

SOLAR ELECTRIC SYSTEM FOR MEXICO SCHOOL DISTRICT HAWTHORNE ELEMENTARY



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

PROJECT INFORMATION:

MEXICO SCHOOL
DISTRICT
HAWTHORNE
ELEMENTARY
**24.705kW PV
System**
1250 WEST CURTIS STREET
MEXICO, MO 65265

ISSUE DATE:

01/02/2014

REV: _____ DATE: _____ BY: _____

ENGINEER:

DRAWN BY: _____ CHK.: _____ APV.: _____

NJK	AJN	MR
-----	-----	----

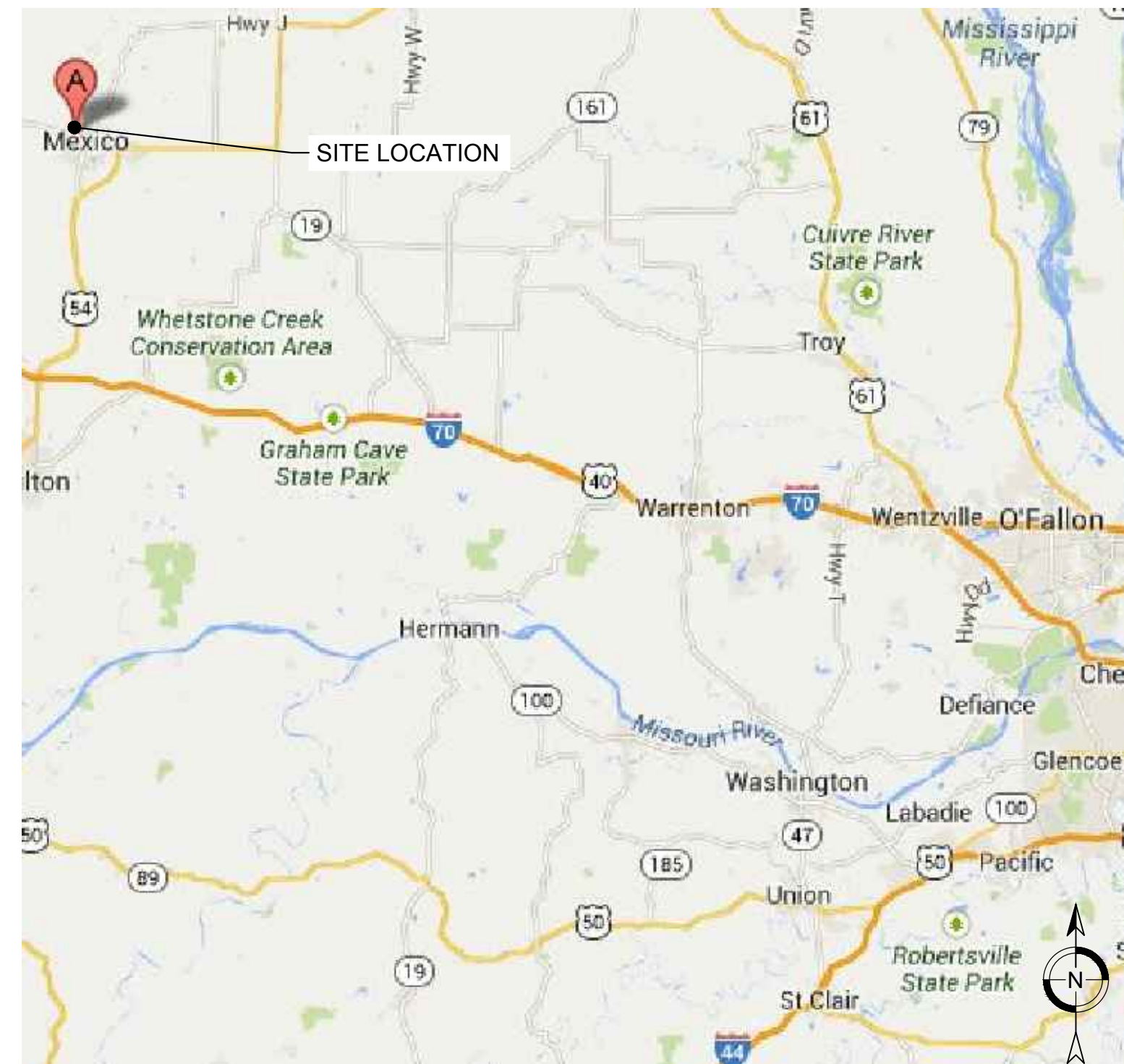
STAMP:

SHEET TITLE:

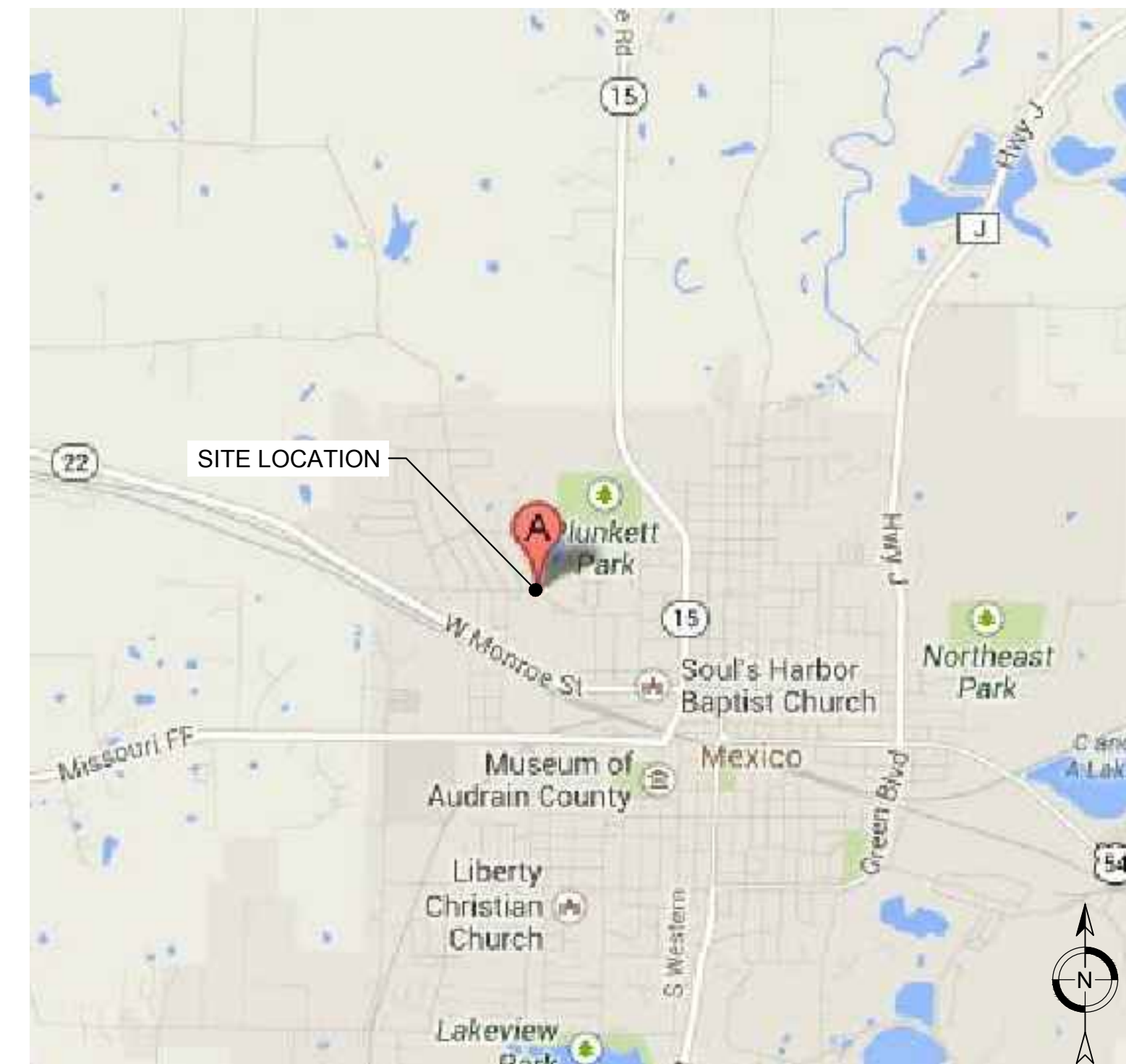
**TITLE
SHEET**

SHEET NUMBER:

T1



VICINITY MAP



LOCAL MAP

SITE INFORMATION:

