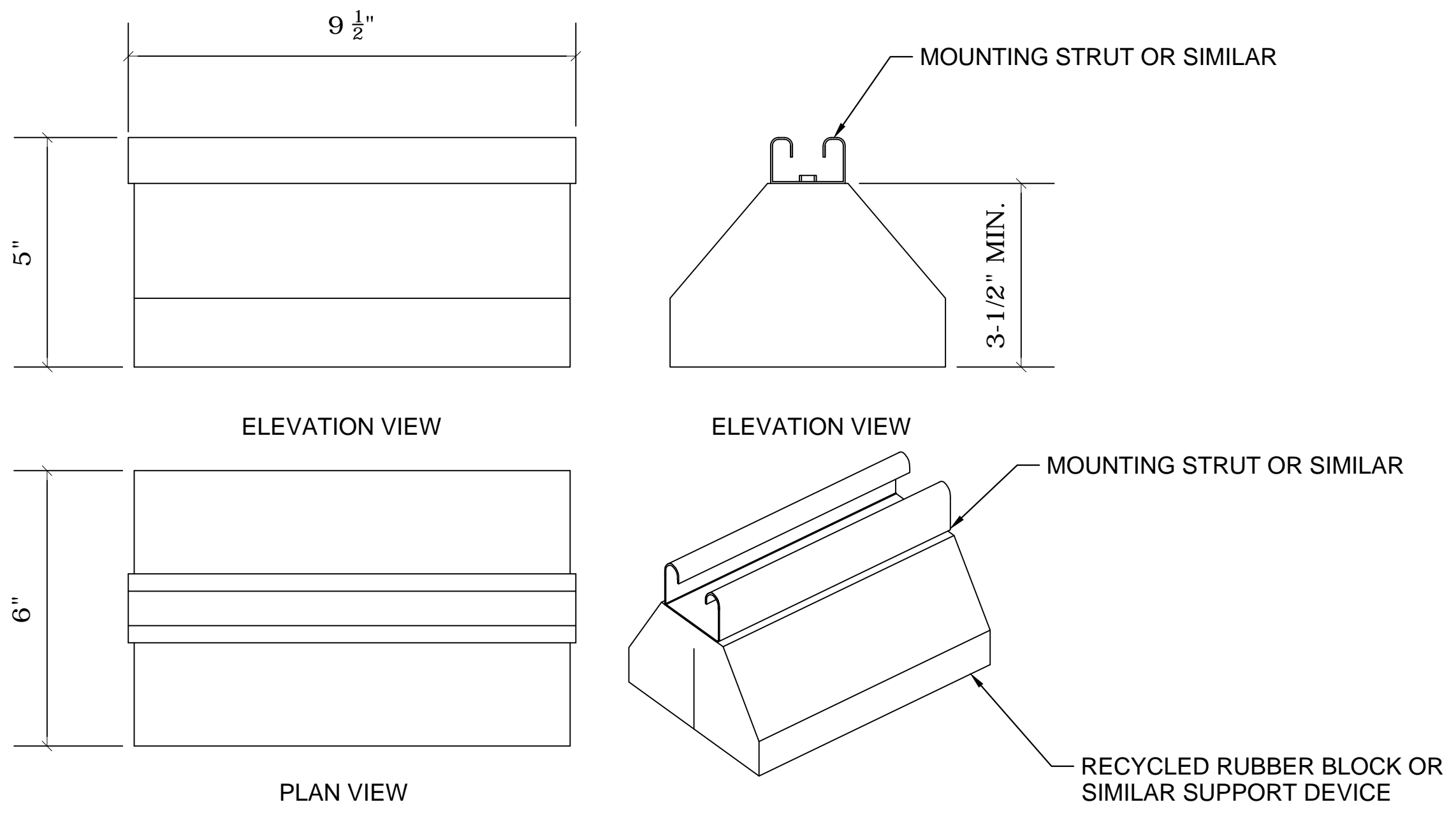
**1** ELECTRICAL LAYOUT  
SCALE: 1/8" = 1'-0"





