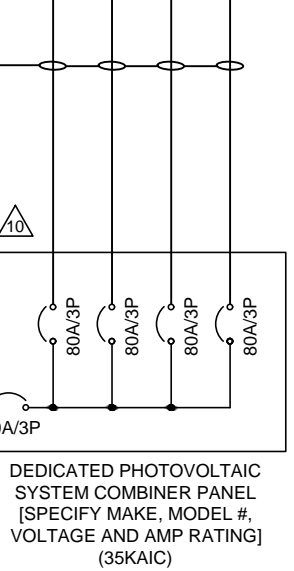
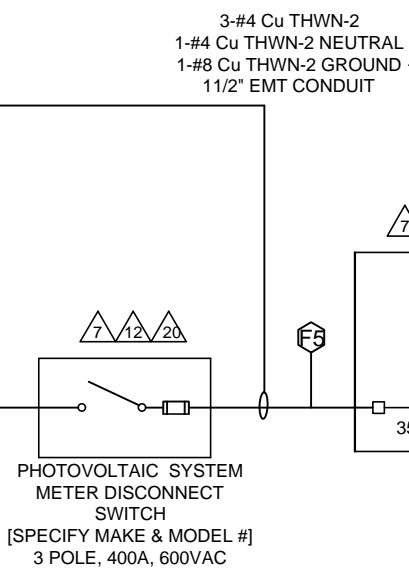
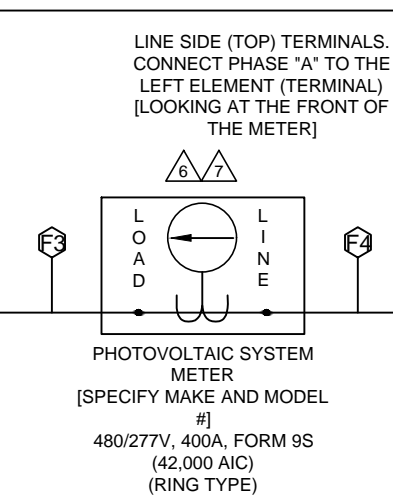
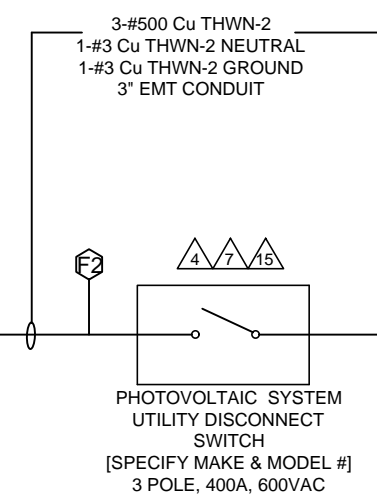
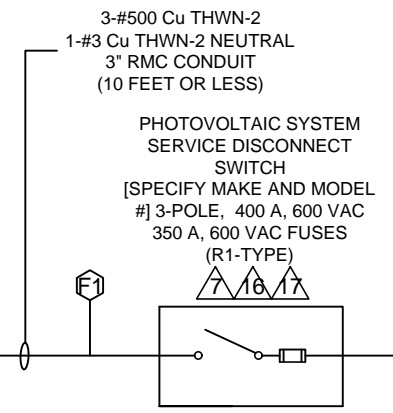
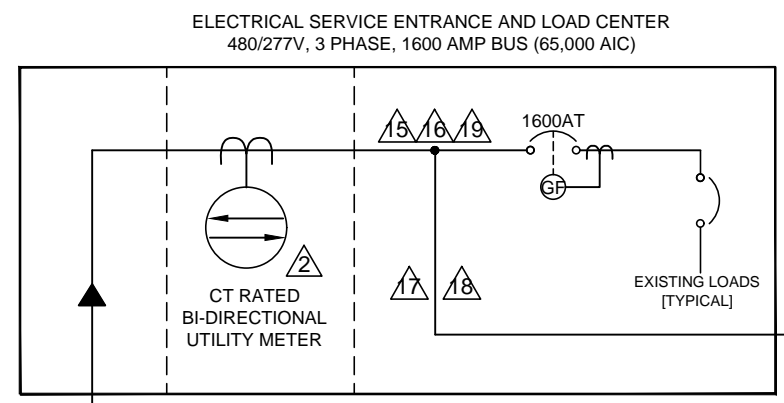
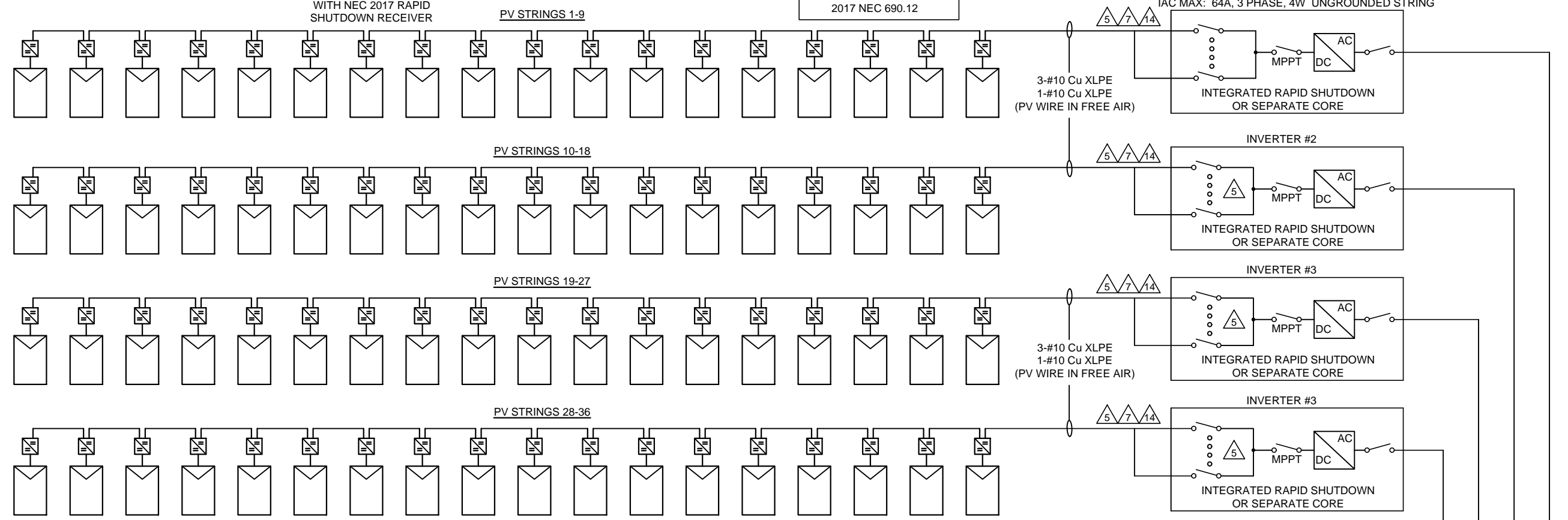