OWNER: MEXICO SCHOOL DISTRICT HAWTHORNE ELEMENTARY
1250 WEST CURTIS STREET
MEXICO, MO 65265
AUDRAIN

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

UTILITY COMPANY: AMEREN
ACCOUNT NUMBER: 26850-32008
METER NUMBER: 07987519

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

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: _____

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 DETAILS

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



SOLAR SOLUTIONS

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

PROJECT INFORMATION:

MEXICO SCHOOL
DISTRICT
HAWTHORNE
ELEMENTARY
24.705kW PV
System

1250 WEST CURTIS STREET
MEXICO, MO 65265

ISSUE DATE:

01/02/2014

REV: DATE: BY:

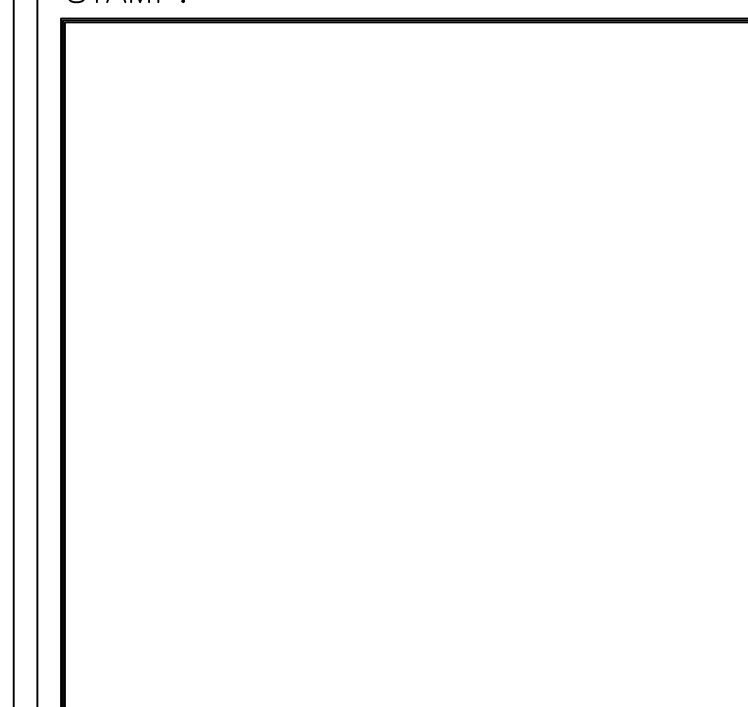
ENGINEER:



DRAWN BY: CHK.: APV.:

NJK AJN MR

STAMP:

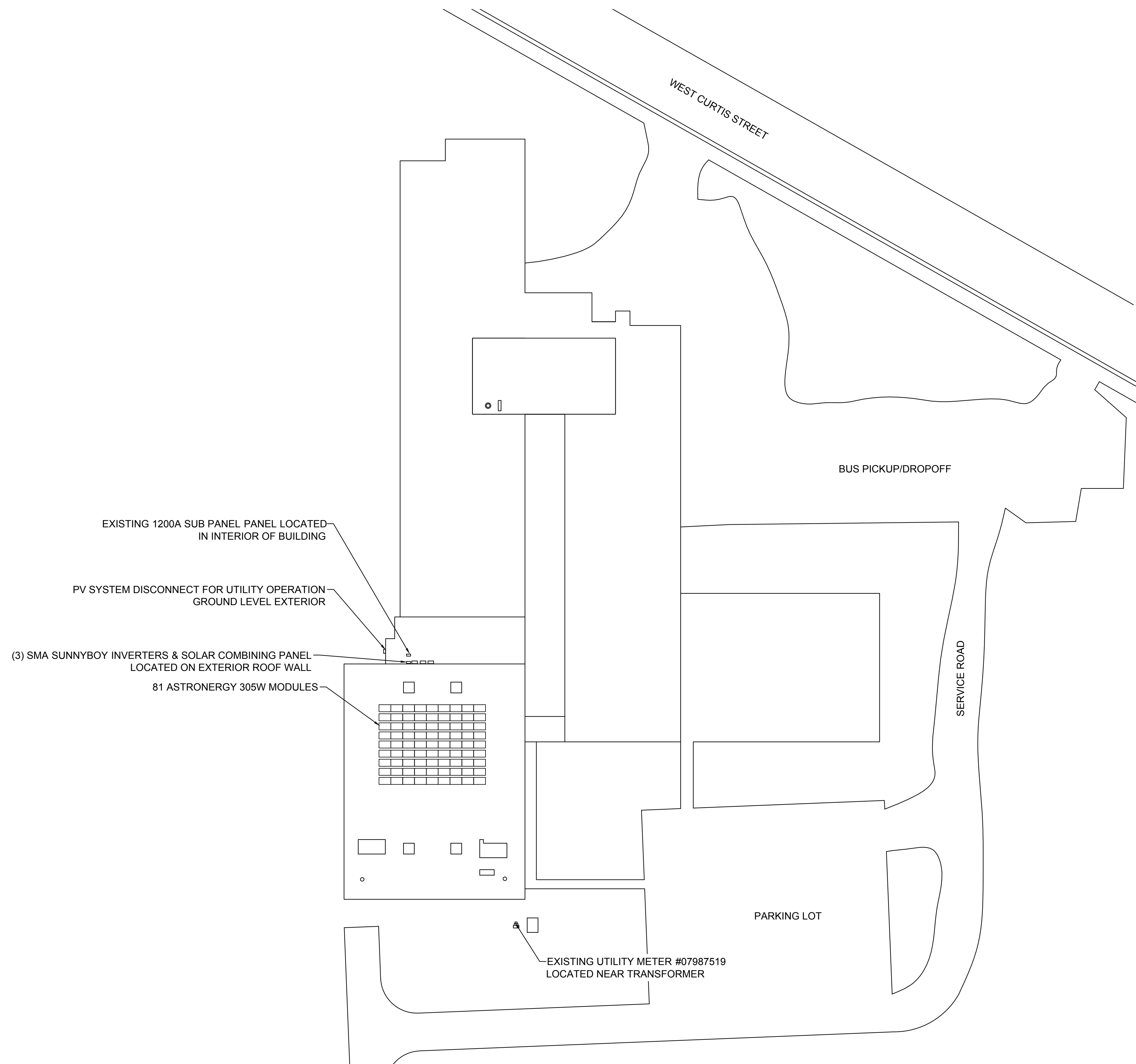


SHEET TITLE:

