

SOLAR ELECTRIC SYSTEM FOR MEXICO SCHOOL HART CAREER CENTER



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

PROJECT INFORMATION:

**MEXICO SCHOOL
HART CAREER
CENTER**
24.705kW PV System

905 N. WADE ST.
MEXICO, MO 65265

ISSUE DATE:

01/03/2014

REV: _____ DATE: _____ BY: _____

ENGINEER:

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

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

STAMP:

SHEET TITLE:

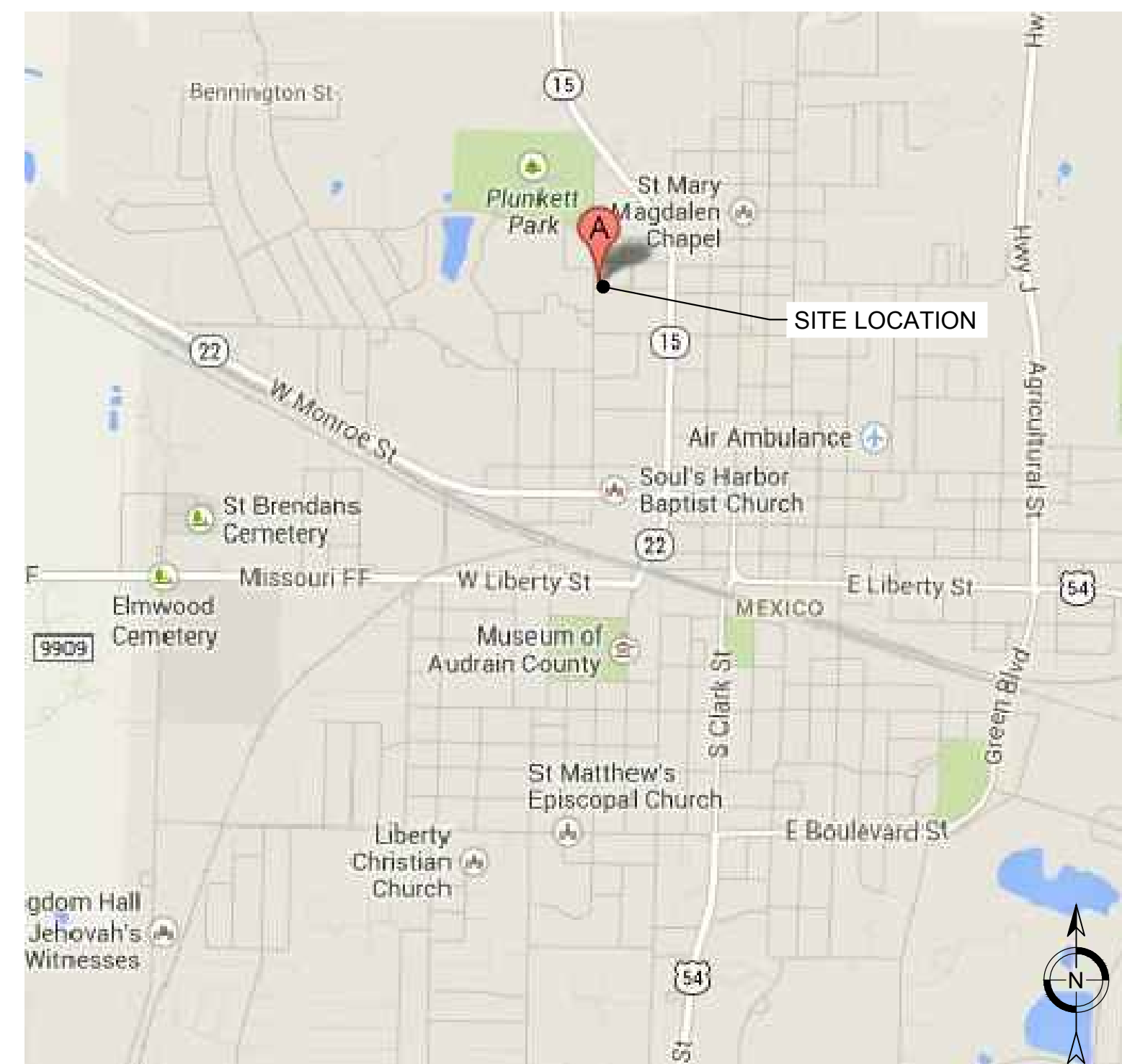
**TITLE
SHEET**

SHEET NUMBER:

T1



VICINITY MAP



LOCAL MAP

SITE INFORMATION:

OWNER: MEXICO SCHOOL HART CAREER CENTER
905 N. WADE ST.
MEXICO, MO 65265

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

UTILITY COMPANY: AMEREN
ACCOUNT NUMBER: 12280-39001
METER NUMBER: 06873604

CONTACT INFORMATION:

PROPERTY REPRESENTATIVE: KEVIN FREEMAN
(573) 581-3773

PROJECT MANAGER: MIKE RIEHL - BRIGHTERGY, LLC
(314) 473-1545

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
HART CAREER
CENTER**
24.705kW PV System

905 N. WADE ST.
MEXICO, MO 65265

ISSUE DATE:

01/03/2014

REV: _____ DATE: _____ BY: _____

ENGINEER:

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

NJK AJN MR

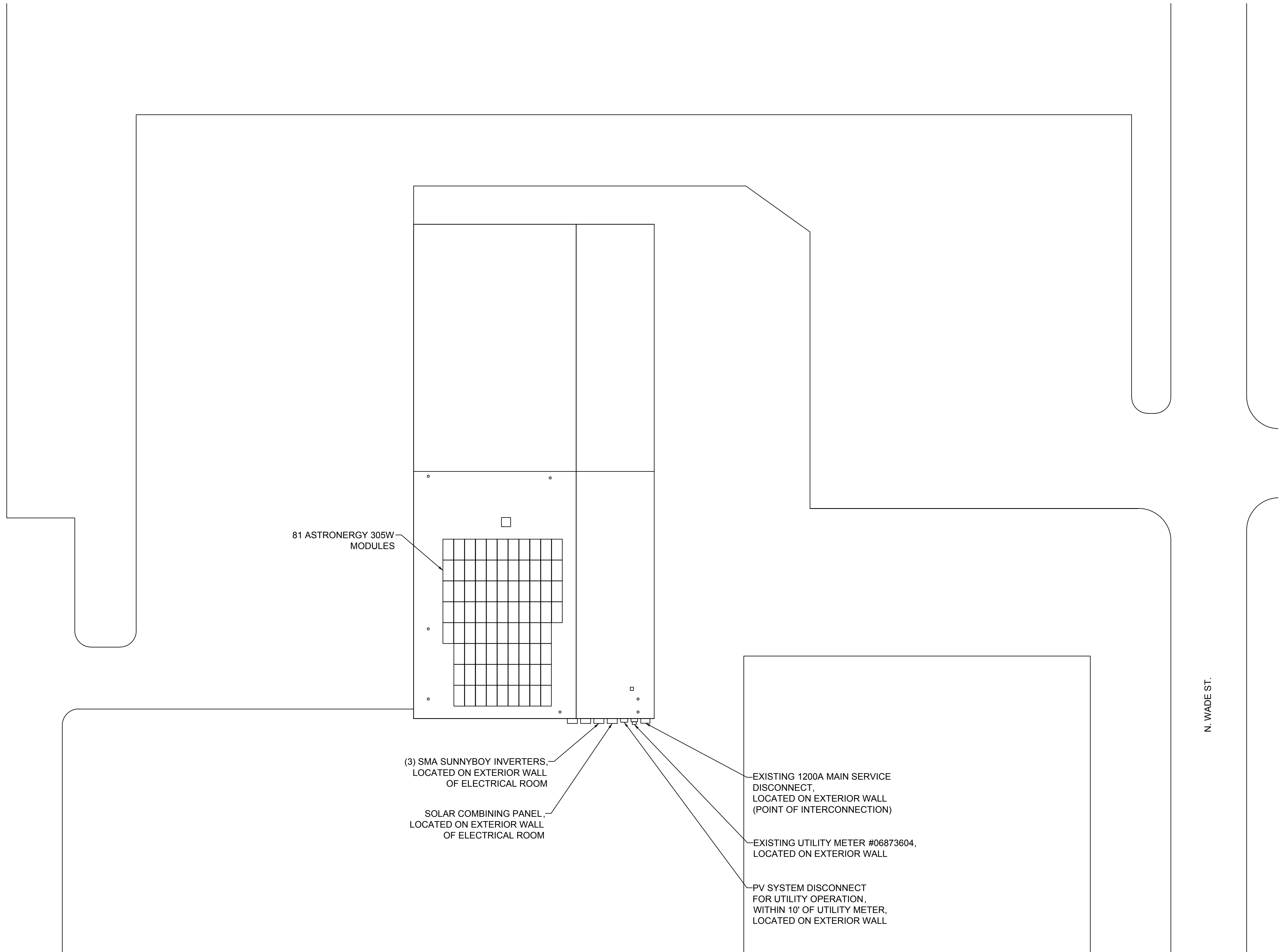
STAMP:

SHEET TITLE:

SITE
PLAN

SHEET NUMBER:

ST1



81 ASTRONERGY 305W
MODULES

(3) SMA SUNNYBOY INVERTERS,
LOCATED ON EXTERIOR WALL
OF ELECTRICAL ROOM

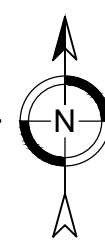
SOLAR COMBINING PANEL,
LOCATED ON EXTERIOR WALL
OF ELECTRICAL ROOM

EXISTING 1200A MAIN SERVICE
DISCONNECT,
LOCATED ON EXTERIOR WALL
(POINT OF INTERCONNECTION)

EXISTING UTILITY METER #06873604,
LOCATED ON EXTERIOR WALL

PV SYSTEM DISCONNECT
FOR UTILITY OPERATION,
WITHIN 10' OF UTILITY METER,
LOCATED ON EXTERIOR WALL

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



N. WADE ST.



SOLAR SOLUTIONS

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

PROJECT INFORMATION:

**MEXICO SCHOOL
HART CAREER
CENTER**
24.705kW PV System

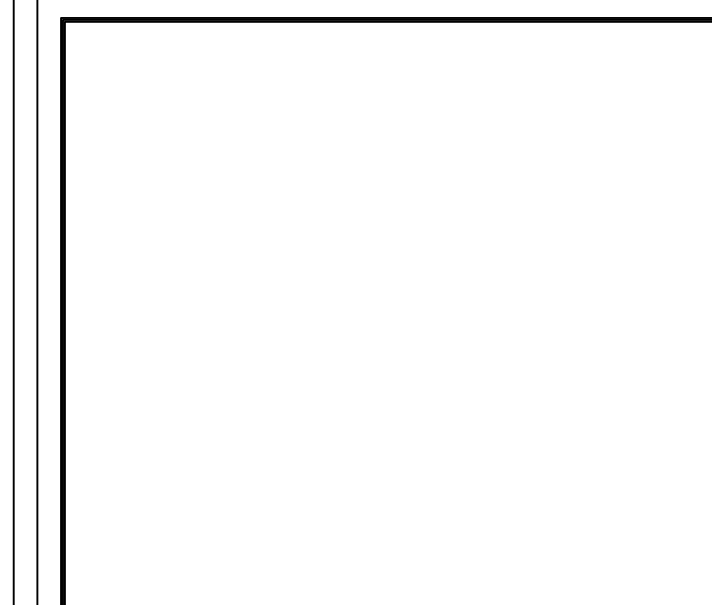
905 N. WADE ST.
MEXICO, MO 65265

ISSUE DATE:

01/03/2014

REV: _____ DATE: _____ BY: _____

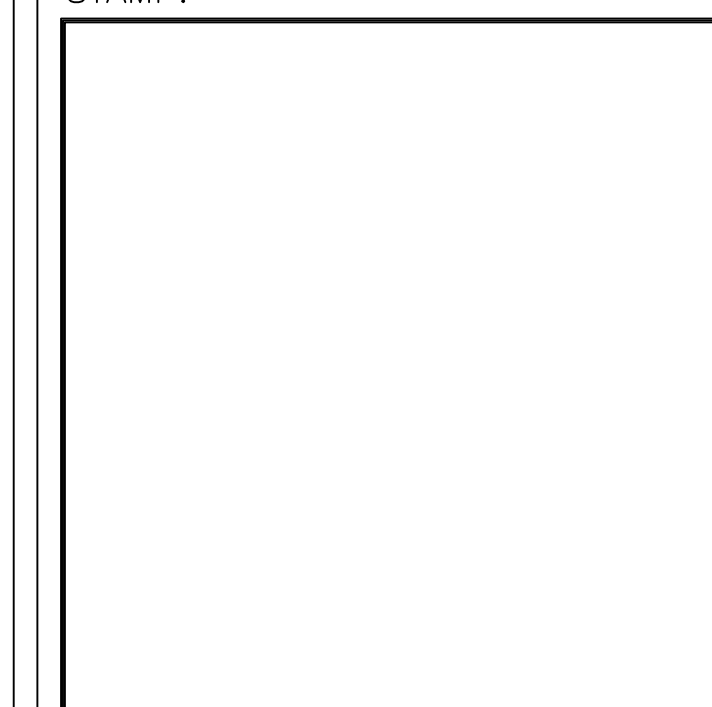
ENGINEER:



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

NJK AJN MR

STAMP:

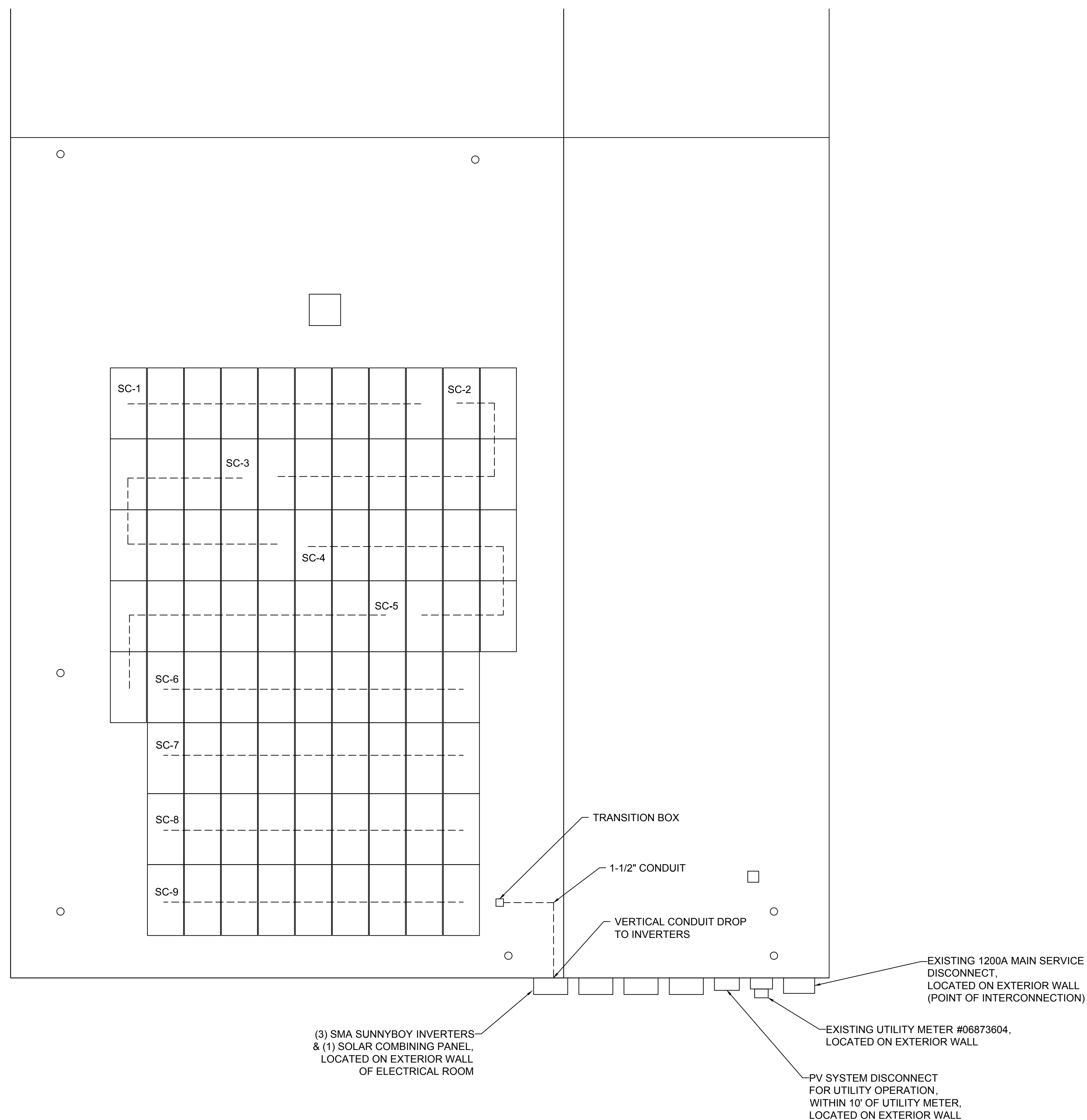


SHEET TITLE:

**ELECTRICAL
LAYOUT**

SHEET NUMBER:

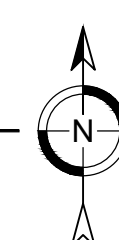
E1

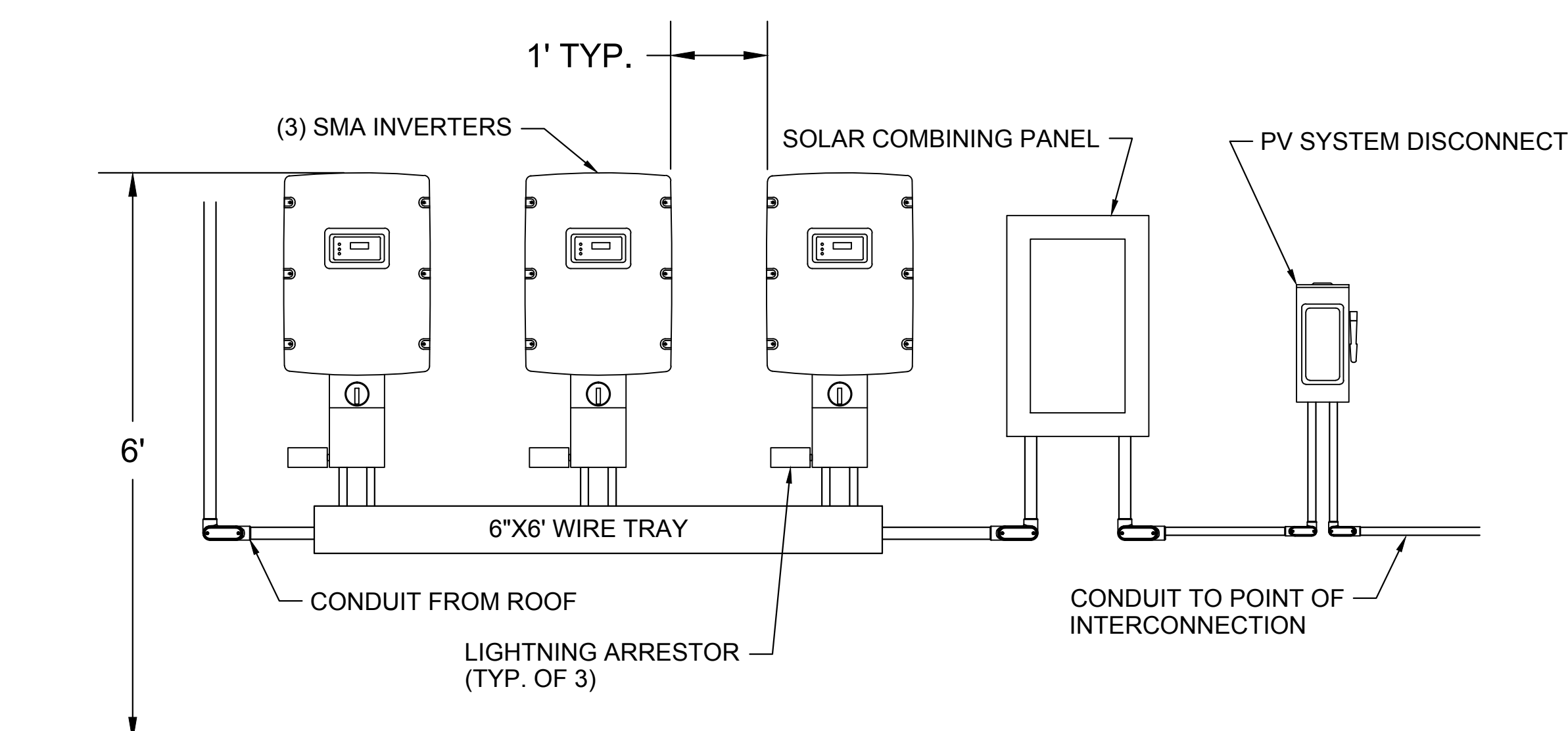
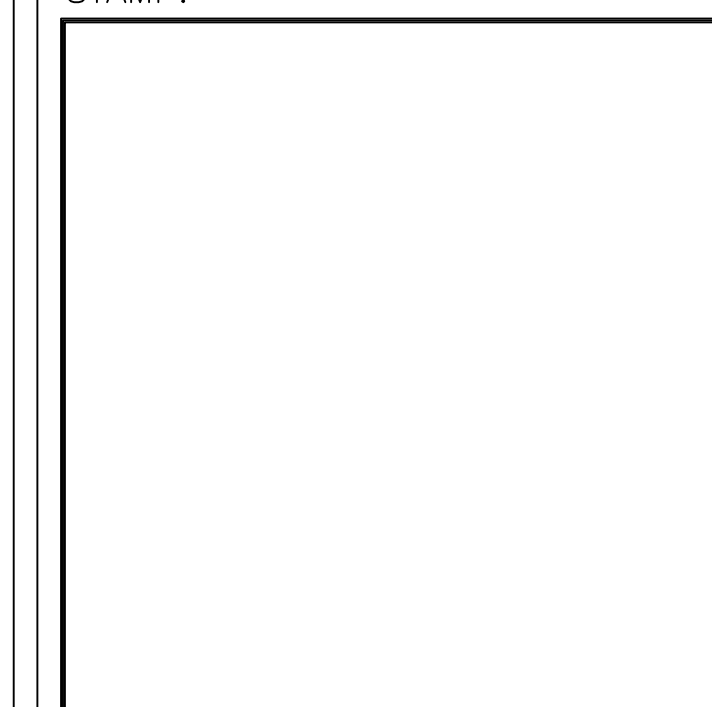
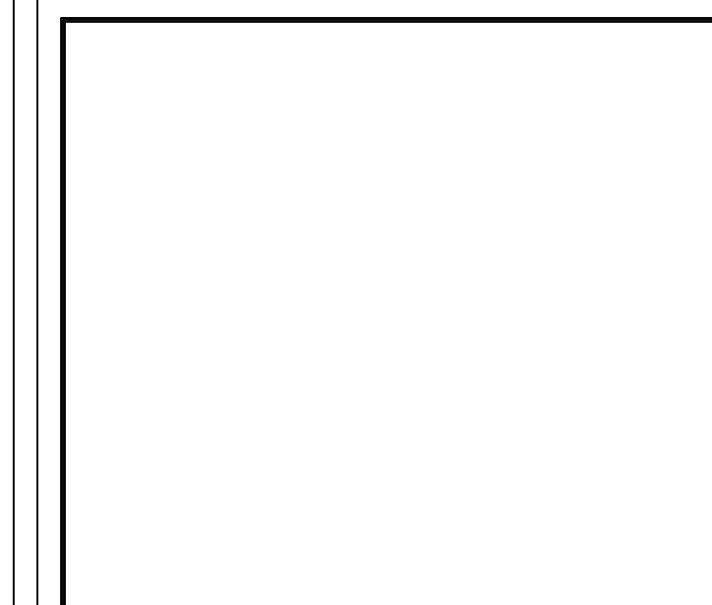