REV.	DESCRIPTION	DATE
A	PRELIMINARY DRAWING SET	09-10-10
B	REVISED PER 2011 NEC REQUIREMENTS	04-30-13
C	REVISED FAULT CURRENT CALCULATIONS	12-19-14
D	REVISED PER 2017 NEC REQUIREMENTS	09-13-19

Voc=896.4VDC,
Isc=10.36AMPS
Vmp=750.6VDC, Imp=9.6AMPS
7200 WATT
PHOTO-VOLTAIC STRINGS
WITH NEC 2017 RAPID
SHUTDOWN RECEIVER

THESE RAPID SHUTDOWN
COMPONENTS SHALL BE
LISTED OR FIELD LABELED
AS AN ASSEMBLY IN
ACCORDANCE WITH
2017 NEC 690.12



UTILITY GRID 480/277V,
3 Phase, 4 Wire
MAX ISC PER APS ESRM
800.2 IS 32,990A

NOTE: FOR COMBINER BOX
TO BE RATED PROPERLY
FOR THE AVAILABLE FAULT
CURRENT, TAKE F4 ISC AND
ADD TO THE FULL LOAD
INVERTER FAULT AT 120%.
IN THIS CASE SINCE WE
HAVE FOUR INVERTERS, THE
FAULT CONTRIBUTION FROM
THE PV SYSTEM WILL BE THE
TOTAL FAULT CONTRIBUTION
FROM INVERTERS.