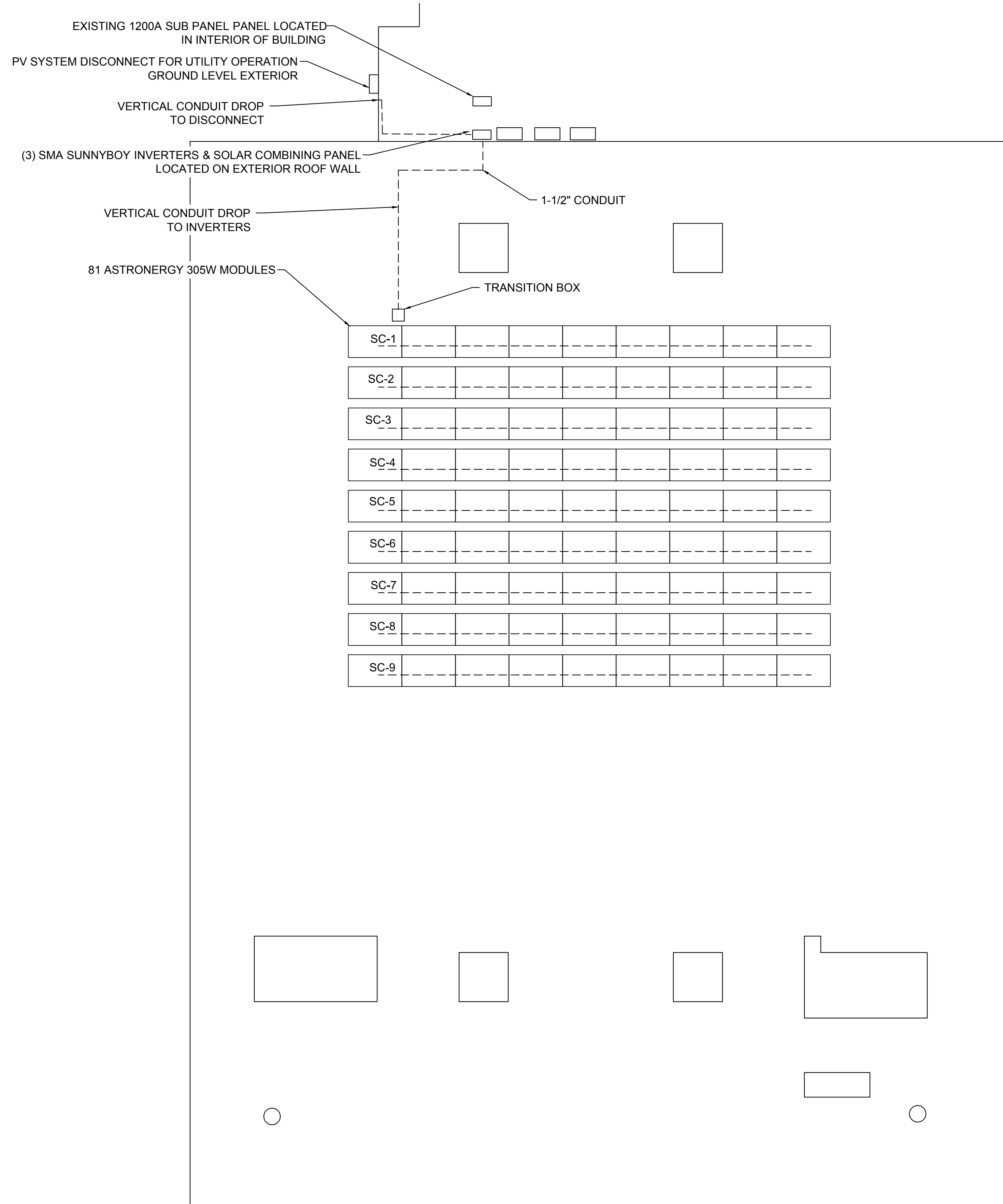
SITE
PLAN

SHEET NUMBER:

ST1



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



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

PROJECT INFORMATION:

MEXICO SCHOOL DISTRICT
 HAWTHORNE ELEMENTARY
24.705kW PV System
 1250 WEST CURTIS STREET
 MEXICO, MO 65265

ISSUE DATE:

01/02/2014

REV: _____ DATE: _____ BY: _____

ENGINEER:

DRAWN BY: _____ CHK.: _____ APV.: _____

NJK AJN MR

STAMP:

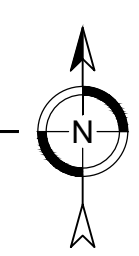
SHEET TITLE:

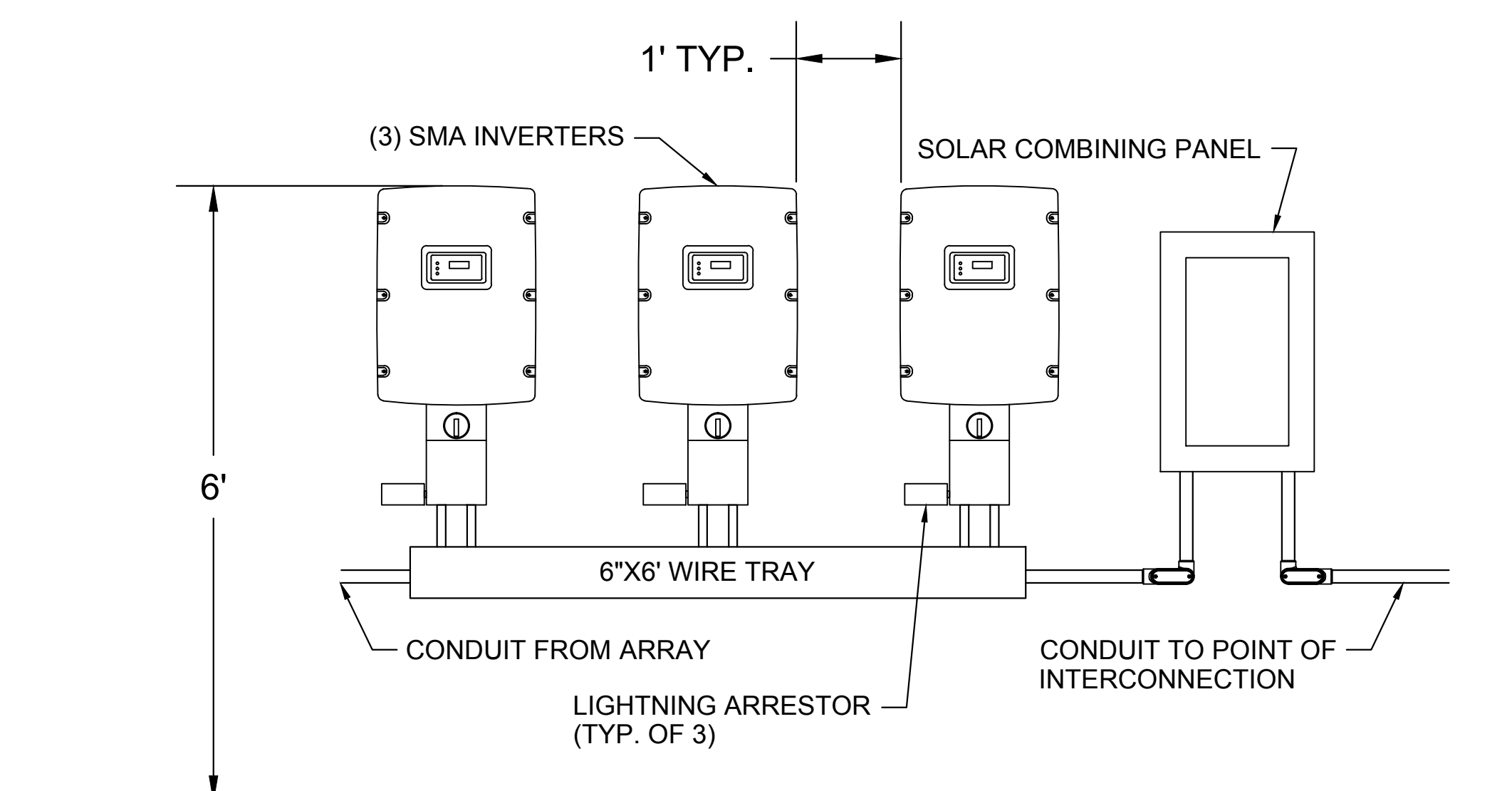
ELECTRICAL LAYOUT

SHEET NUMBER:

E1

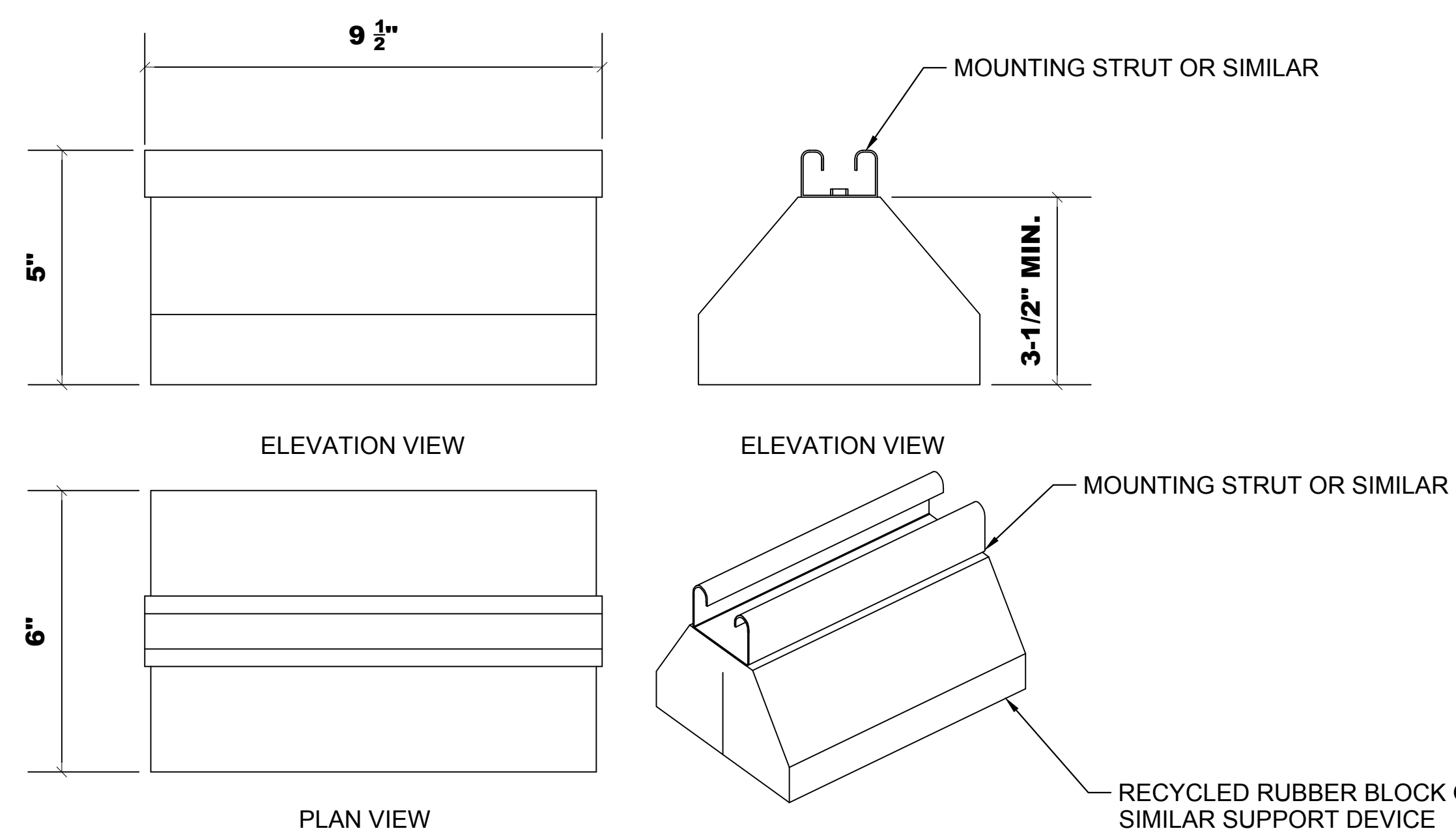
1 ELECTRICAL LAYOUT
 SCALE: 1/8" = 1'-0"