NOTES:

- CONDUIT SHALL BE SUPPORTED EVERY 10' O.C.
- CONDUIT ACROSS ROOF AT A MINIMUM OF 3-1/2" ABOVE ROOF SURFACE.

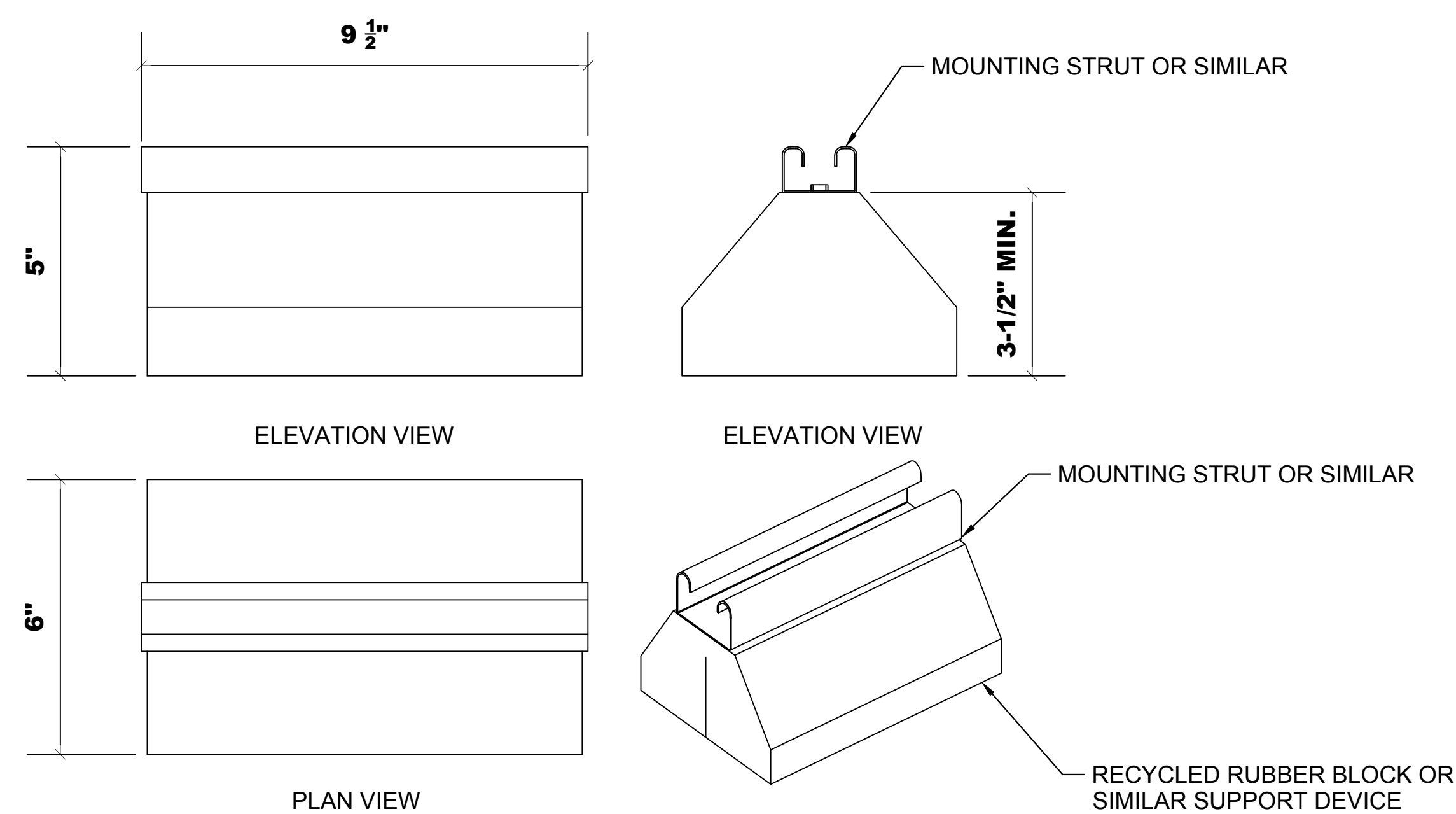
1 ELECTRICAL LAYOUT
SCALE: 3/16" = 1'-0"