I.E. $4 \times (64A \times 120\%) = 307A + 27,163A = 27,470A$

FAULT CALCS:			
F1: AVAIL = 32,990 AIC d = 10 feet f = 0.0537 m = 0.949 Isc = 31,309 AIC	F2: AVAIL = 31,309 AIC d = 10 feet f = 0.0509 m = 0.9515 Isc = 29,790 AIC	F3: AVAIL = 29,790 AIC d = 10 feet f = 0.0485 m = 0.954 Isc = 28,419 AIC	F4: AVAIL = 28,419 AIC d = 10 feet f = 0.0462 m = 0.9558 Isc = 27,163 AIC
F5: AVAIL = 27,163 AIC d = 200 feet f = 5.146 m = 0.163 Isc = 4,420 AIC			

* SOURCE: COOPER
BUSSMAN SPD MANUAL, REV
2009. CALCULATIONS IN
ACCORDANCE WITH NEC
ART 110.9 & 110.10.

NOTE: SYSTEM DESIGNED IN
ACCORDANCE WITH THE
2017 N.E.C.

SAMPLE SUPPLY SIDE CONNECTION ONE-LINE DRAWING

1234 South Main Street
Any City, Arizona 85123
Tel: 602-555-5555

APPROVALS	DATE
DRAWN ABC	09-10-10
CHECKED	
ENGINEER	
REV. D	09-13-19

ABC PROJECT #1111-9999

ABC SOLAR COMPANY INC.

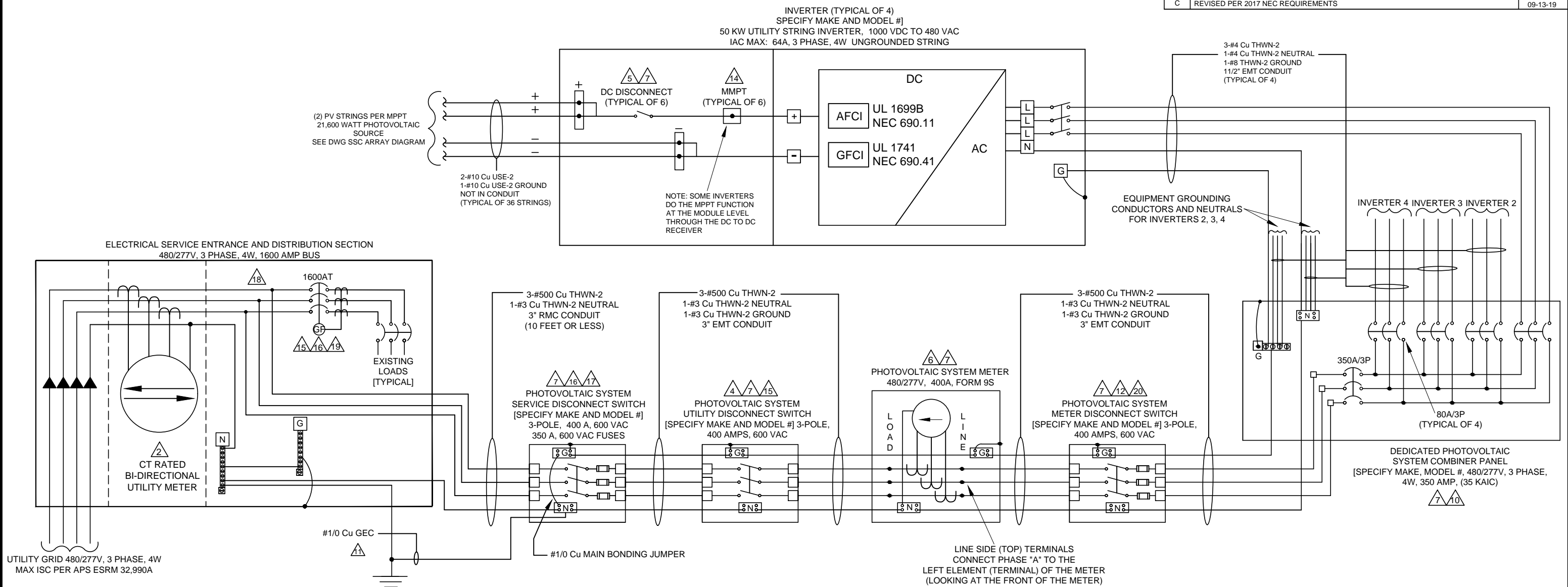
ONE-LINE ELECTRICAL DIAGRAM
200 KW AC PHOTOVOLTAIC SYSTEM
999 N. CACTUS BIRD RD.
ANY CITY, AZ 85123