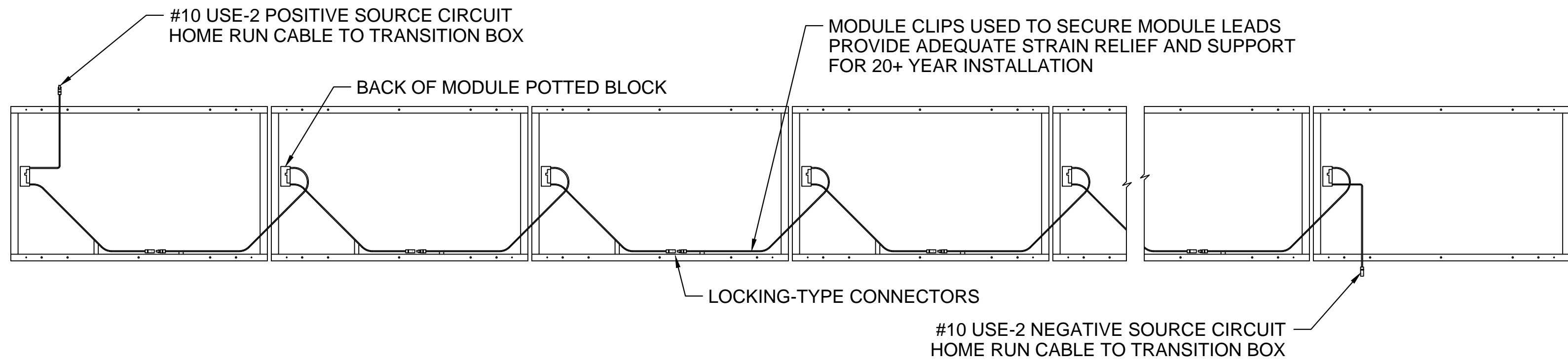


**1 EQUIPMENT ELEVATION**  
SCALE: 3/4" = 1'-0"

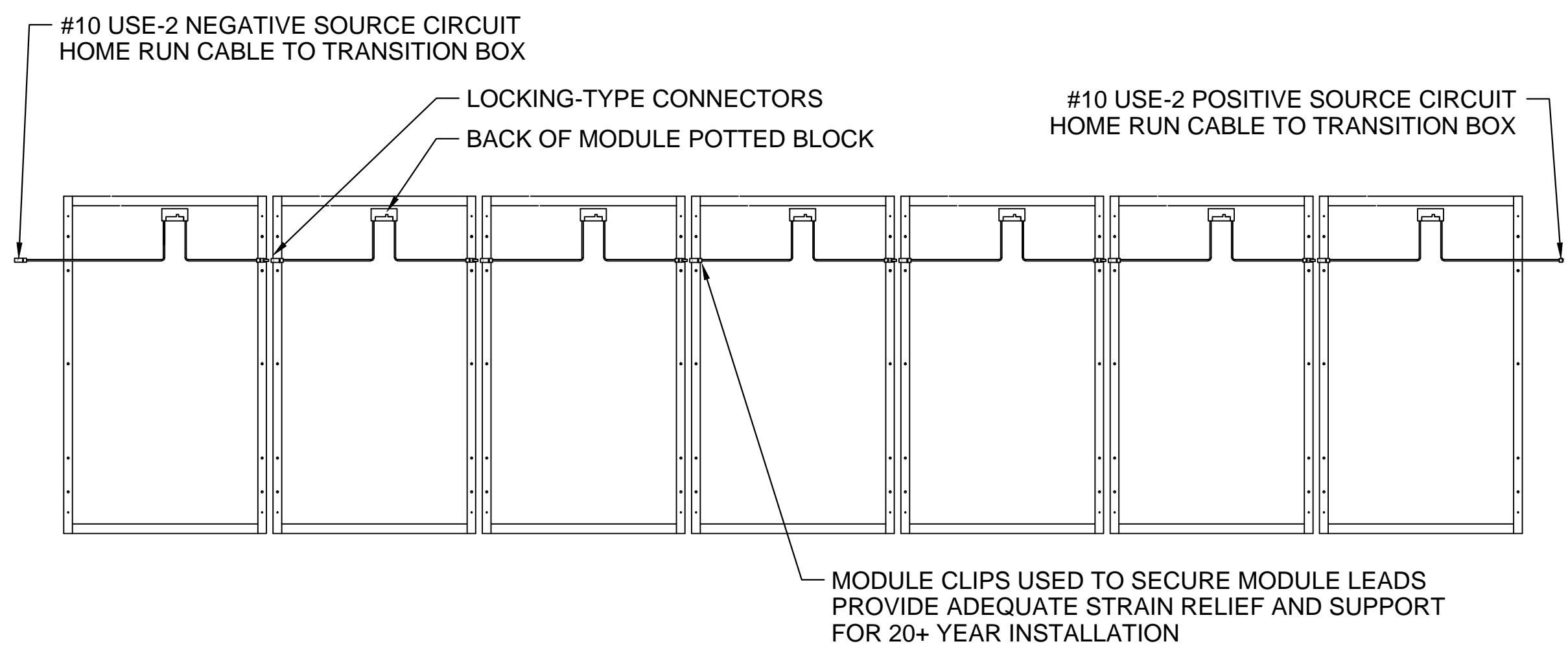


NOTE: PROVIDE QUANTITY AS REQUIRED TO SUPPORT EXTERNAL CONDUIT