1 EQUIPMENT ELEVATION

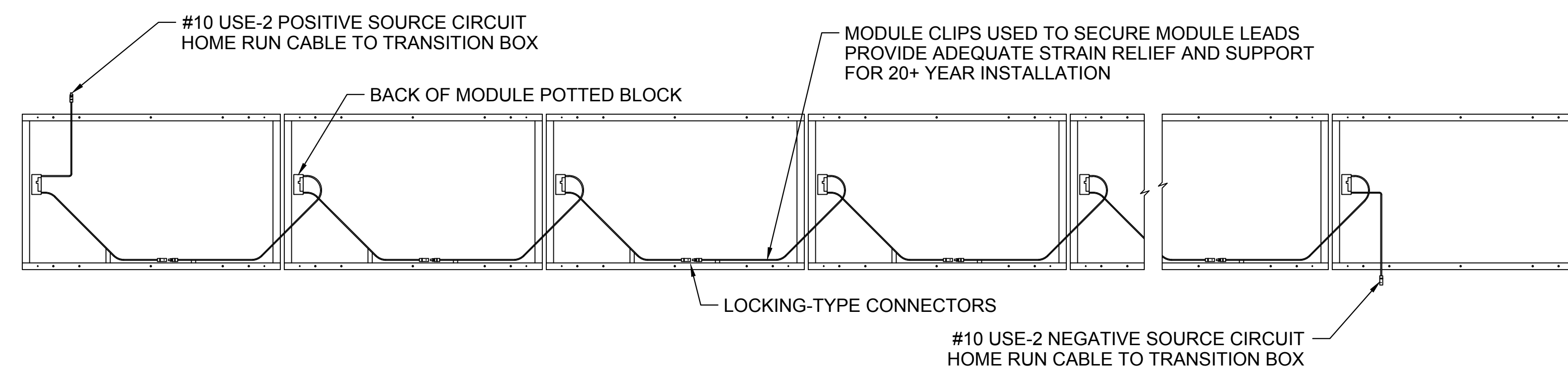
SCALE: 3/4" = 1'-0"