1 EQUIPMENT ELEVATION

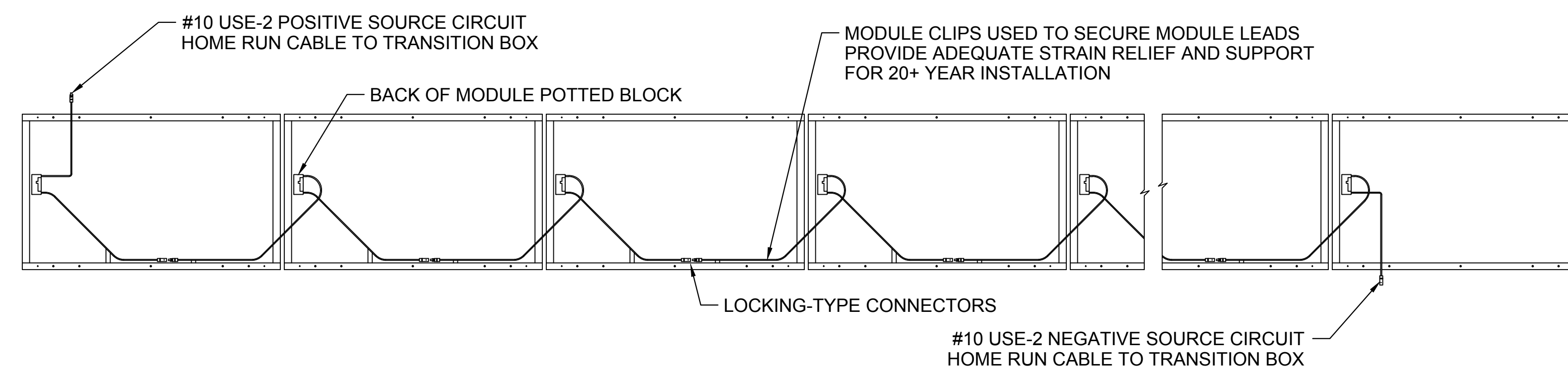
SCALE: 3/4" = 1'-0"