SIZE	CODE INTENT NO.	DRAWING NO.
B		SSC ONE-LINE

SCALE NA REV. D SHEET 1 OF 5

This Sample Drawing is for
illustration purposes only and is
not to be used for design or
construction. This drawing and
its suitability for end use is not
implied. The intent is to only
illustrate typical minimum
information required at time of
application to APS. Additional
information may be required.

REV.	DESCRIPTION:	DATE
A	PRELIMINARY DRAWING SET	09-10-10
B	APS CORRECTIONS	10-10-10
C	REVISED PER 2017 NEC REQUIREMENTS	09-13-19



NOTES:

- 1 ALL EQUIPMENT SHALL BE INSTALLED AND LABELED IN ACCORDANCE WITH THE NEC AND ALL APPLICABLE REQUIREMENTS OF THE SERVING ELECTRIC UTILITY COMPANY AND OF THE LOCAL AUTHORITY HAVING JURISDICTION.
- 2 CT-RATED BI-DIRECTIONAL UTILITY METER INSTALLED BY UTILITY COMPANY.
- 3 -----
- 4 LABEL "PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH". SWITCH COVER TO BE LOCKED AT ALL TIMES. SWITCH TO BE VISUAL OPEN, ACCESSIBLE PER UTILITY REQUIREMENTS, CONFORM TO NEC 705.22, AND RATED FOR THE AVAILABLE FAULT CURRENT.
- 5 LABEL "PHOTOVOLTAIC DC DISCONNECT PER NEC 690.13(B)". LABEL WITH OPERATING CURRENT, OPERATING VOLTAGE, MAXIMUM SYSTEM VOLTAGE, AND SHORT CIRCUIT CURRENT PER NEC 690.53. SWITCH TO BE LOCKED PER NEC 110.26 & 110.27. [SWITCH IS INTERNAL TO INVERTER].
- 6 LABEL "PHOTOVOLTAIC SYSTEM METER". METER ENCLOSURE AND SOCKET PROVIDED AND INSTALLED BY CUSTOMER PER APS ESRM. METER, CTs AND TEST SWITCHES PROVIDED BY UTILITY COMPANY WHEN REQUIRED. **NOTE: CUSTOMER TO SUBMIT SHOP DRAWINGS OF METERING CABINET TO APS METERSHOP FOR APPROVAL.**
- 7 PROVIDE WARNING SIGN PER NEC 690.17 READING "WARNING-ELECTRIC SHOCK HAZARD-DO NOT TOUCH TERMINALS-TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OFF POSITION".
- 8 -----
- 9 METALLIC CONDUIT SHALL BE USED WITHIN BUILDING PER NEC 690.31(G).
- 10 LABEL "DEDICATED PHOTOVOLTAIC SYSTEM COMBINER PANEL" AND "DO NOT ADD LOADS TO THIS PANEL".
- 11 GEC TO BE INSTALLED PER NEC 250.