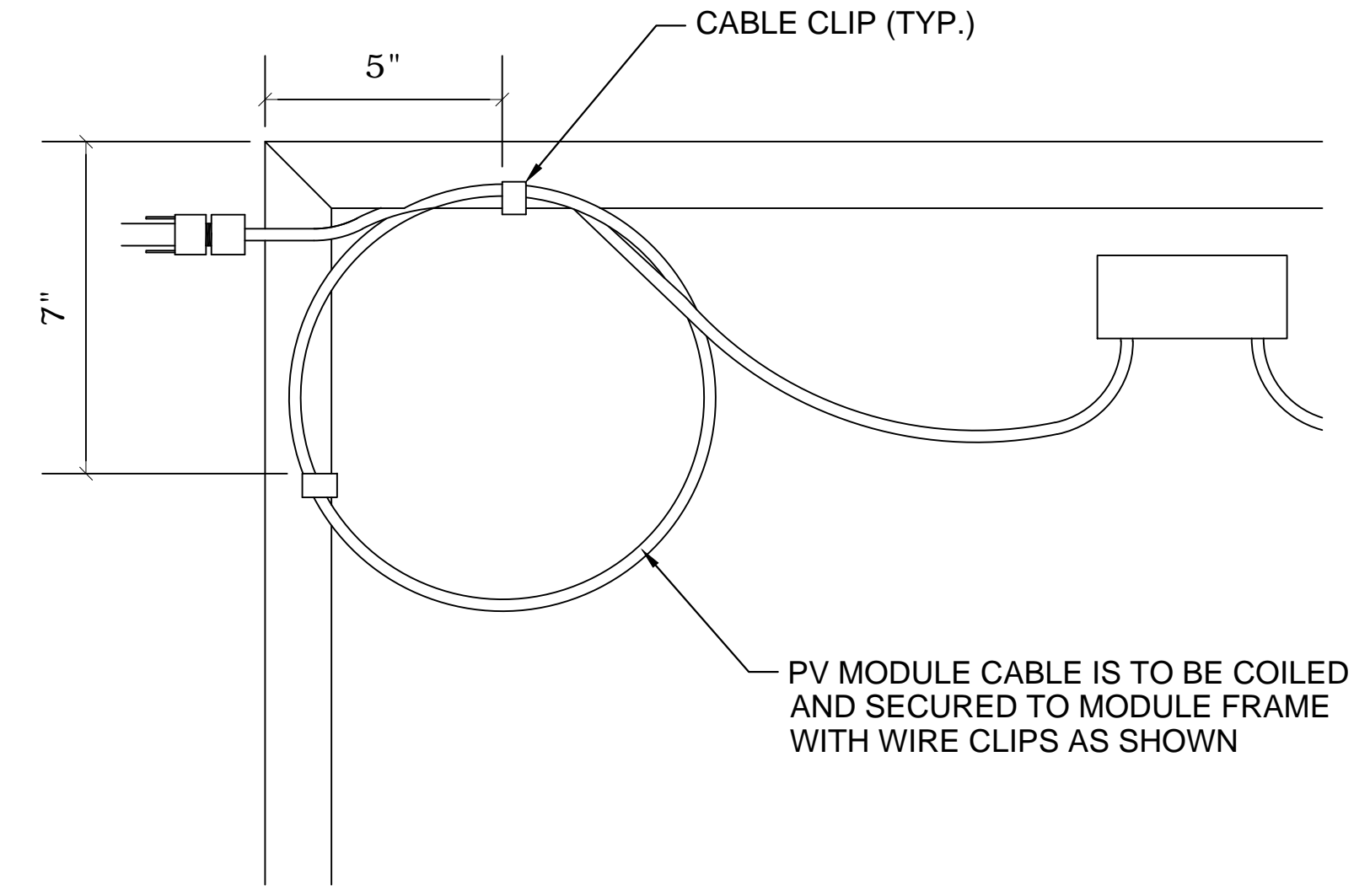
**5 CONDUIT SUPPORT DETAIL**  
NTS



**2 PV STRING WIRING DETAIL**  
NTS



**3 PV STRING WIRING DETAIL**  
NTS



**4 PV WIRE MANAGEMENT DETAIL**  
NTS

REV:	DATE:	BY:

ENGINEER:

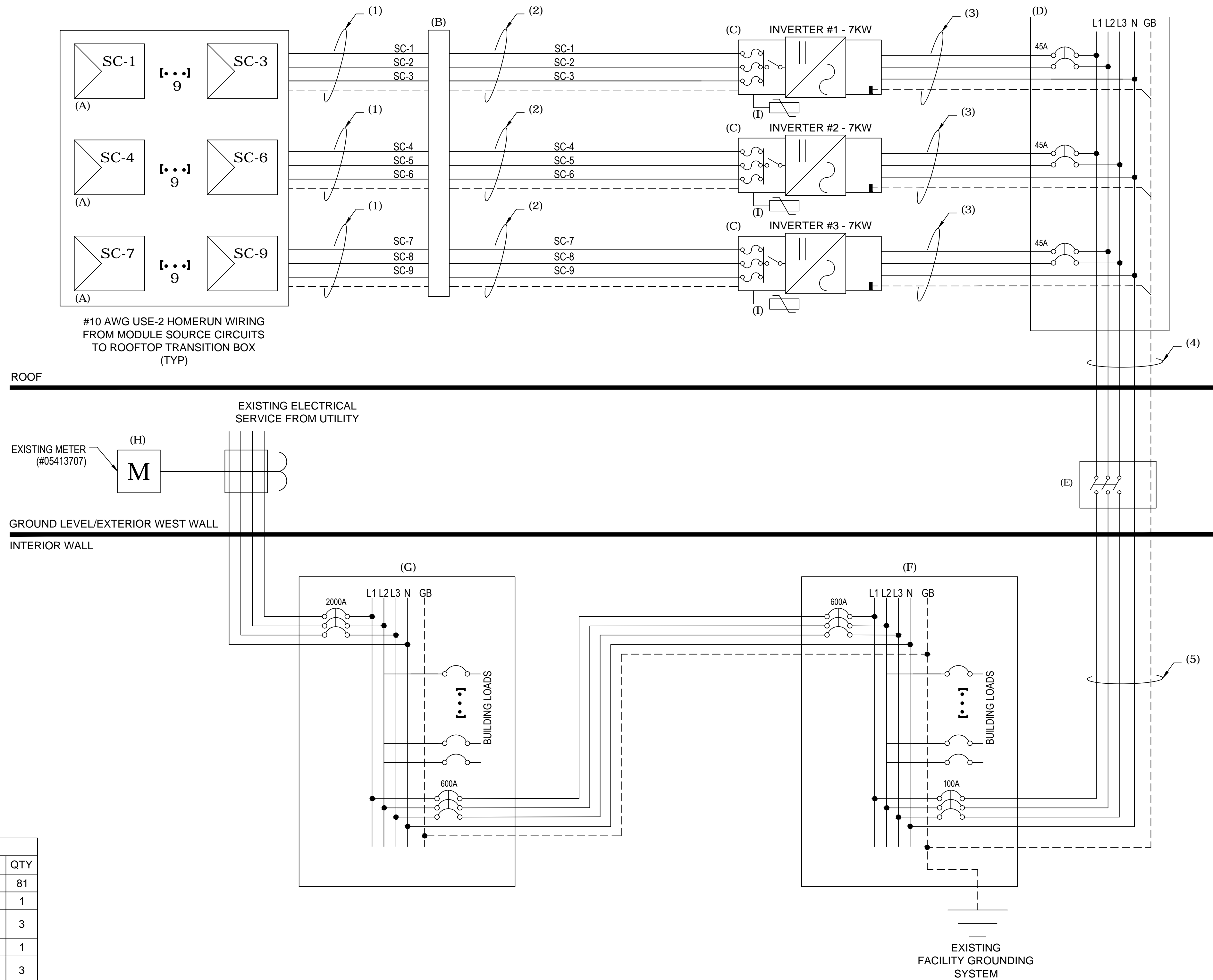
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ALM	ALM	MB

STAMP:

SHEET TITLE: **ELECTRICAL DETAILS**

SHEET NUMBER: **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)	



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, 208V, 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	3
(F)	EXISTING DISTRIBUTION SUBPANEL "DP": 600A, 208V, 3-PHASE, 4-WIRE	1
(G)	EXISTING MAIN DISTRIBUTION PANEL: 2000A, 208V, 3-PHASE, 4-WIRE	1
(H)	EXISTING BILLING METER TO BE SWAPPED AFTER UTILITY INSPECTION	1
(I)	LIGHTNING SUPPRESSOR(S) - PART #LA602 (DC)	1

- NOTES**
- ALL HOMERUN WIRES TO TRANSITION BOXES ARE #10 AWG USE-2/RHW-2 DUAL RATED WIRES. ROUTED AS REQUIRED.
  - ALL CONDUIT TO BE EMT, UNLESS OTHERWISE SPECIFIED BY LOCAL AHJ.
  - ALL EQUIPMENT TO BE LABELLED PER NEC REQUIREMENTS.
  - SYSTEM TO BE INSTALLED WITH ADEQUATE AC AND DC TRANSIENT VOLTAGE SURGE SUPPRESSION.
  - POINT OF INTERCONNECTION:
    - 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.
    - 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).

ID	MAX AMPERAGE	EST. MAX LENGTH	# OF WIRES	WIRE SIZE (AWG)	VOLTAGE DROP	GROUND SIZE	CONDUIT SIZE
(1)	13.96 Adc	45'	6	#10 USE-2		#6	FREE AIR
(2)	13.96 Adc	25'	6	#10 THWN-2		#6	1-1/2"
(3)	42.5 Aac	10'	3	#8 THWN-2	0.23	#6	1-1/2"
(4)	73.5 Aac	15'	4	#4 THWN-2	0.20	#6	1-1/2"
(5)	73.5 Aac	15'	4	#4 THWN-2	0.20	#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.