NOTE: PROVIDE QUANTITY AS REQUIRED TO SUPPORT EXTERNAL CONDUIT

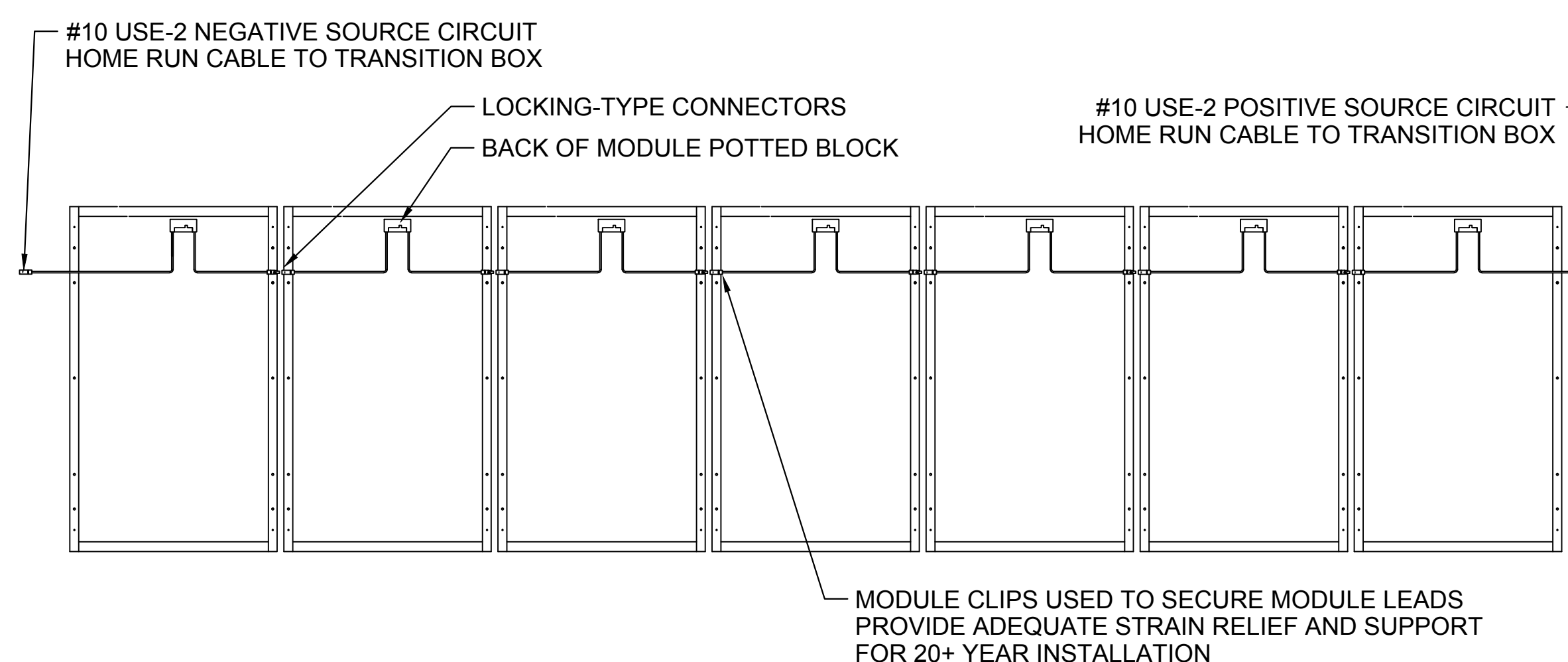
5 CONDUIT SUPPORT DETAIL

NTS



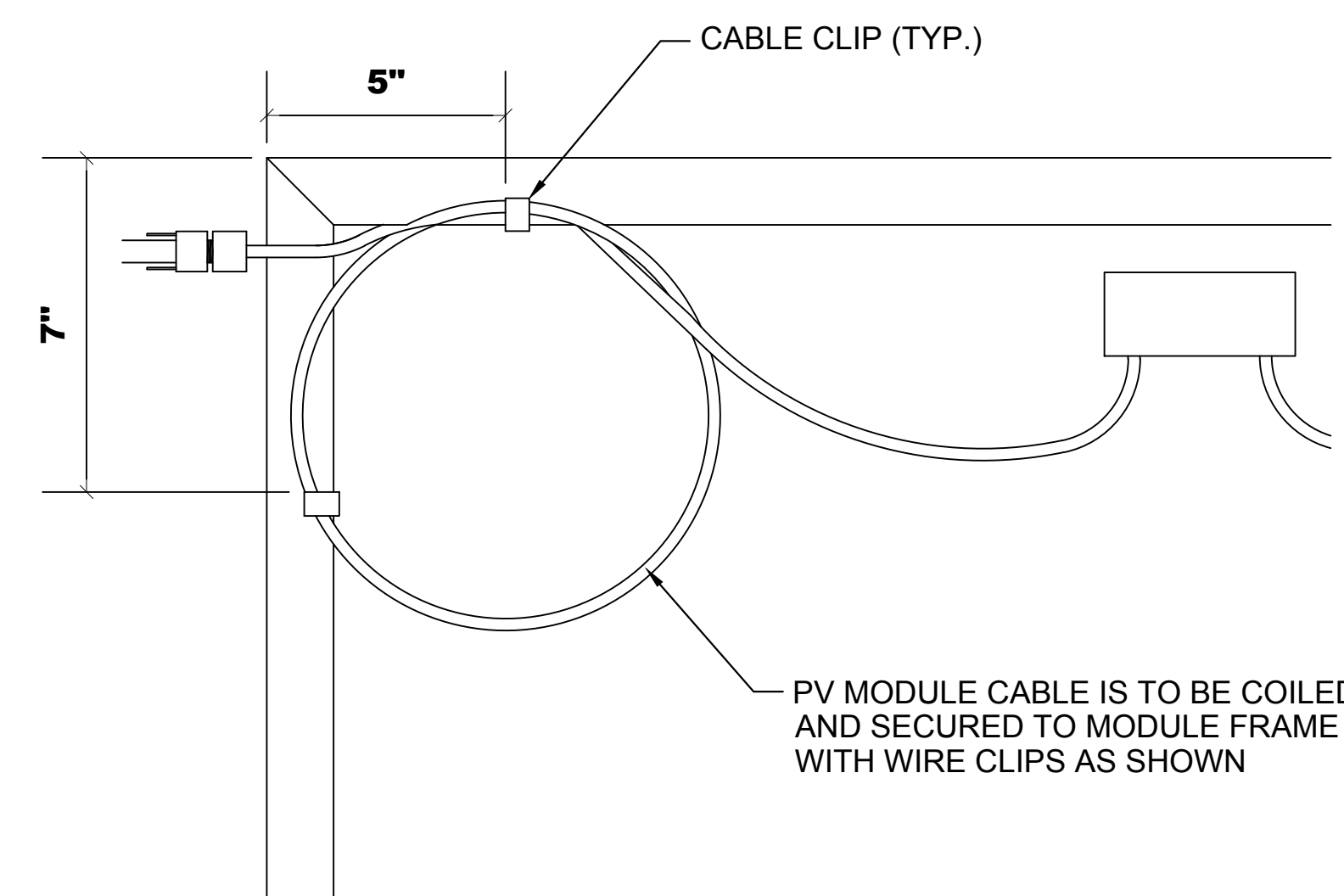
2 PV STRING WIRING DETAIL

NTS



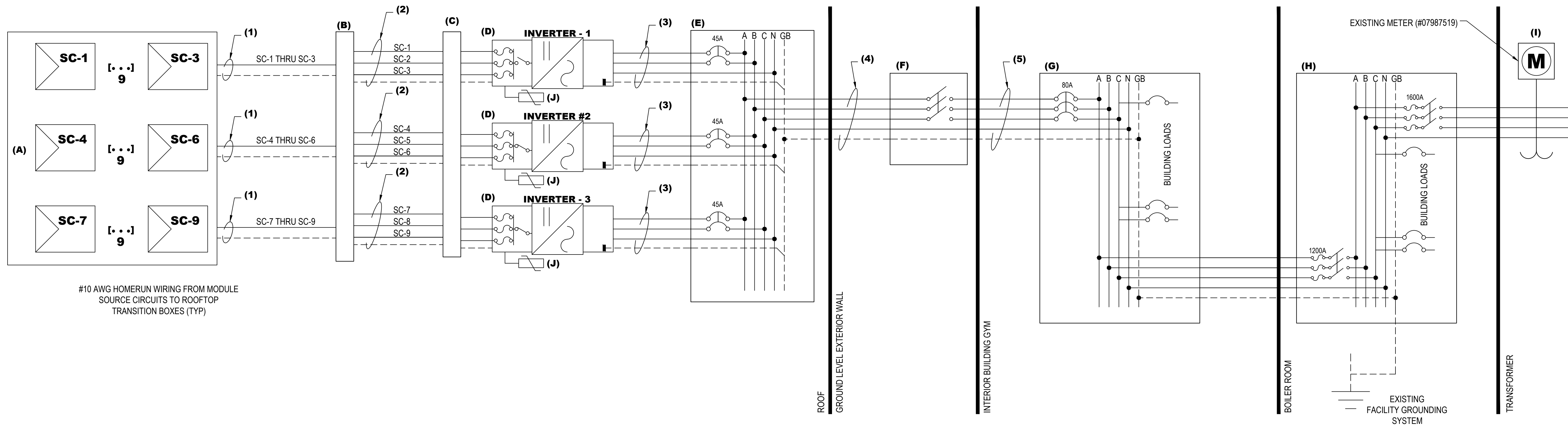
3 PV STRING WIRING DETAIL

NTS



4 PV WIRE MANAGEMENT DETAIL

NTS



#10 AWG HOMERUN WIRING FROM MODULE
SOURCE CIRCUITS TO ROOFTOP
TRANSITION BOXES (TYP)

SITE CONDITIONS	
LOCATION:	MEXICO, MO 64061
MAX AVG. TEMP:	38°C
EXTREME MIN TEMP	-22°C
INFO OBTAINED FROM ASHRAE	
PV ARRAY CONFIGURATION	
MODULE MFR.:	ASTRONERGY
MODULE MFR. MODELS:	CHSM6612P-305
MODULE QTY.:	81
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:	407.61 Vdc
TEMP. ADJUSTED	470.88 Vdc
ISC	8.95 Adc
VMP	321.9 Vdc
IMP	8.95 Adc
INDIVIDUAL 7KW INVERTER OUTPUT	
TYPE	SMA SB 7000US
RATED POWER:	7.0 KWac
OPERATING AC VOLTAGE:	208 V
MAX. CURRENT:	34 A
OUTPUT FREQUENCY	60 Hz
*BASED ON MODULE PERFORMANCE AT STANDARD TEST CONDITIONS (STC)	

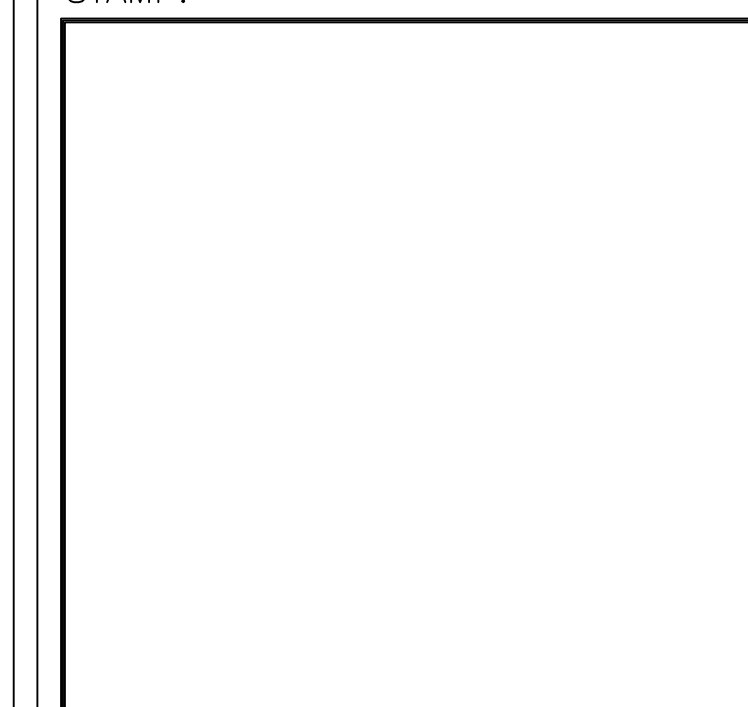
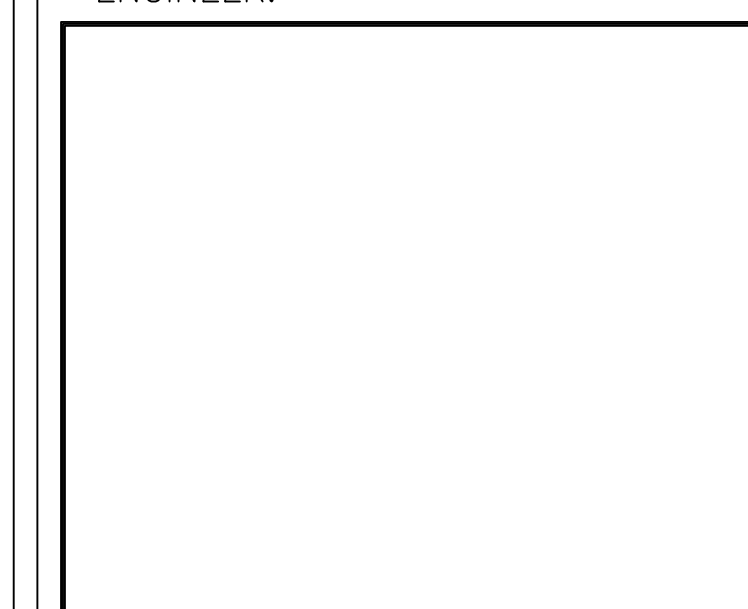
TABLE 1: PHOTOVOLTAIC SYSTEM EQUIPMENT SCHEDULE		
ID	DESCRIPTION	QTY
(A)	ASTRONERGY CHSM6612P-305 (305W) MODULES, NEGATIVE GROUNDED	81
(B)	TRANSITION BOX, SIZE: 12"x12"x6", NEMA 4, ADJACENT TO ARRAY	1
(C)	WIREWAY, 6"x6"x6", NEMA 3R, BELOW INVERTERS	1
(D)	SMA SUNNYBOY 7.0 kW UTILITY INTERACTIVE DC-TO-AC INVERTER: 1-PHASE, 3-WIRE, 208V VAC, NEMA 3R W/ INTEGRAL DC COMBINER	3
(E)	SOLAR COMBINING PANEL: 225A, 3P, 4W, 250V, NEMA 3R	1
(F)	AC DISCONNECT: 100A, 250V, NEMA 3R	1
(G)	EXISTING SUB PANEL: 1600A, 208V; POINT OF PV INTERCONNECTION AT BACKFED BREAKER	1
(H)	EXISTING MAIN DISTRIBUTION PANEL: 1600A, 208V, 3-PHASE, 4W	1
(G)	EXISTING BILLING METER TO BE SWAPPED AFTER UTILITY INSPECTION	1
(H)	LIGHTNING SUPPRESSOR(S) - PART #LA602 (DC)	2