NOTE: PROVIDE QUANTITY AS REQUIRED TO SUPPORT EXTERNAL CONDUIT

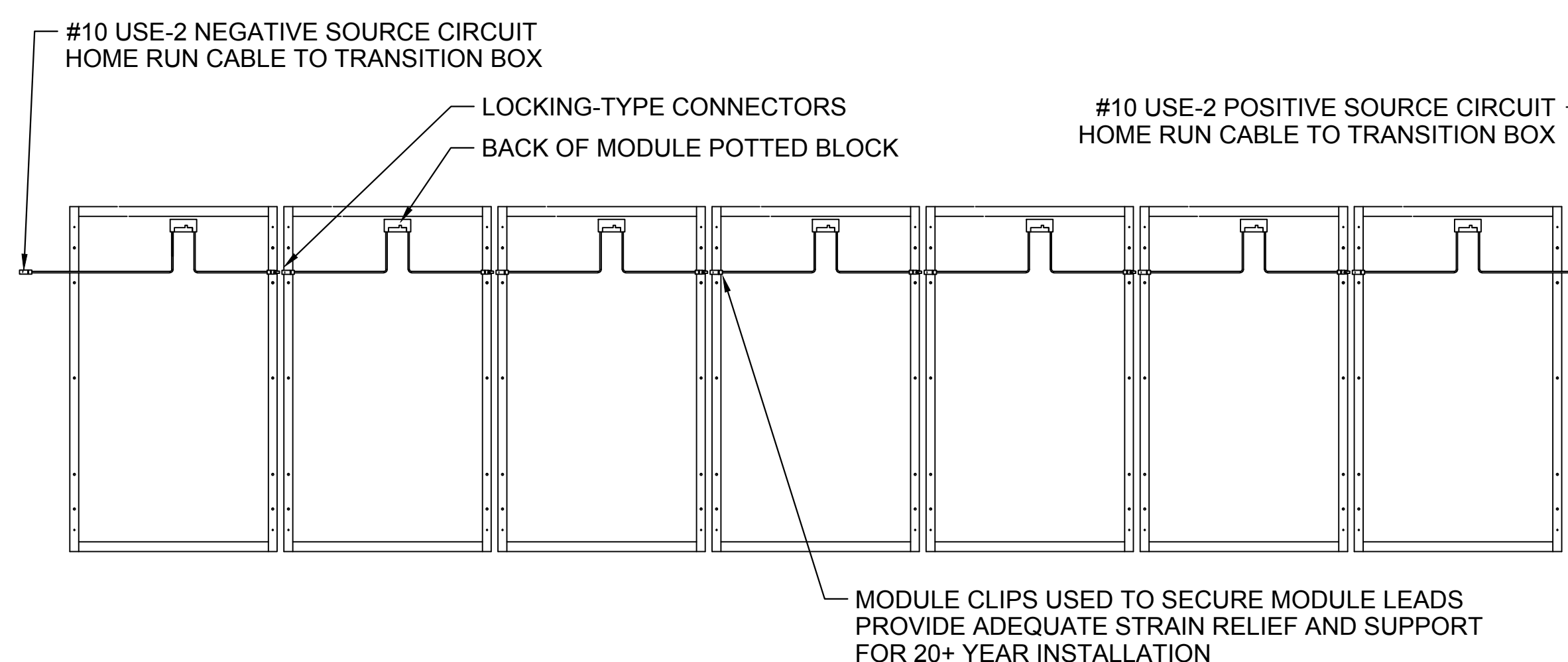
5 CONDUIT SUPPORT DETAIL

NTS



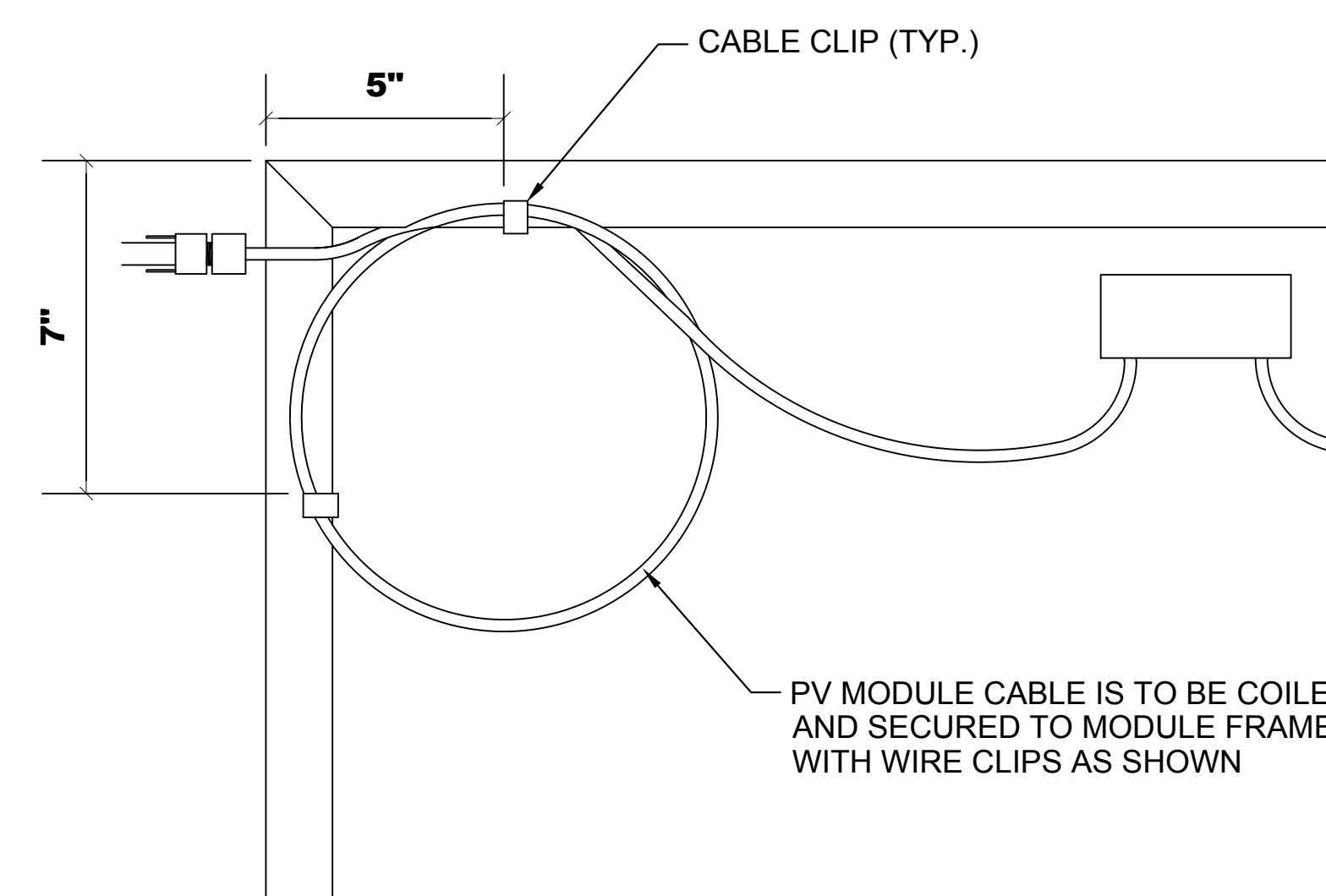
2 PV STRING WIRING DETAIL

NTS



3 PV STRING WIRING DETAIL

NTS



4 PV WIRE MANAGEMENT DETAIL

NTS

MEXICO SCHOOL HART CAREER CENTER 24.705kW PV System

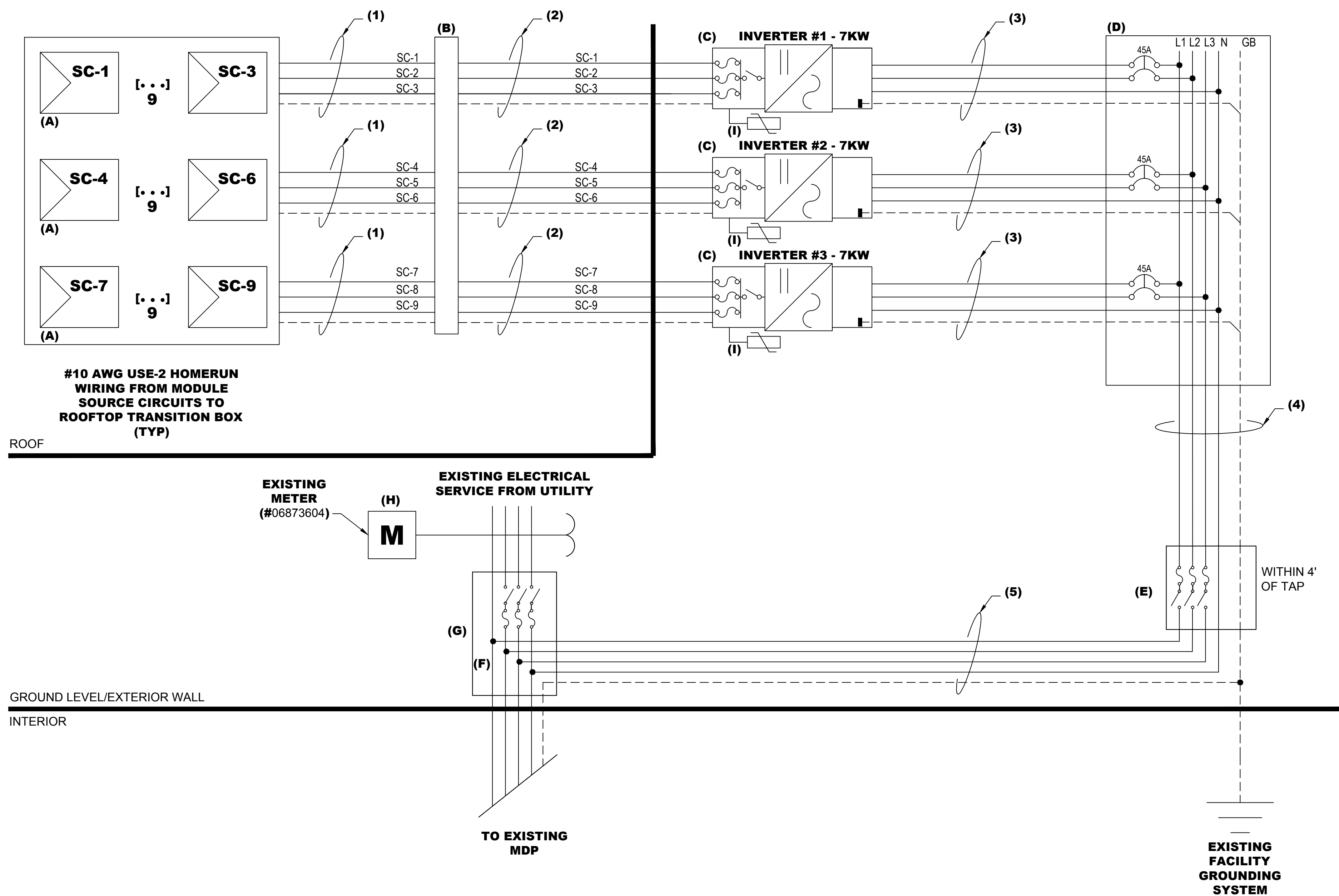
905 N. WADE ST.
MEXICO, MO 65265

01/03/2014

NJK **AJN** **MR**

ELECTRICAL LINE DIAGRAM

E3



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, 208VAC, NEMA 3R W/ INTEGRAL DC COMBINER	3
(D)	SOLAR COMBINING PANEL: 225A, 208V, 3-PHASE, 4-WIRE, 250V, NEMA 3R	1
(E)	PV DISCONNECT FOR UTILITY OPERATION: 100AT, 80AF, 250V, NEMA 3R	1
(F)	POINT OF INTERCONNECTION AT 1200A SERVICE DISCONNECT	1
(G)	EXISTING SERVICE FUSED DISCONNECT: 1200A, 250V	1
(H)	EXISTING BILLING METER TO BE SWAPPED AFTER UTILITY INSPECTION	1
(I)	LIGHTNING SUPPRESSOR(S) - PART #LA602 (DC)	3

- 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:
 - (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).

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	0.51	#6	FREE AIR
(2)	13.96 Adc	30'	6	#10 THWN-2	0.19	#6	1-1/2"
(3)	42.5 Aac	10'	3	#8 THWN-2	0.68	#8	1-1/2"
(4)	73.5 Aac	10'	4	#4 THWN-2	0.16	#6	1-1/2"
(5)	73.5 Aac	4'	4	#4 THWN-2	0.06	#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 (2), 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 (5 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 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: 25.59Aac
2) MAXIMUM POWER-POINT VOLTAGE: 321.3Vdc
3) MAXIMUM SYSTEM VOLTAGE (ADJUSTED): 461.1Vdc
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): 461.1Vdc
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): 461.1Vdc
4) SHORT CIRCUIT CURRENT (ADJUSTED): 33.56Aac

①

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 SOUTH WALL

②
③
④
⑤

UTILITY BILLING METER & POINT OF INTERCONNECTION (& MDP, IF SEPARATE), SHALL RECEIVE A PERMANENT LABEL, DENOTING ALL ELECTRICAL POWER SOURCES PER NEC ARTICLE 705.12(D)(4) & 705.10 (2 REQUIRED)

