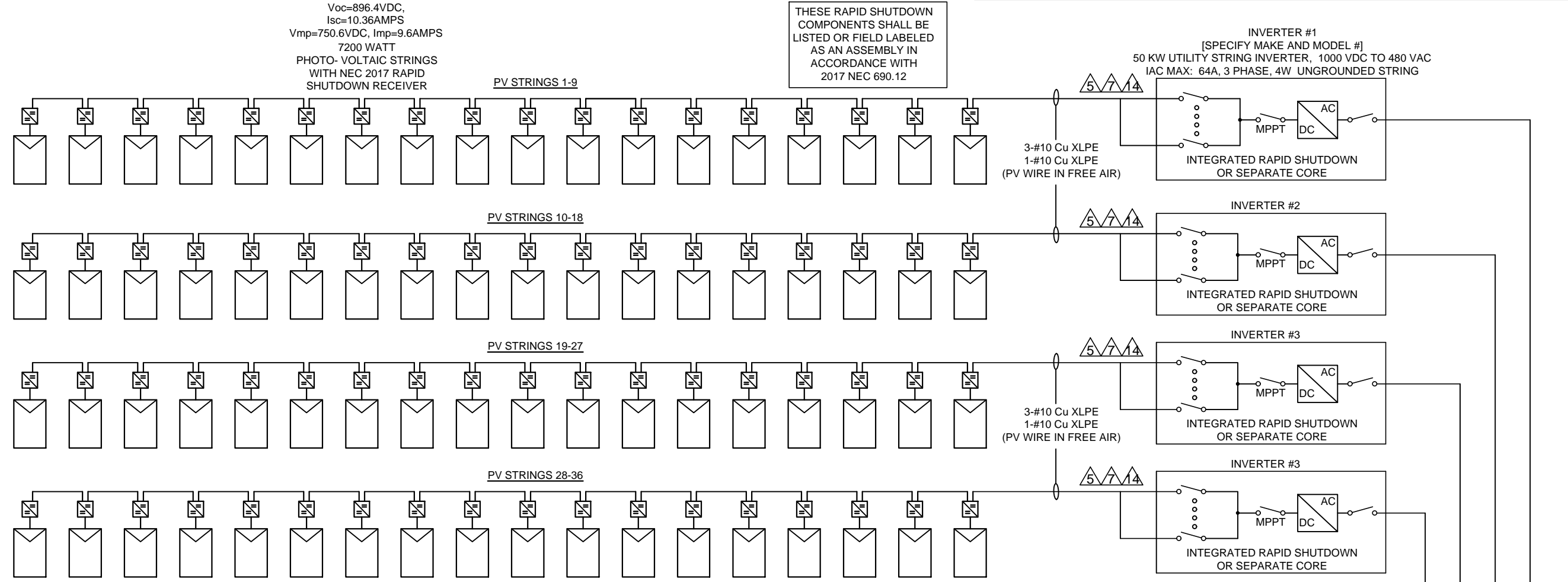


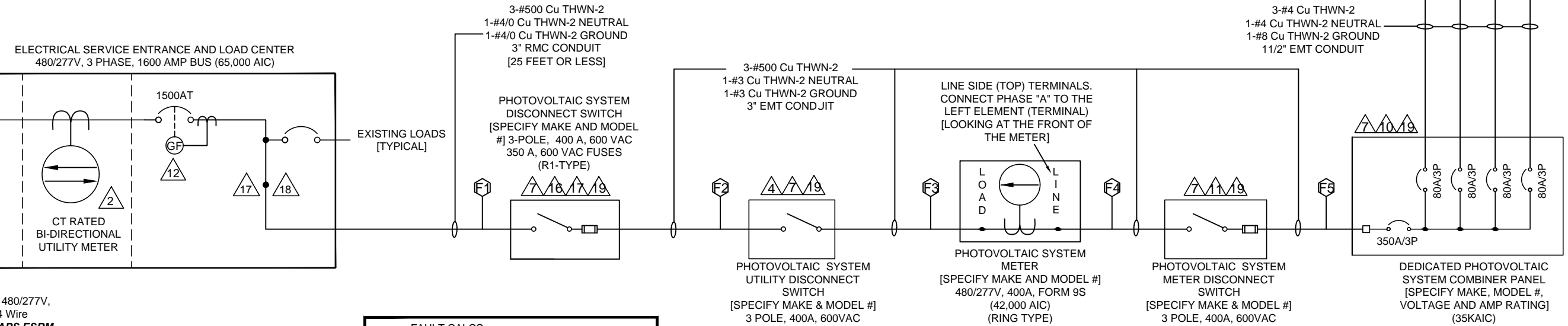
REV.	DESCRIPTION	DATE
A	NEW DRAWING - LST	12-19-14
B	REVISED PER 2017 NEC REQUIREMENTS	03-18-20