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	90'	6	#10 USE-2	0.40	#6	FREE AIR
(2)	13.96 Adc	40'	6	#10 THWN-2	0.15	#6	1-1/2"
(3)	42.5 Aac	10'	3	#6 THWN-2	0.14	#6	1-1/2"
(4)	73.5 Aac	50'	4	#4 THWN-2	0.85	#6	1-1/2"
(5)	73.5 Aac	15'	4	#4 THWN-2	0.23	#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.



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 690.9(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
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: 321.9Vdc
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED): 470.9Vdc
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: 321.9Vdc
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED): 470.9Vdc
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: 321.9Vdc
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED): 470.9Vdc
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.

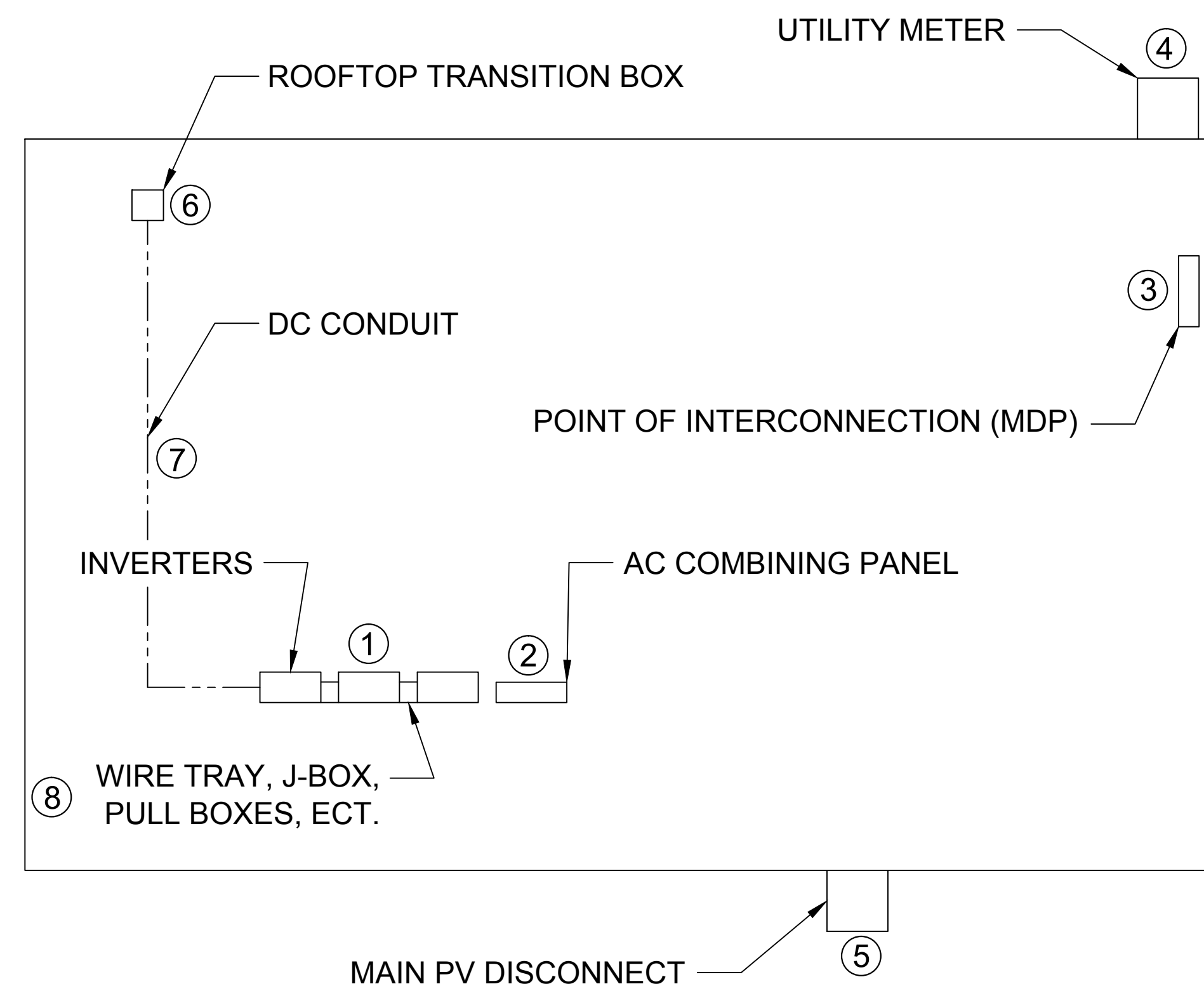
- AN ADDITIONAL LABEL SHALL BE PLACED ADJACENT TO THE MAIN SERVICE DISCONNECT IN A LOCATION CLEARLY VISIBLE FROM THE LOCATION WHERE THE DISCONNECT IS OPERATED.

- 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 ON
ROOF, AND MDP LOCATED ON ROOF