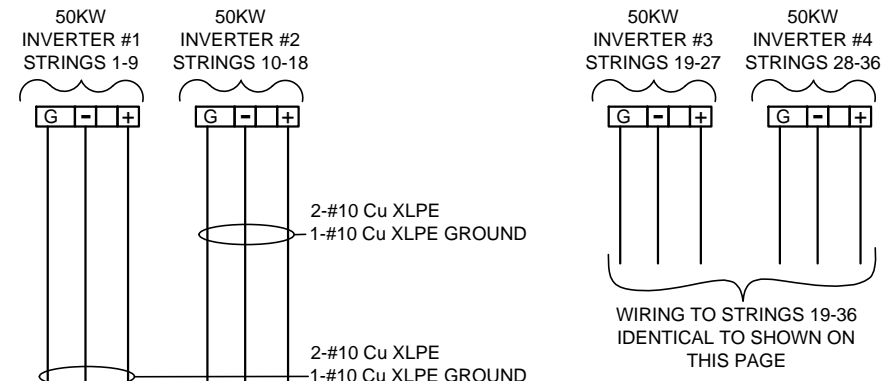
- 12 LABEL "PHOTOVOLTAIC SYSTEM METER DISCONNECT SWITCH". SWITCH COVER TO BE LOCKED AT ALL TIMES. SWITCH TO BE ACCESSIBLE PER UTILITY REQUIREMENTS, CONFORM TO NEC 705.22, AND RATED FOR THE AVAILABLE FAULT CURRENT.
- 13 -----
- 14 THE STRING INVERTERS DEPICTED HAVE A MAXIMUM OF TWO STRINGS PER MMPT; THEREFORE, THE STRINGS DO NOT REQUIRE OVERCURRENT DEVICES. FOR STRING INVERTERS WITH THREE STRINGS OR MORE IN PARALLEL EACH SERIES STRING REQUIRES OVERCURRENT DEVICES.
- 15 A PLACARD OR DIRECTORY IS INSTALLED AT THE SERVICE ENTRANCE WITH EXPLICIT DIRECTIONS TO THE LOCATION OF THE PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH PER APS REQUIREMENTS.
- 16 A PERMANENT PLACARD OR DIRECTORY IS INSTALLED PER NEC 705.10.
- 17 SUPPLY SIDE CONNECTION IS INSTALLED PER NEC 230, APS ESRM AND APS INTERCONNECTION REQUIREMENTS. LABEL "PHOTOVOLTAIC SYSTEM SERVICE DISCONNECT". SWITCH TO BE LOCKED AT ALL TIMES.
- 18 SUPPLY SIDE CONNECTION IS INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. DOCUMENTATION IS INCLUDED WITH THE APS INTERCONNECTION APPLICATION.
- 19 LABEL "WARNING - A GENERATION SOURCE IS CONNECTED TO THE SUPPLY (UTILITY) SIDE OF THE SERVICE DISCONNECTING MEANS. FOLLOW PROPER LOCKOUT/TAGOUT PROCEDURES TO ENSURE THE PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH IS OPENED PRIOR TO PERFORMING WORK ON THIS DEVICE."
- 20 LABEL "PHOTOVOLTAIC SYSTEM METER DISCONNECT SWITCH". SWITCH COVER TO BE LOCKED AT ALL TIMES. SWITCH TO BE VISUAL OPEN AND ACCESSIBLE PER UTILITY REQUIREMENTS, CONFORM TO NEC 705.22, AND RATED FOR THE AVAILABLE FAULT CURRENT.