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

INVERTER #1  
[SPECIFY MAKE AND MODEL #]  
50 KW UTILITY STRING INVERTER, 1000 VDC TO 480 VAC  
IAC MAX: 64A, 3 PHASE, 4W UNGROUNDED STRING



ELECTRICAL SERVICE ENTRANCE AND LOAD CENTER  
480/277V, 3 PHASE, 1600 AMP BUS (65,000 AIC)

3-#500 Cu THWN-2  
1-#4/0 Cu THWN-2 NEUTRAL  
1-#4/0 Cu THWN-2 GROUND  
3" RMC CONDUIT  
[25 FEET OR LESS]

3-#4 Cu THWN-2  
1-#4 Cu THWN-2 NEUTRAL  
1-#8 Cu THWN-2 GROUND  
1 1/2" EMT CONDUIT

**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	

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 X (64A X 120%) = 307A +  
27,163A = 27,470A

\* 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.

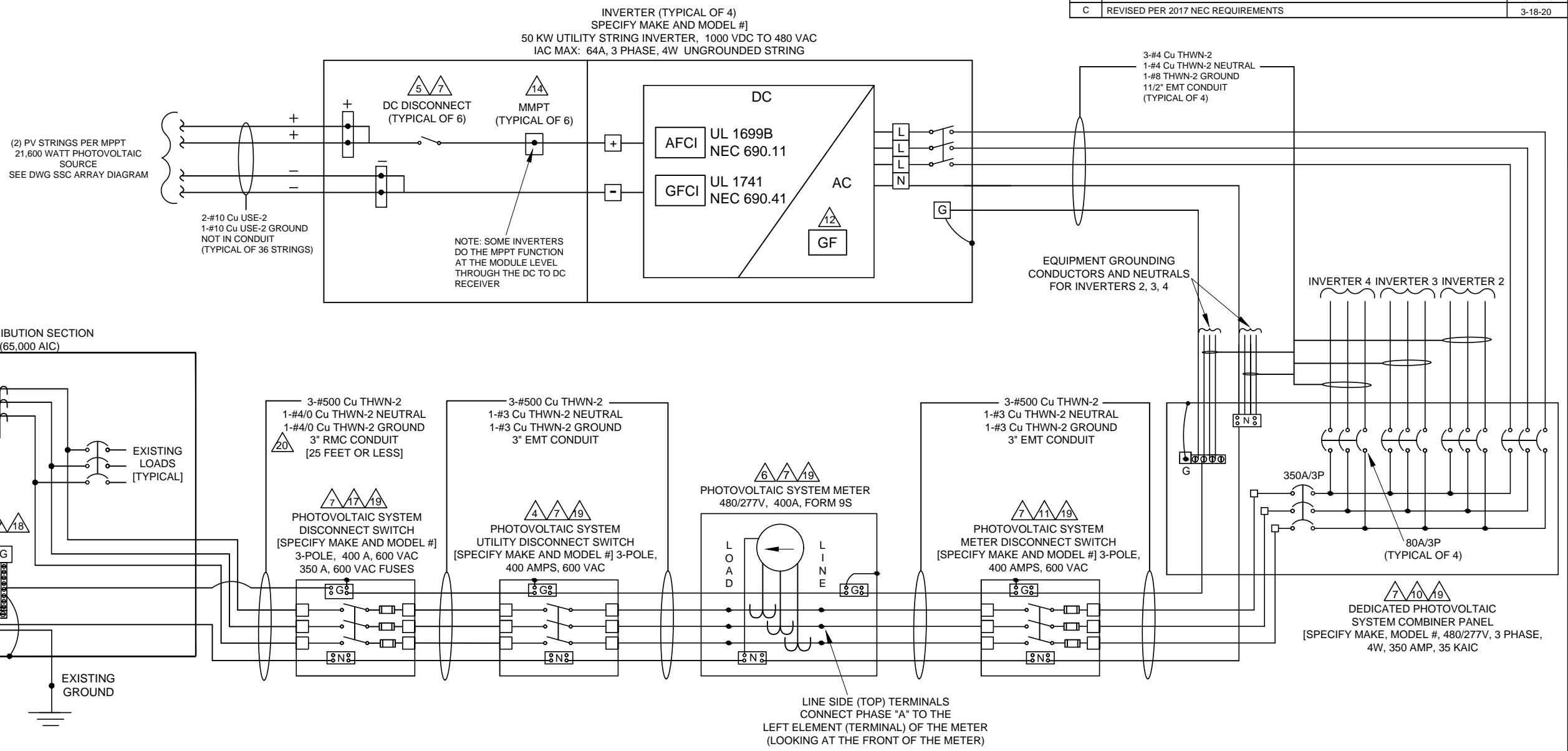
**SAMPLE LOAD SIDE TAP ONE-LINE DIAGRAM**