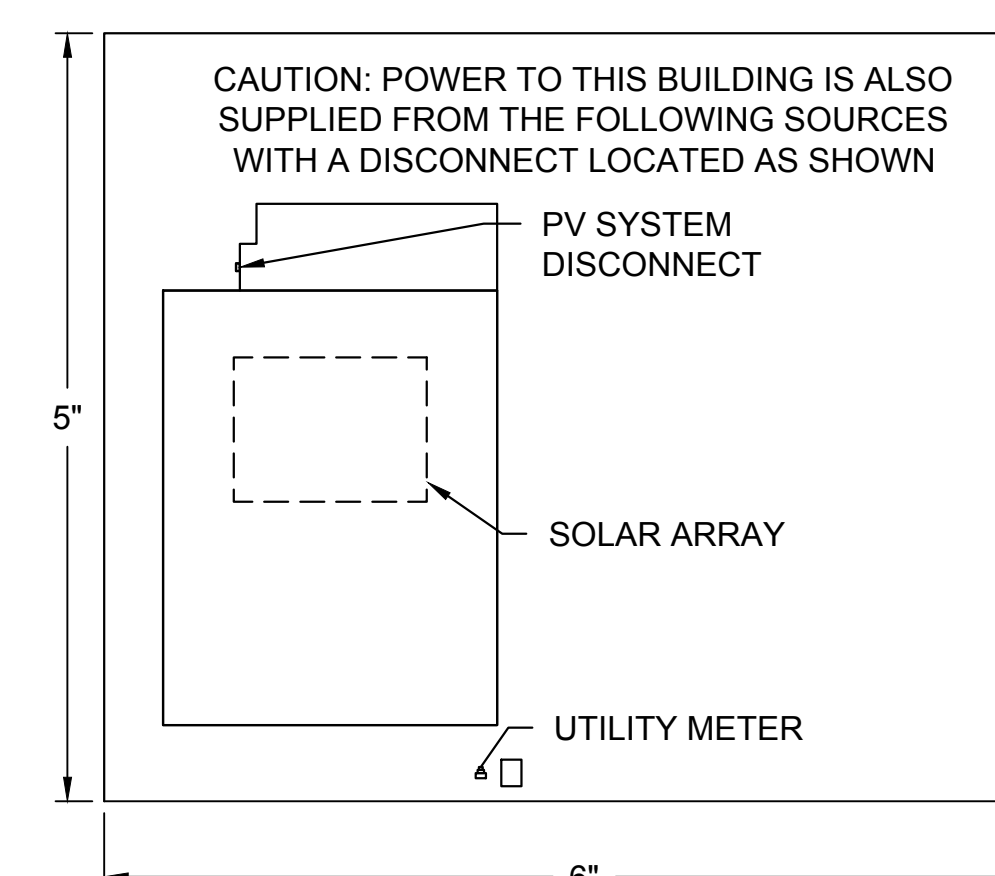
②
③
④
⑤

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

PROJECT INFORMATION:

MEXICO SCHOOL
DISTRICT
HAWTHORNE
ELEMENTARY
**24.705kW PV
System**

1250 WEST CURTIS STREET
MEXICO, MO 65265

ISSUE DATE:

01/02/2014

REV: _____ DATE: _____ BY: _____

ENGINEER:

DRAWN BY: _____ CHK.: _____ APV.: _____

NJK **AJN** **MR**

STAMP:

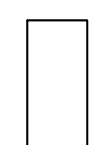
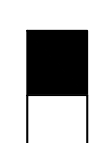
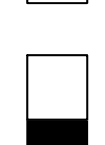
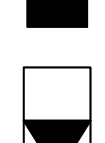
SHEET TITLE:


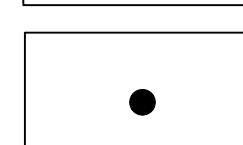
**RACKING
LAYOUT**

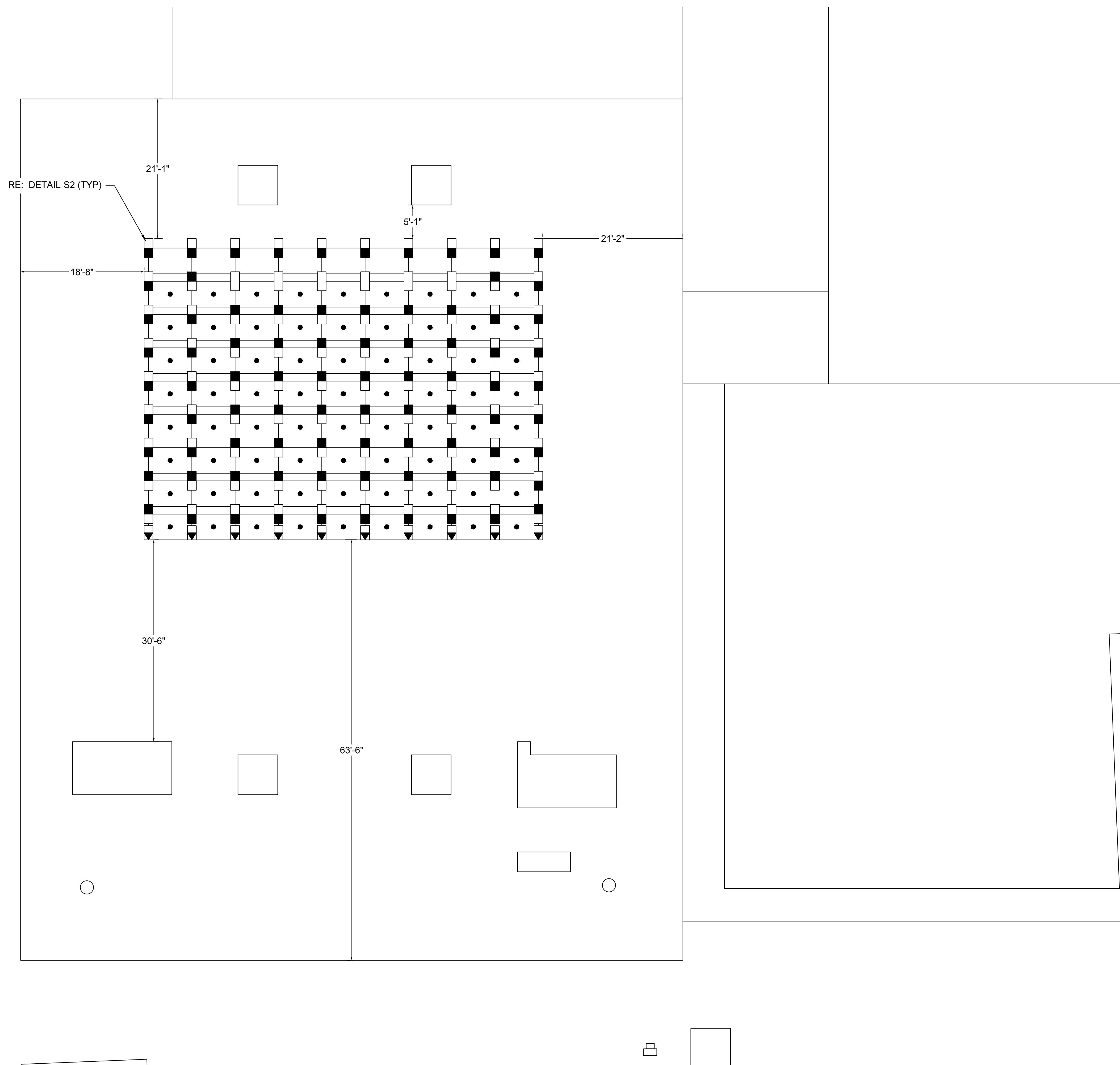
SHEET NUMBER:

S1

BALLAST LEGEND

-  1 BLOCK
-  2 BLOCK
-  3 BLOCK
-  2 BLOCK SOUTH SUPPORT

-  WIND DEFLECTOR
-  NO WIND DEFLECTOR



1 ROOF BALLAST PLAN
SCALE: 1/8" = 1'-0"

PROJECT INFORMATION:

MEXICO SCHOOL
DISTRICT
HAWTHORNE
ELEMENTARY
**24.705kW PV
System**

1250 WEST CURTIS STREET
MEXICO, MO 65265

ISSUE DATE:

01/02/2014

REV: _____ DATE: _____ BY: _____

ENGINEER:

DRAWN BY: _____ CHK.: _____ APV.: _____

NJK AJN MR

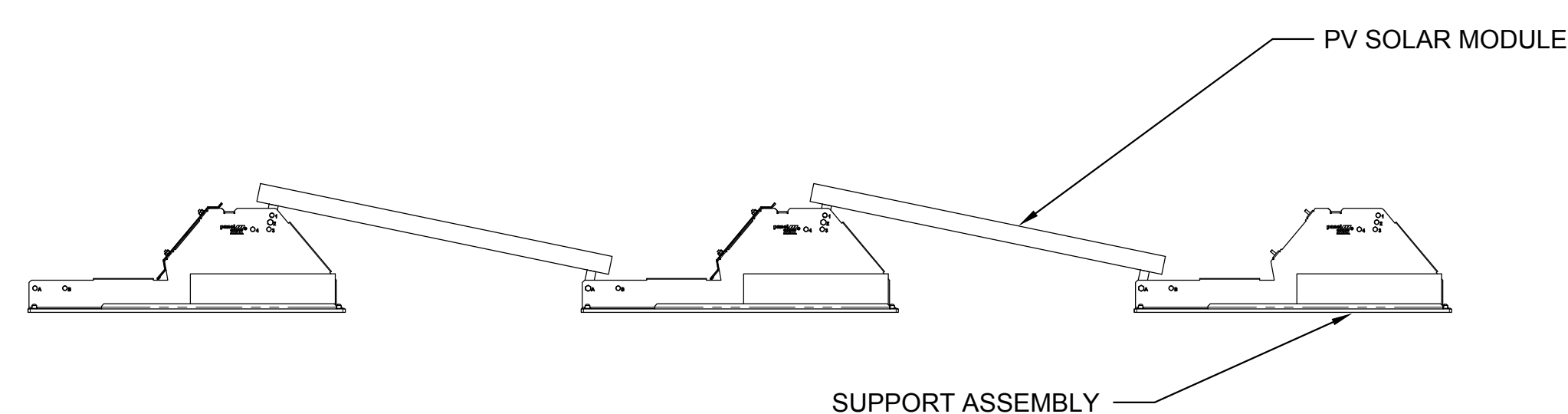
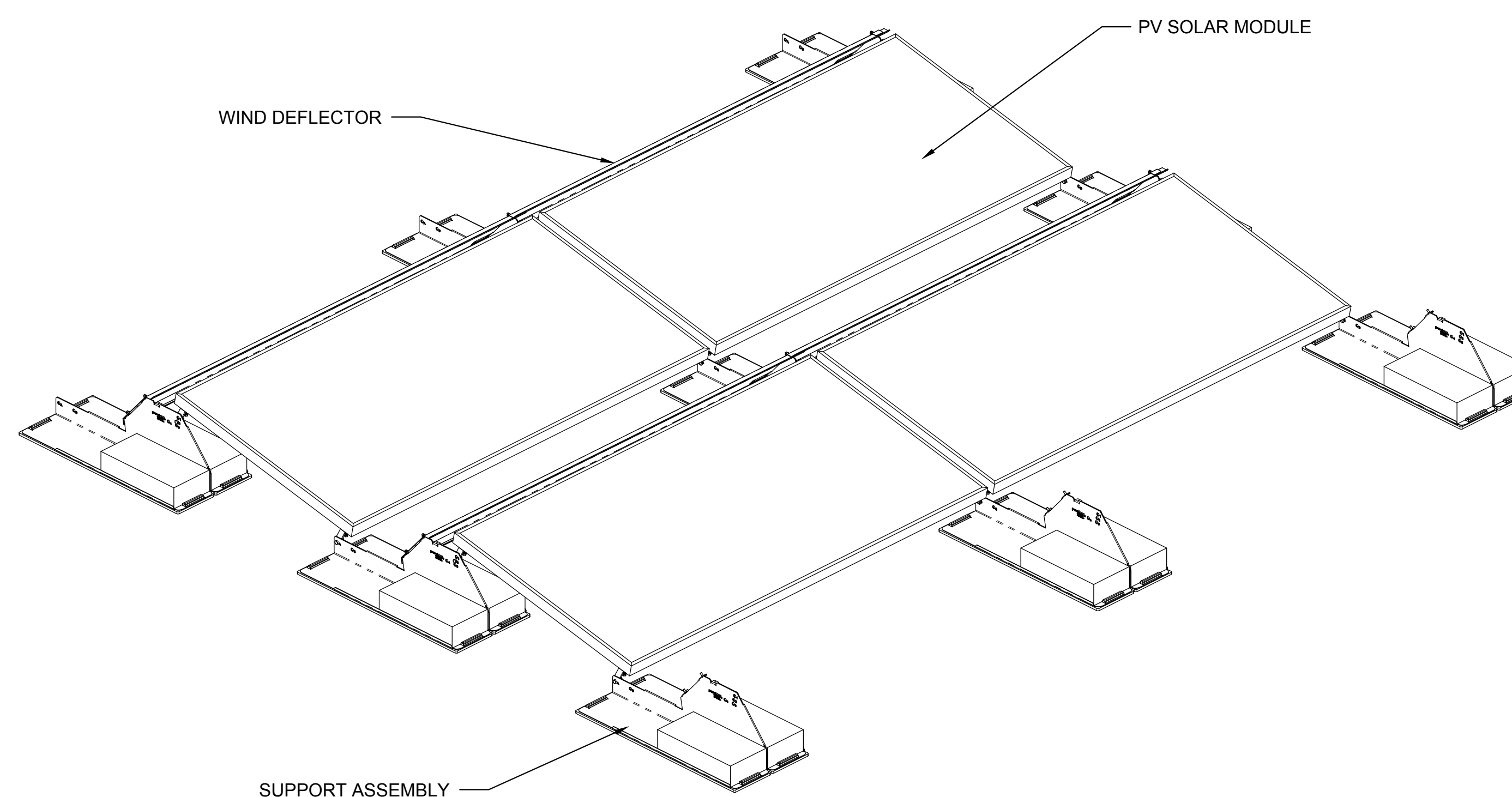
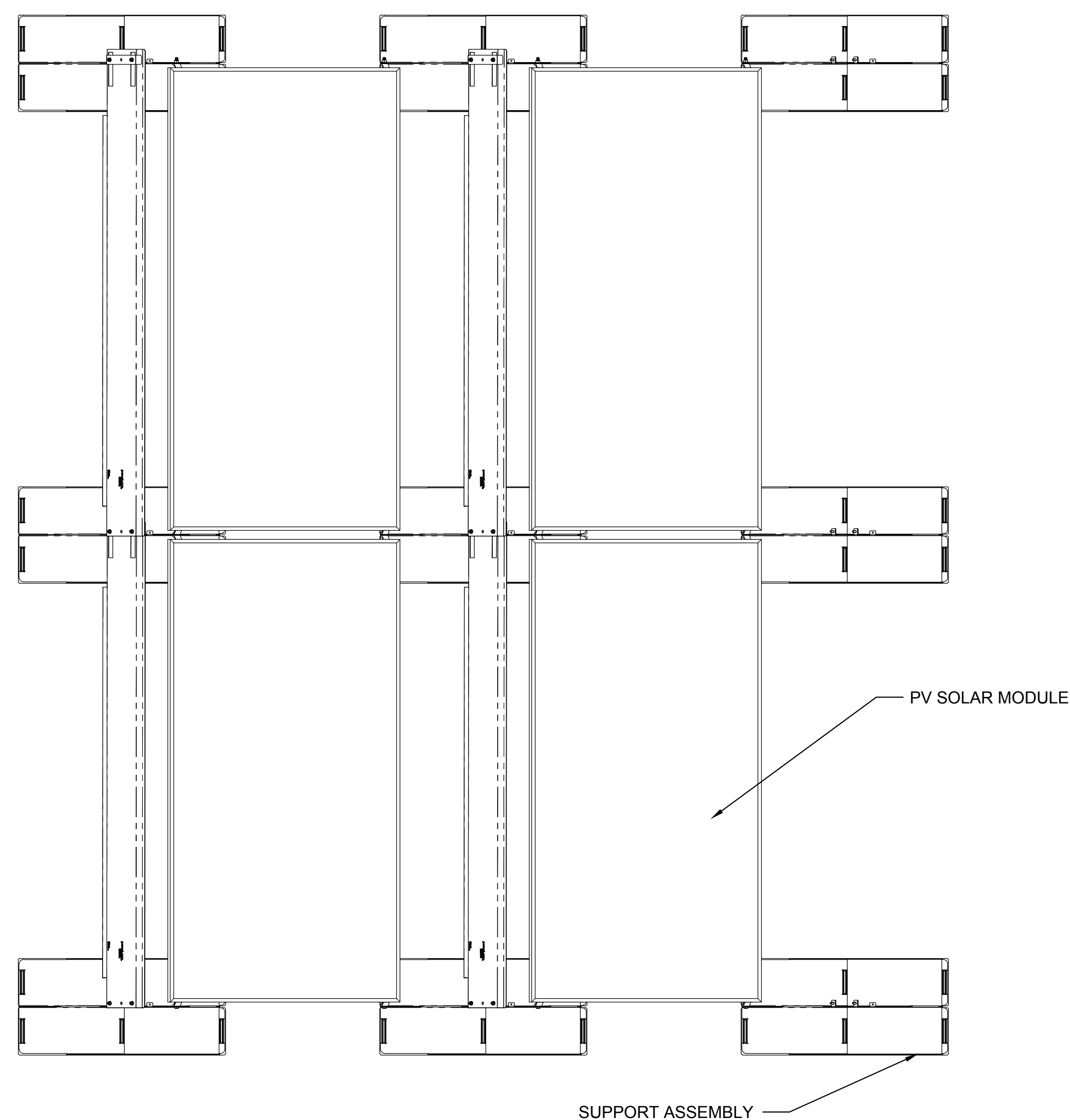
STAMP:

SHEET TITLE:

**RACKING
DETAILS**

SHEET NUMBER:

S2



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