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SAMPLE SUPPLY SIDE CONNECTION 3-LINE DIAGRAM

1234 South Main Street Any City, Arizona 85123 Tel: 602-555-5555		ABC SOLAR COMPANY INC.	
APPROVALS		DATE	
DRAWN	ABC	09-10-10	
CHECKED			
ENGINEER			
REV. C		09-03-19	
ABC PROJECT #1111-9999		SIZE	CODE INTENT NO.
		B	
		DRAWING NO.	
		SSC THREE-LINE	
SCALE		NA	REV. C
		SHEET 2 OF 5	

REV.	DESCRIPTION	DATE
A	PRELIMINARY DRAWING SET	09/10/10
B	REVISED PER 2011 NEC REQUIREMENTS	04/30/13
C	REVISED PER 2017 NEC REQUIREMENTS	09/13/19



PHOTOVOLTAIC MODULE SPECIFICATIONS

[SPECIFY MAKE & MODEL]
 400 WATTS
 $V_{oc}=49.8$ VDC, $I_{sc}=10.36$ AMPS
 $V_{mp}=41.7$ VDC, $I_{mp}=9.6$ AMPS
 T_{coeff} of $V_{oc}=-0.28$ %/°C
 T_{coeff} of $P_{max}=-0.36$ %/°C

ONE PHOTOVOLTAIC STRING

7,200 WATTS
 18 MODULES IN SERIES PER STRING
 $V_{oc}=896.4$ VDC, $I_{sc}=10.36$ AMPS
 $V_{mp}=750.6$ VDC, $I_{mp}=9.6$ AMPS
 TYPICAL OF 36 STRINGS
 (9 STRINGS PER INVERTER)

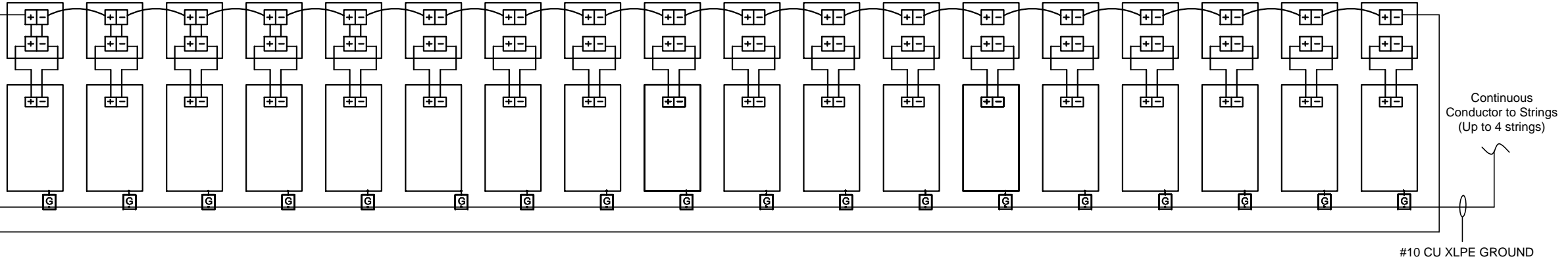
COMPLETE PHOTOVOLTAIC ARRAY

259,200 WATTS
 $V_{oc} = 896.4$ VDC, $I_{sc} = 372.96$ AMPS
 $V_{mp} = 750.6$ VDC, $I_{mp} = 345.6$ AMPS

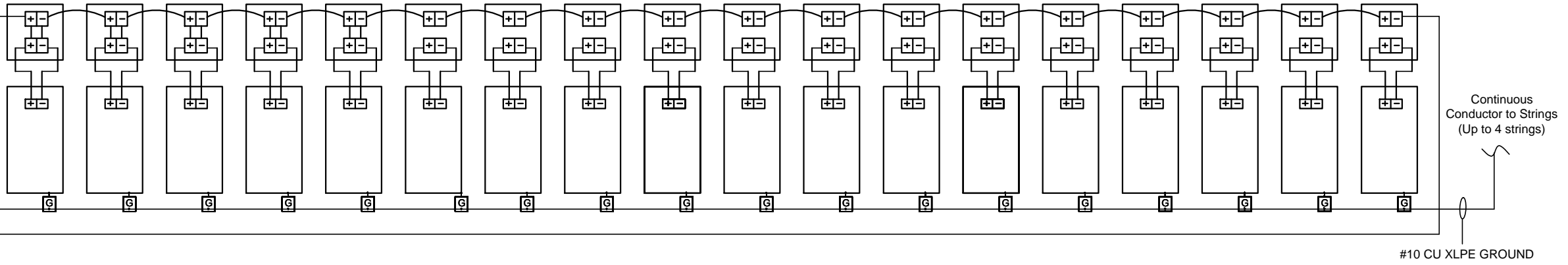
RAPID SHUTDOWN TRANSMITTER AND RECEIVER COMPONENTS SHALL BE LISTED OR FIELD LABELED AS AN ASSEMBLY IN ACCORDANCE WITH 2017 NEC 690.12