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. B		03-18-20	
ABC PROJECT #1111-9999		SIZE B	CODE INTENT NO.
		DRAWING NO. LST ONE-LINE	
SCALE NA	REV. B	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.

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

REV.	DESCRIPTION:	DATE
A	PRELIMINARY DRAWING SET	09-10-10
B	APS CORRECTIONS	10-10-10
C	REVISED PER 2017 NEC REQUIREMENTS	3-18-20



**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 SYSTEM 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. [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 690.13(B) READING "WARNING-ELECTRIC SHOCK HAZARD-DO NOT TOUCH TERMINALS-TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN 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".

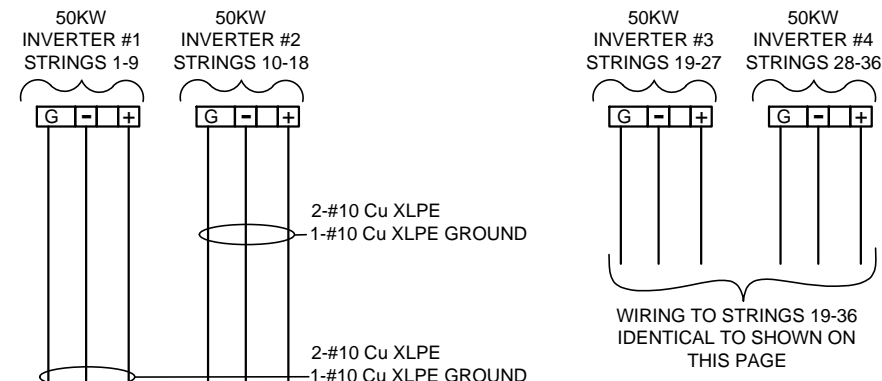
- 11 LABEL "PHOTOVOLTAIC SYSTEM METER DISCONNECT SWITCH". SWITCH COVER TO BE LOCKED AT ALL TIMES. SWITCH TO BE ACCESSIBLE PER UTILITY REQUIREMENTS, CONFORM TO NEC 705.22, AND RATED FOR THE AVAILABLE FAULT CURRENT.
- 12 GROUND-FAULT PROTECTION ACCESSORY INTEGRAL TO THE INVERTER IN ACCORDANCE WITH NEC 705.32 SINCE THE EXISTING MAIN IS EQUIPPED WITH GROUND FAULT PROTECTION. DOCUMENTATION IS INCLUDED WITH THE DRAWINGS AND INTERCONNECTION APPLICATION SHOWING THE CALCULATIONS ON HOW TO PROPERLY SET THE GROUND FAULT TRIPS ON BOTH THE MAIN AND PV SYSTEM. DOCUMENTATION FROM THE MAIN BREAKER SUPPLIER CERTIFYING THAT GROUND FAULT ACCESSORY IS SUITABLE FOR BACK FEEDING.
- 13 IF DC FUSES ARE ADDED, LABEL: "WARNING, DO NOT OPEN FUSES UNDER LOAD."
- 14 THE STRING INVERTERS DEPICTED HAVE A MAXIMUM OF TWO STRINGS PER MPPT; 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 AS REQUIRED BY APS.
- 16 -----
- 17 LOAD SIDE TAP IS INSTALLED PER NEC 240.21(B) AND LOCAL AHJ APPROVALS. LABEL "PHOTOVOLTAIC CUSTOMER DISCONNECT". SWITCH TO BE LOCKED AT ALL TIMES.
- 18 LOAD SIDE TAP IS INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. DOCUMENTATION IS INCLUDED WITH THE APS INTERCONNECTION APPLICATION.
- 19 EQUIPMENT SHALL BE TESTED, LISTED AND MARKED TO WITHSTAND THE AVAILABLE SHORT CIRCUIT CURRENT.
- 20 EGC IS INSTALLED IN ACCORDANCE WITH NEC ARTICLE 250.122(G).