EQUIPMENT FED BY TWO SOURCES:
UTILITY AND PHOTOVOLTAIC SYSTEM,
WITH MAIN PV DISCONNECT LOCATED
ON EXTERIOR SOUTH WALL

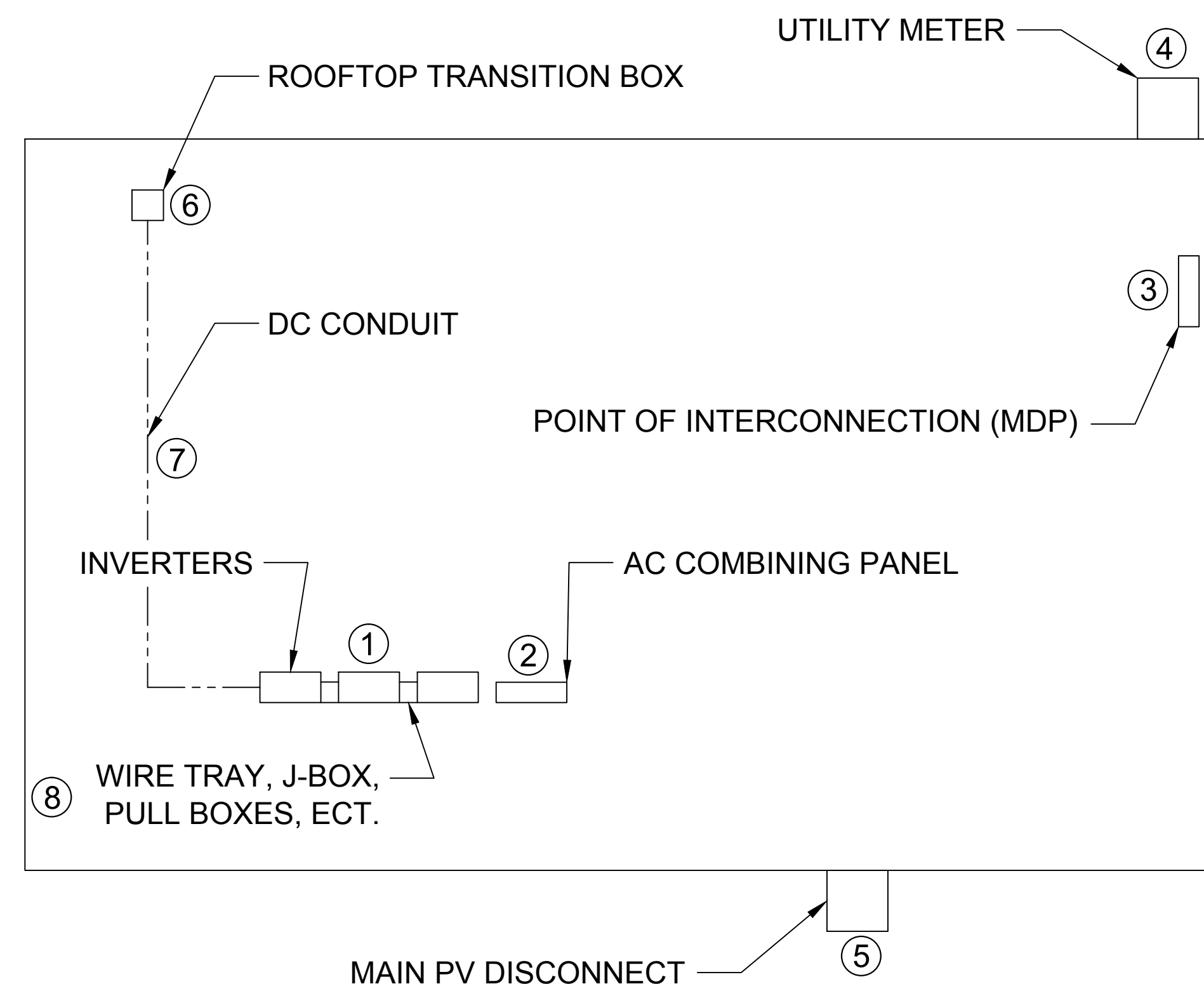
③
④

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

****SAMPLE LAYOUT FOR REFERENCE ONLY****



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.

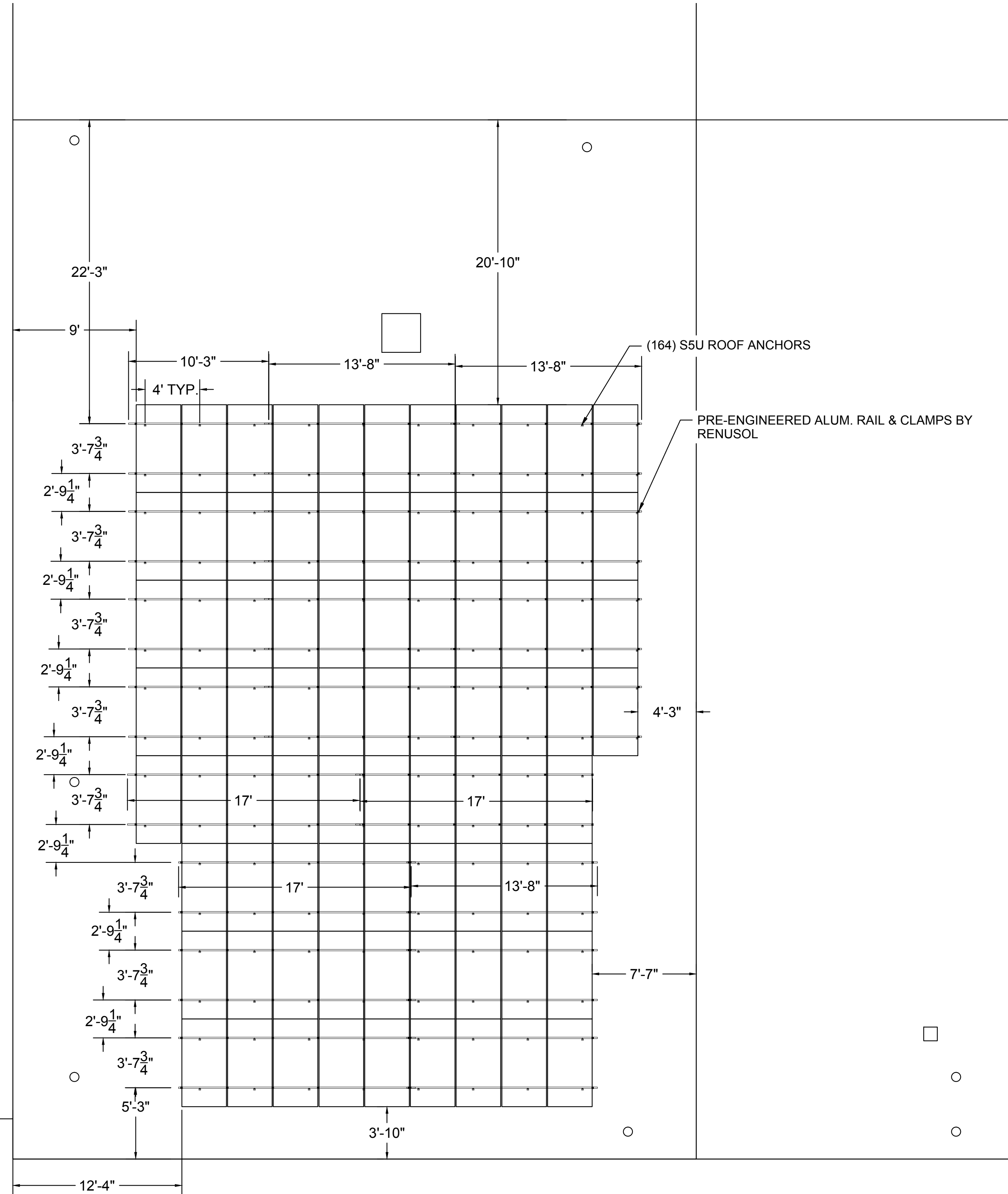
- AN ADDITIONAL LABEL SHALL BE PLACED ADJACENT TO THE MAIN SERVICE DISCONNECT IN A LOCATION CLEARLY VISIBLE FROM THE LOCATION WHERE THE DISCONNECT IS OPERATED.