# Brightergy

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ENGINEER: \_\_\_\_\_

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DRAWN BY: \_\_\_\_\_ CHK.: \_\_\_\_\_ APV.: \_\_\_\_\_

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SHEET TITLE:

ELECTRICAL LINE DIAGRAM

SHEET NUMBER:

E3


\_\_\_\_\_

\_\_\_\_\_

INVERTERS (3), AC DISCONNECT (1), MAIN DISTRIBUTION PANEL OR SUBPANEL (1), SOLAR COMBINING PANEL (1), JUNCTION BOX (1) & TRANSITION BOX (1) SHALL REQUIRE THE FOLLOWING LABEL (8)

**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)

3  
4

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

PV OUTPUT CIRCUIT SHALL BE LABELED ON 5-POLE COMBINER / INVERTER'S DC DISCONNECT WITH THE FOLLOWING INFORMATION PER NEC ARTICLE 690.53 & 690.4(B) (3 REQUIRED, 1 PER INVERTER)

**INVERTER #1**  
GRID TIED PHOTOVOLTAIC POWER SOURCE

1) MAXIMUM POWER-POINT CURRENT: 25.59Aac  
2) MAXIMUM POWER-POINT VOLTAGE: 321.3Vdc  
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED): 469.3Vdc  
4) SHORT CIRCUIT CURRENT (ADJUSTED): 33.56Aac

1

**INVERTER #2**  
GRID TIED PHOTOVOLTAIC POWER SOURCE

1) MAXIMUM POWER-POINT CURRENT: 25.59Aac  
2) MAXIMUM POWER-POINT VOLTAGE: 321.3Vdc  
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED): 469.3Vdc  
4) SHORT CIRCUIT CURRENT (ADJUSTED): 33.56Aac

1

**INVERTER #3**  
GRID TIED PHOTOVOLTAIC POWER SOURCE

1) MAXIMUM POWER-POINT CURRENT: 25.59Aac  
2) MAXIMUM POWER-POINT VOLTAGE: 321.3Vdc  
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED): 469.3Vdc  
4) SHORT CIRCUIT CURRENT (ADJUSTED): 33.56Aac

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.

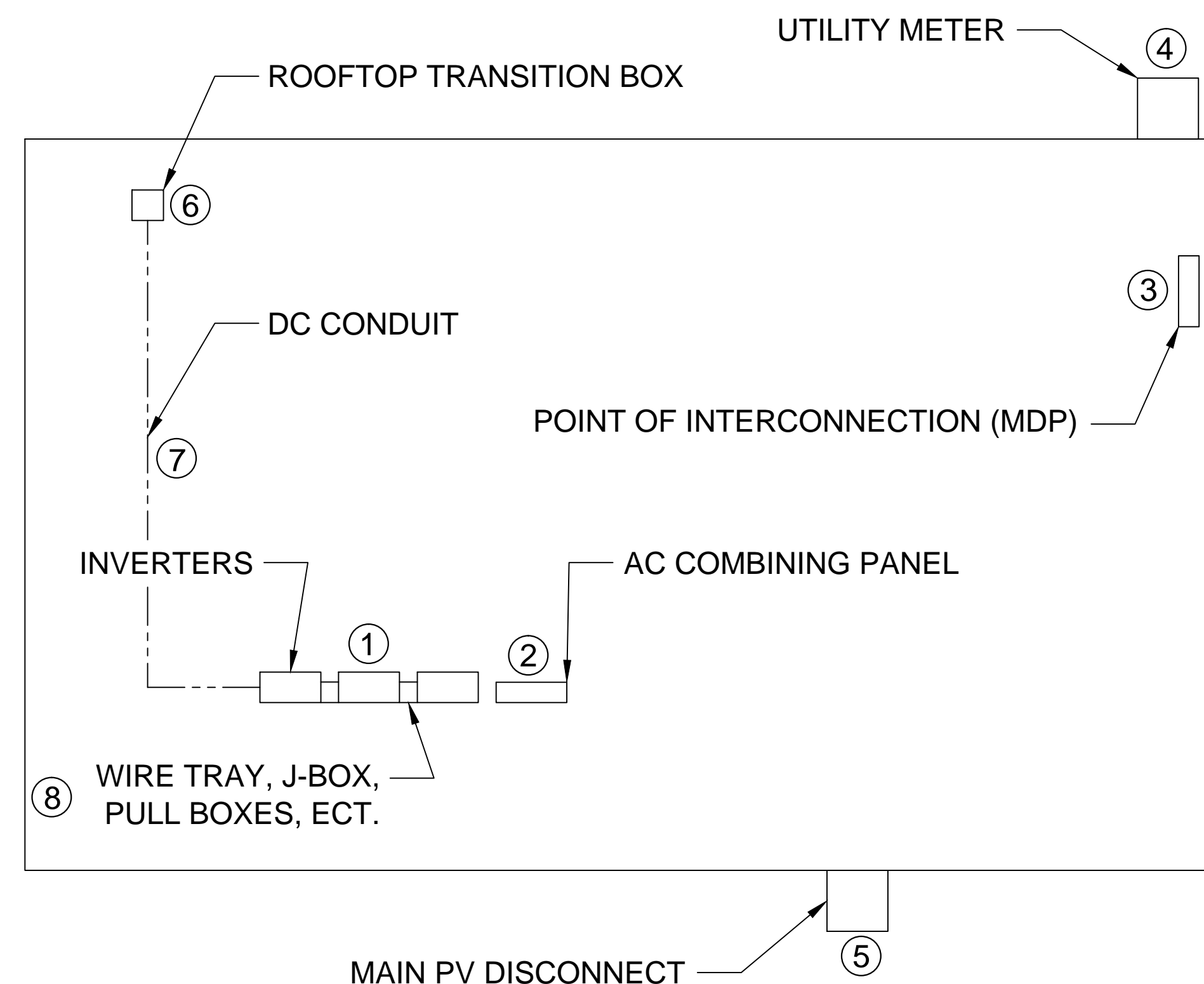
- AN ADDITIONAL LABEL SHALL BE PLACED ADJACENT TO THE MAIN SERVICE DISCONNECT IN A LOCATION CLEARLY VISIBLE FROM THE LOCATION WHERE THE DISCONNECT IS OPERATED.