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**SAMPLE LOAD SIDE TAP 3-LINE DIAGRAM**

1234 South Main Street Any City, Arizona 85123 Tel: 602-555-5555		<b>ABC SOLAR COMPANY INC.</b>	
APPROVALS		DATE	
DRAWN	ABC	09-10-10	
CHECKED			
ENGINEER			
REV. C		03-18-20	
ABC PROJECT #1111-9999		SIZE <b>B</b>	CODE INTENT NO. <b>NA</b>
		DRAWING NO. <b>LST THREE-LINE</b>	
		SCALE <b>NA</b>	REV. <b>C</b>
		SHEET <b>2</b> OF <b>5</b>	

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)

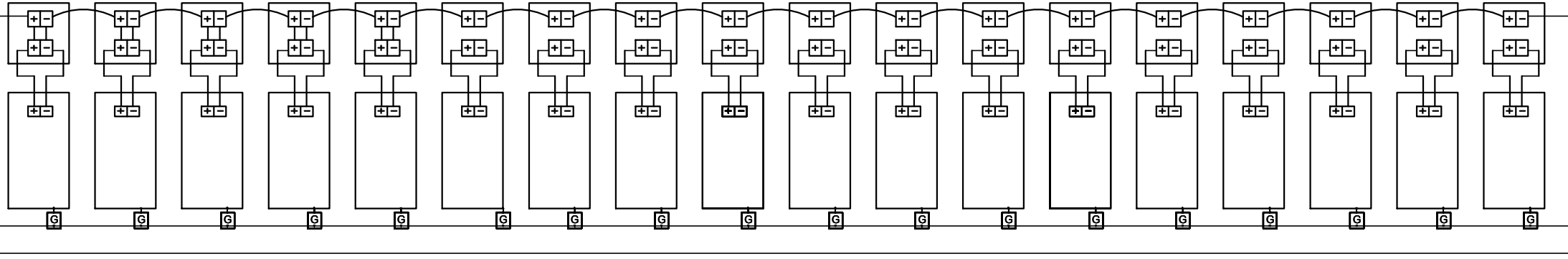
**COMPLETE PHOTOVOLTAIC ARRAY**

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

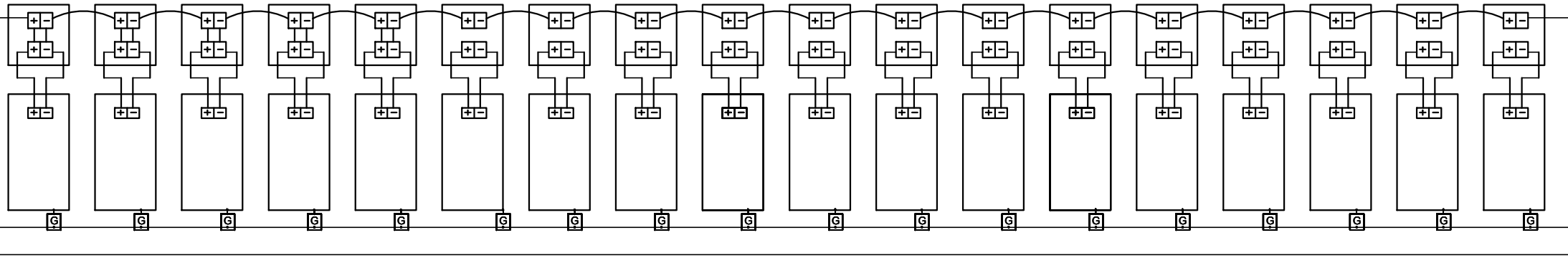
RAPID SHUTDOWN TRANSMITTER AND RECEIVER COMPONENTS SHALL BE LISTED OR FIELD LABELED AS AN ASSEMBLY IN ACCORDANCE WITH 2017 NEC 690.12