- 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

- NOTES:
 - RAILS MUST EXTEND 1.5" MINIMUM BEYOND END MODULES.
 - END MODULES MUST NOT EXTEND MORE THAN 24" FROM END ROOF ANCHORS.
 - ROOF ANCHORS MUST BE PLACED ON ONE SIDE OF EVERY SPLICE, ON NEAREST STRUCTURAL SUPPORT.
 - EXPANSION GAP REQUIRED WHERE INDICATED, RAIL GAP = 1", MODULE GAP = 4", MODULE NOT TO EXTEND MORE THAN 24" FROM NEAREST SUPPORT.



1 ARRAY RACKING LAYOUT
 SCALE: 3/16" = 1'-0"



SOLAR SOLUTIONS

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

PROJECT INFORMATION:

**MEXICO SCHOOL
 HART CAREER
 CENTER**
 24.705kW PV System

905 N. WADE ST.
 MEXICO, MO 65265

ISSUE DATE:

01/03/2014

REV: _____ DATE: _____ BY: _____

ENGINEER:

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

NJK **AJN** **MR**

STAMP:

SHEET TITLE:

**RACKING
 LAYOUT**

SHEET NUMBER:

S1

PROJECT INFORMATION:

**MEXICO SCHOOL
HART CAREER
CENTER**
24.705kW PV System

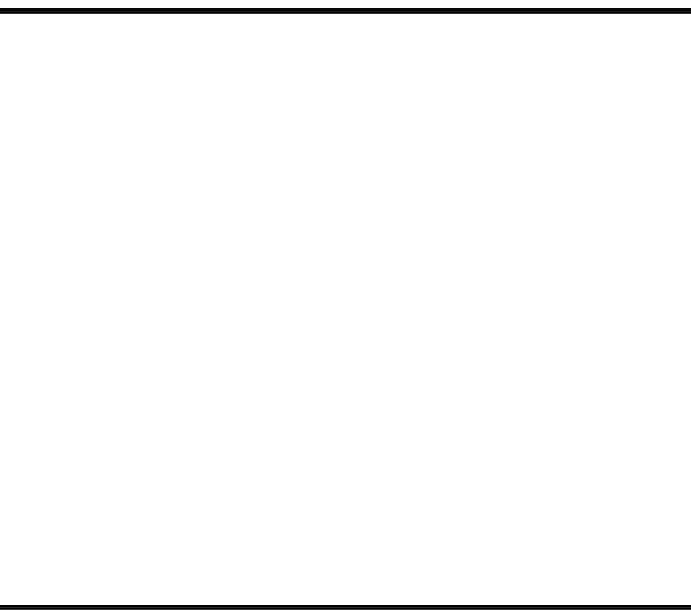
905 N. WADE ST.
MEXICO, MO 65265

ISSUE DATE:

01/03/2014

REV: _____ DATE: _____ BY: _____

ENGINEER:



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

NJK AJN MR

STAMP:

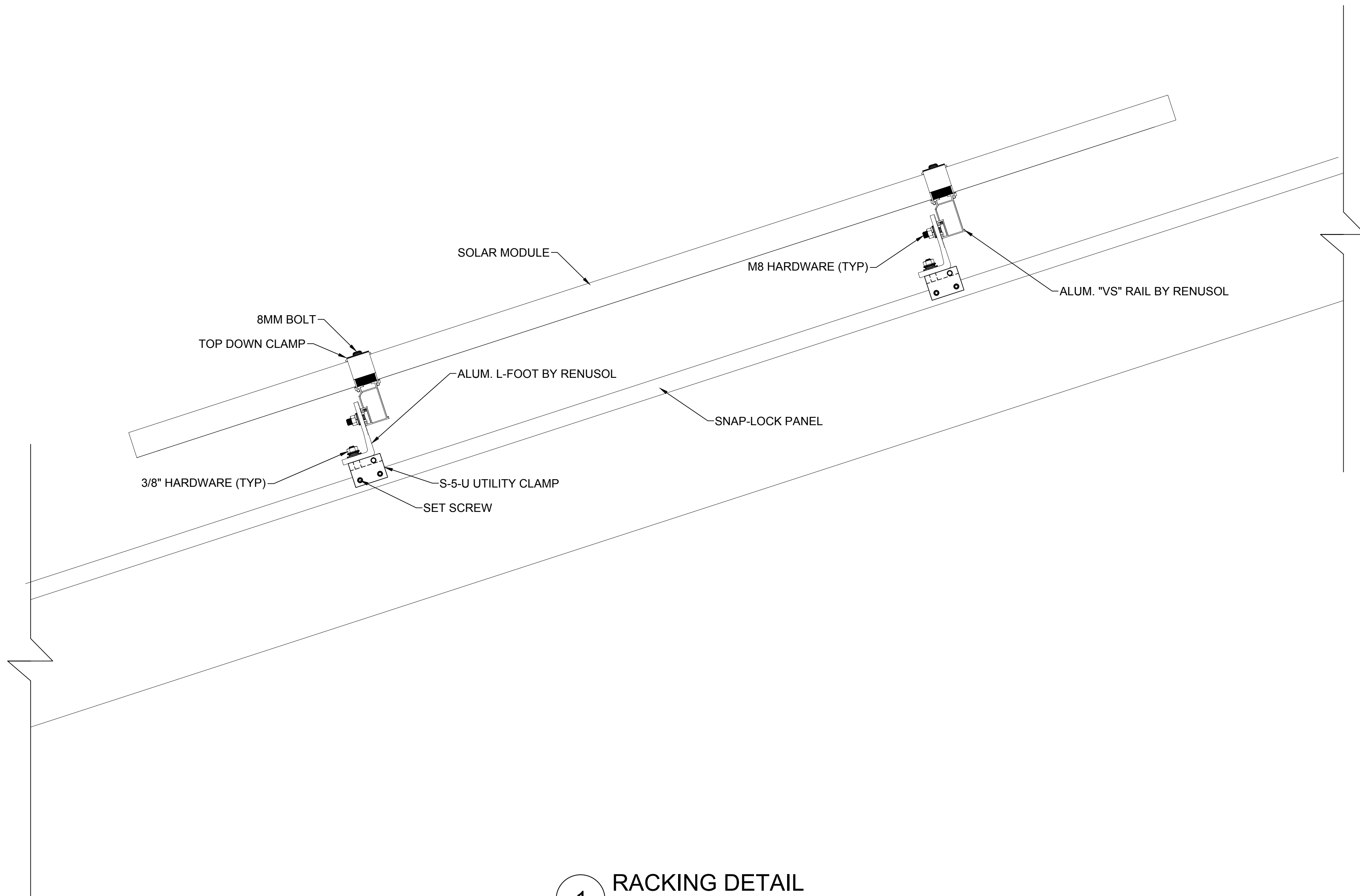


SHEET TITLE:

**RACKING
DETAILS**

SHEET NUMBER:

S2



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