- 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 AND INVERTERS  
LOCATED ON ROOF

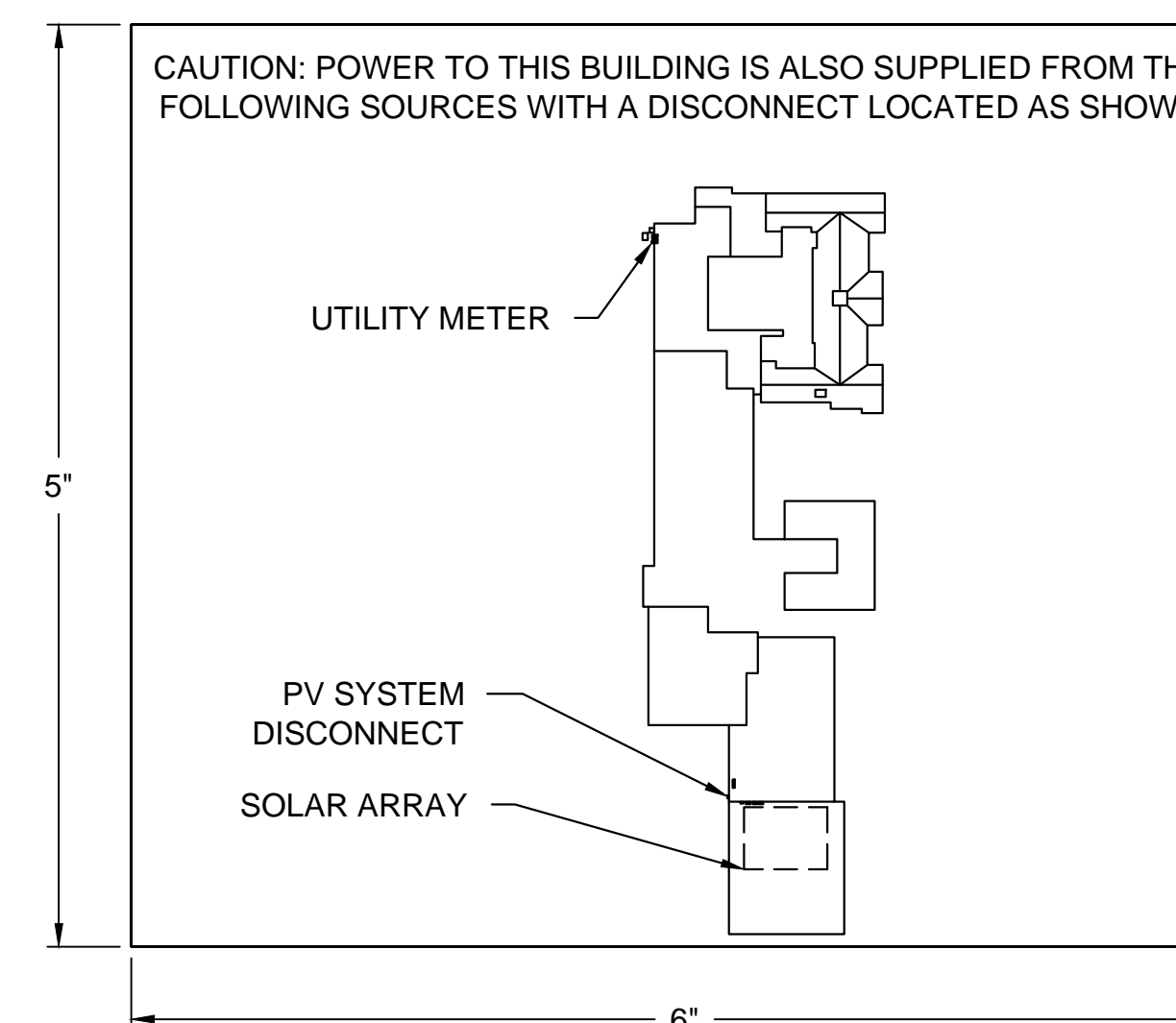
2  
3  
4  
5

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

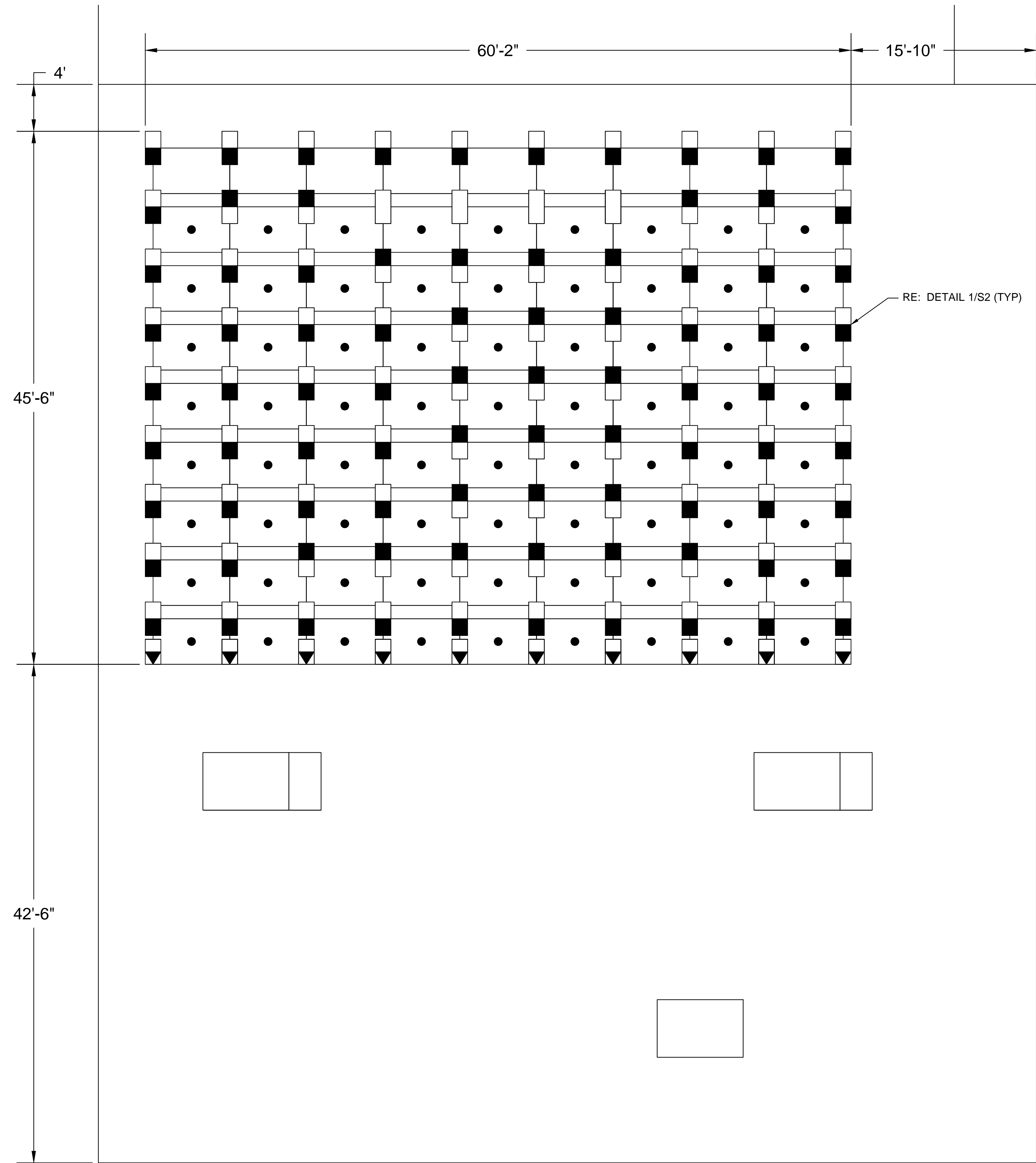
PV SYSTEM DISCONNECT  
FOR UTILITY OPERATION

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



1 ROOF BALLAST PLAN  
SCALE: 3/16" = 1'-0"

- MODULE LEGEND**
- MODULE WITH DEFELECTOR
  - MODULE WITHOUT DEFELECTOR
  - MODULE WITHOUT DEFELECTOR

- BALLAST LEGEND**
- 1-BLOCK (STANDARD)
  - 2-BLOCK (STANDARD)
  - 3-BLOCK (STANDARD)
  - 2-BLOCK (SOUTH)

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2318 WOODSON ROAD #140007  
ST. LOUIS, MO 63114  
314-739-0515

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SHEET TITLE: **RACKING LAYOUT**