TS4-F FIRE SAFETY RAPID SHUTDOWN RECEIVERS

PV STRING OF 18 MODULES (TYPICAL OF 9)



PV STRING OF 18 MODULES (TYPICAL OF 9)



NOTES:

- EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE NEC AND ALL APPLICABLE REQUIREMENTS OF THE LOCAL AUTHORITY HAVING JURISDICTION.
- FOLLOW MANUFACTURERS SUGGESTED INSTALLATION PRACTICES AND WIRING SPECIFICATIONS.
- WIRES SHALL BE RATED AND LABELED "SUNLIGHT RESISTANT" WHERE EXPOSED TO AMBIENT CONDITIONS.

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SAMPLE SUPPLY SIDE CONNECTION ARRAY DRAWING

1234 South Main Street Any City, Arizona 85123 Tel: 602-555-5555		ABC SOLAR COMPANY INC.	
THREE-LINE ELECTRICAL ARRAY DIAGRAM 200 KW AC PHOTOVOLTAIC SYSTEM 999 N. CACTUS BIRD RD. ANY CITY, AZ 85123		SIZE B	CODE INTENT NO.
APPROVALS	DATE	DRAWING NO. SSC ARRAY DIAGRAM	
DRAWN ABC	09-10-10	SCALE NA	REV. C
CHECKED		SHEET 3 OF 5	
ENGINEER			
REV. C	09-13-19		
ABC PROJECT #1111-9999			