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 LOAD SIDE TAP ARRAY DRAWING**

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

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



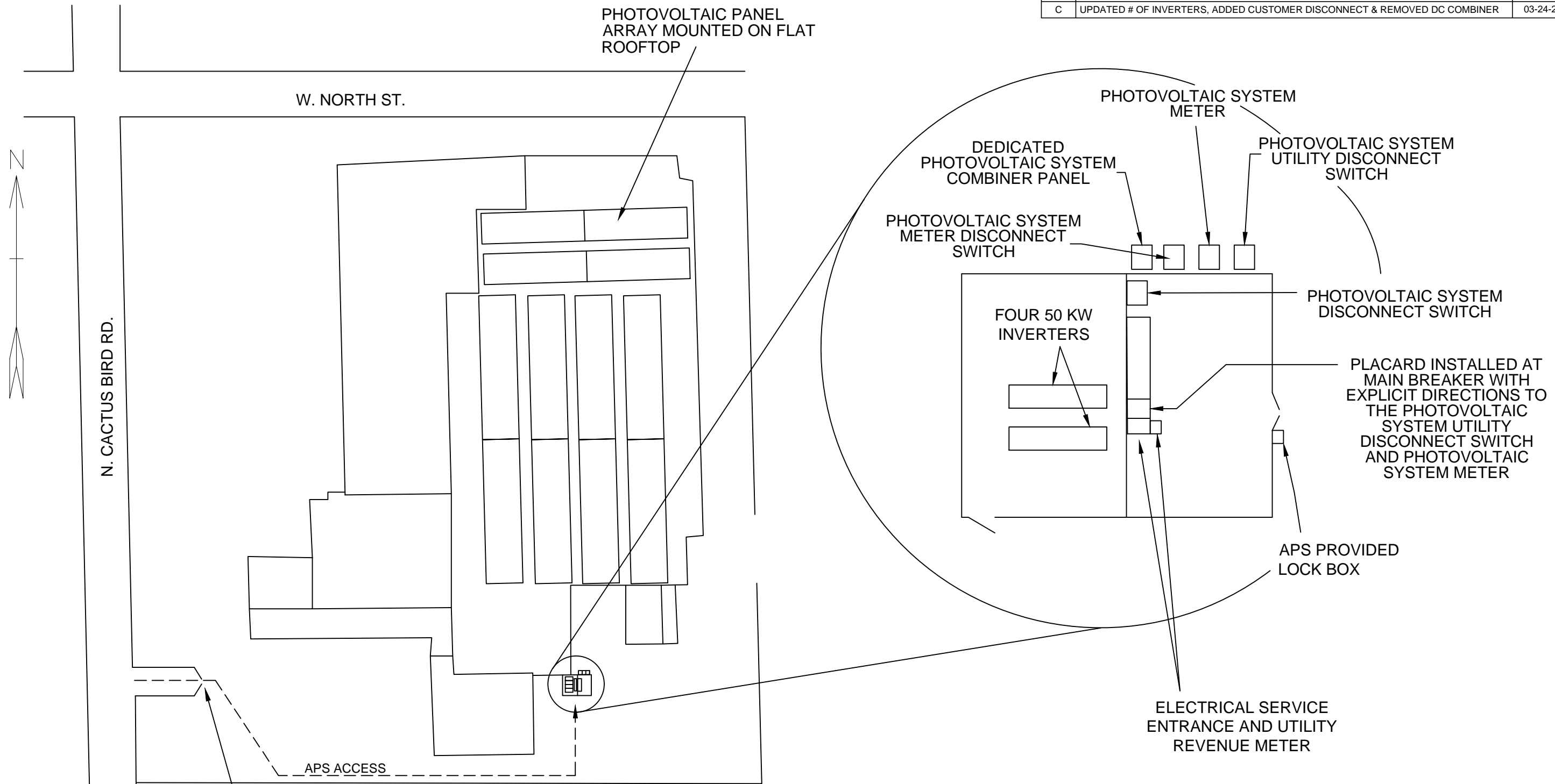
**SAMPLE LOAD SIDE TAP PLANT LOCATION**

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

**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**

**SAMPLE LOAD SIDE TAP SITE PLAN**

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

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