SHEET NUMBER: **S1**

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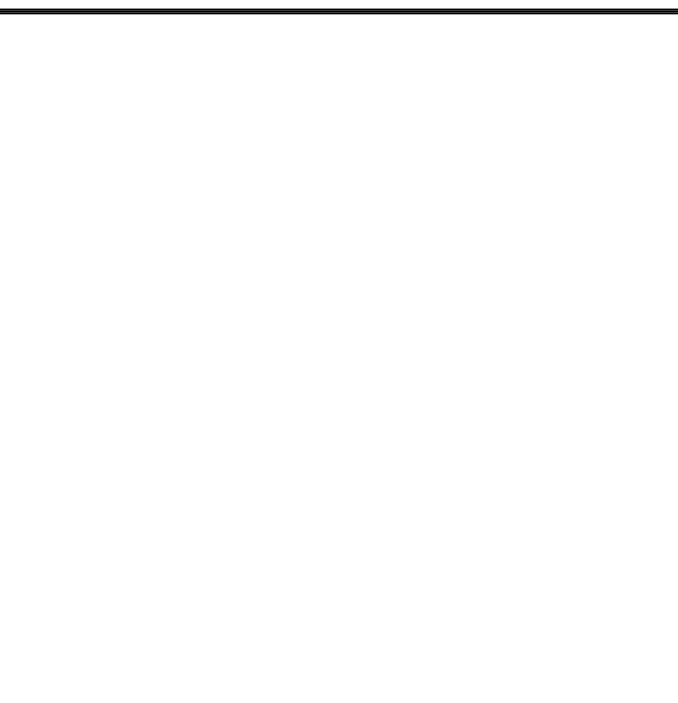

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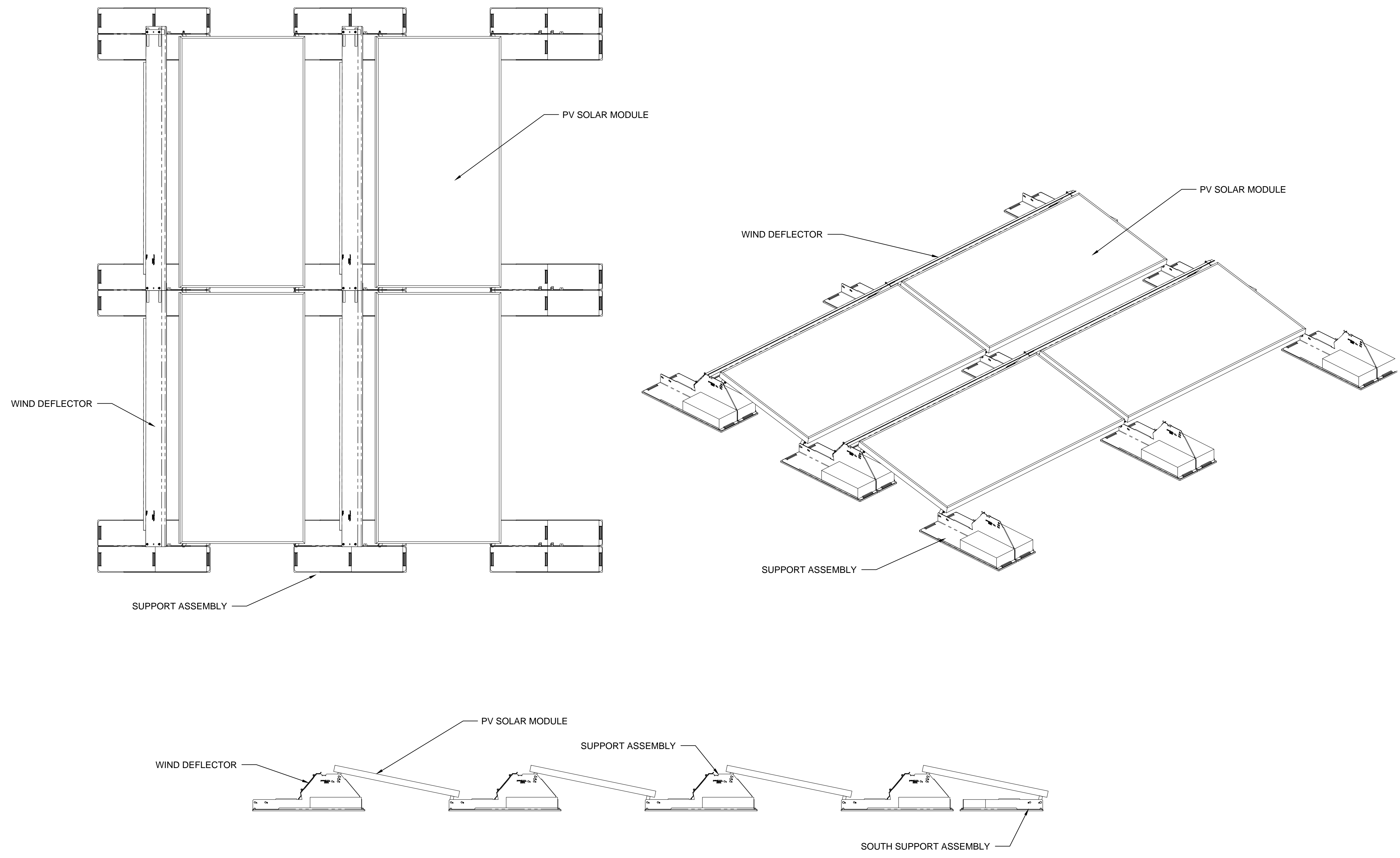


SHEET TITLE:

RACKING DETAILS

SHEET NUMBER:

S2



**1** RACKING DETAIL  
SCALE: 3/4" = 1'-0"