REV.	DESCRIPTION:	DATE
A	PRELIMINARY DRAWING SET	09/10/10



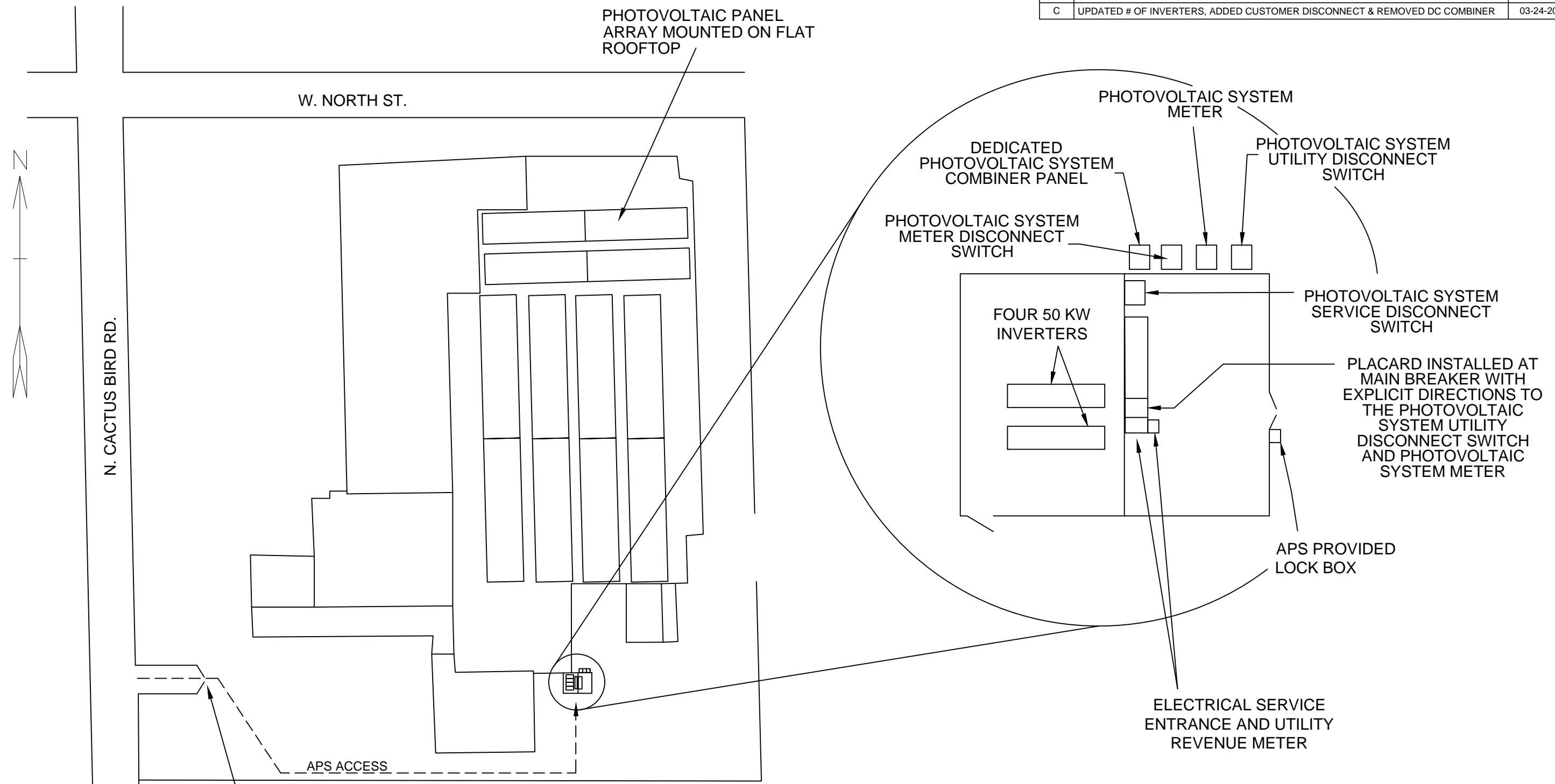
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SAMPLE SUPPLY SIDE CONNECTION PLANT LOCATION

1234 South Main Street Any City, Arizona 85123 Tel: 602-555-5555		ABC SOLAR COMPANY INC.	
APPROVALS		DATE	
DRAWN	ABC	09-10-10	
CHECKED			
ENGINEER			
REV. A	09-10-10		
ABC PROJECT #1111-9999		SIZE A	CODE INTENT NO. DRAWING NO. SSC PLANT LOCATION
		SCALE NA	REV. A SHEET 4 OF 5

PLANT LOCATION
200 KW AC PHOTOVOLTAIC SYSTEM
999 N. CACTUS BIRD RD.
ANY CITY, AZ 85123

REV.	DESCRIPTION:	DATE
A	PRELIMINARY DRAWING SET	09-10-10
B	ADDED METER DISCONNECT SWITCH	02-24-20
C	UPDATED # OF INVERTERS, ADDED CUSTOMER DISCONNECT & REMOVED DC COMBINER	03-24-20



DRIVEWAY WITH GATE & KEY CODE SECURITY IN APS PROVIDED LOCKBOX
ACCESS CODE: 12345#

NOTE: UTILITY HAS 24-HR UNRESTRICTED ACCESS TO THE PHOTOVOLTAIC SYSTEM METER AND PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH THROUGH THE SECURITY GATE

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SAMPLE SUPPLY SIDE CONNECTION SITE PLAN

1234 South Main Street Any City, Arizona 85123 Tel: 602-555-5555		ABC SOLAR COMPANY INC.	
APPROVALS		DATE	
DRAWN ABC		09-10-10	
CHECKED			
ENGINEER			
REV. C		03-24-20	
ABC PROJECT #1111-9999		SIZE B	CODE INTENT NO.
		DRAWING NO. SSC SITE PLAN	
		SCALE NA	REV. C
		SHEET 5 OF 5	

200 KW AC PHOTOVOLTAIC SYSTEM
 999 N. CACTUS BIRD RD.
 ANY CITY, AZ 85123