PERMIT PROCESS GUIDELINES FOR SMALL-SCALE PV SYSTEMS

STANDARD STRING SYSTEM, MICRO-INVERTER, SUPPLY-SIDE CONNECTION, AC MODULE

The information in this guideline is intended to help local jurisdictions and contractors identify when PV system installations are simple, needing only a basic review, and when an installation is more complex. It is likely that 50%-75% of all residential systems will comply with these simple criteria.

Required Information for Permit:

1. **Complete building permit application and Contractor's Registration.**
2. **Site plan showing location of major components on the property. This drawing need not be exactly to scale, but it should represent relative location of components at site (see supplied example site plan). PV arrays on dwellings with a 3' perimeter space at ridge and sides may not need separate fire service review.**
3. **Electrical diagram showing PV array configuration, wiring system, overcurrent protection, inverter, disconnects, required signs, and ac connection to building (see supplied standard electrical diagram).**
4. **Specification sheets and installation manuals (if available) for all manufactured components including, but not limited to, PV modules, inverter(s), combiner box, disconnects, and mounting system.**

Step 1: Structural Review of PV Array Mounting System

Is the array to be mounted on a defined, permitted roof structure? ☐ **Yes** ☐ **No**

If No due to non-compliant roof or a ground mount, submit completed worksheet for the structure WKS1.

Roof Information:

1. Is the roofing type lightweight (Yes = composition, lightweight masonry, metal, etc...)_____

_____

If No, submit completed worksheet for roof structure WKS1 (No = heavy masonry, slate, etc...).

2. Does the roof have a single roof covering? ☐ **Yes** ☐ **No**

If No, submit completed worksheet for roof structure WKS1.

3. Provide method and type of weatherproofing roof penetrations (e.g. flashing, caulk)._____

Mounting System Information:

1. Is the mounting structure an engineered product designed to mount PV modules with no more than an 18" gap beneath the module frames? ☐ **Yes** ☐ **No**

If No, provide details of structural attachment certified by a design professional.

2. For manufactured mounting systems, fill out information on the mounting system below:
   a. Mounting System Manufacturer _____Product Name Model#_____
   b. Total Weight of PV Modules and Rails _____lbs
   c. Total Number of Attachment Points_____
   d. Weight per Attachment Point (b ÷ c)_____lbs (if greater than 45 lbs, see WKS1)
   e. Maximum Spacing Between Attachment Points on a Rail _____inches (see product manual for maximum spacing allowed based on maximum design wind speed)
   f. Total Surface Area of PV Modules (square feet)_____ ft^2
   g. Distributed Weight of PV Module on Roof (b ÷ f)_____ lbs/ft^2

   If distributed weight of the PV system is greater than 5 lbs/ft^2, see WKS1.

Step 2: Electrical Review of PV System (Calculations for Electrical Diagram)

In order for a PV system to meet the basic review requirements, the following must apply:

1. PV modules, utility-interactive inverters, and combiner boxes are identified for use in PV systems.
2. The PV array is composed of 4 series strings or less per inverter.
3. The total inverter capacity has a continuous ac power output 13,440 Watts or less
4. The ac interconnection point is on the load side of service disconnecting means (690.64(B)).
5. One of the standard electrical diagrams can be used to accurately represent the PV system. Interactive PDF diagrams are available at www.solarabcs.org/permitting.

Fill out the standard electrical diagram completely. A guide to the electrical diagram is provided to help the applicant understand each blank to fill in. If the electrical system is more complex than the standard electrical diagram can effectively communicate, provide an alternative diagram with appropriate detail.

STRUCTURE WORKSHEET - WKS1

If array is roof mounted

This section is for evaluating roof structural members that are site built. This includes rafter systems and site built trusses. Manufactured truss and roof joist systems, when installed with proper spacing, meet the roof structure requirements covered in item 2 below.

1. Roof construction: ☐ **Rafters** ☐ **Trusses** ☐ **Other**: _____
2. Describe site-built rafter or or site-built truss system.
   a. Rafter Size: ___ x ___ inches
   b. Rafter Spacing: _____ inches
   c. Maximum unsupported span: _____ feet, _____ inches
   d. Are the rafters over-spanned? (see the IRC span tables in **B.2.**) ☐ **Yes** ☐ **No**
   e. If ***Yes***, complete the rest of this section.
3. If the roof system has
   a. over-spanned rafters or trusses,
   b. the array over 5 lbs/ft^2 on any roof construction, or
   c. the attachments with a dead load exceeding 45 lbs per attachment;

   it is recommended that you provide one of the following:
   i. A framing plan that shows details for how you will strengthen the rafters using the supplied span tables in B.2.
   ii. Confirmation certified by a design professional that the roof structure will support the array.

If array is ground mounted: **(Note: May not be permitted in Village of Hawthorn Woods)**

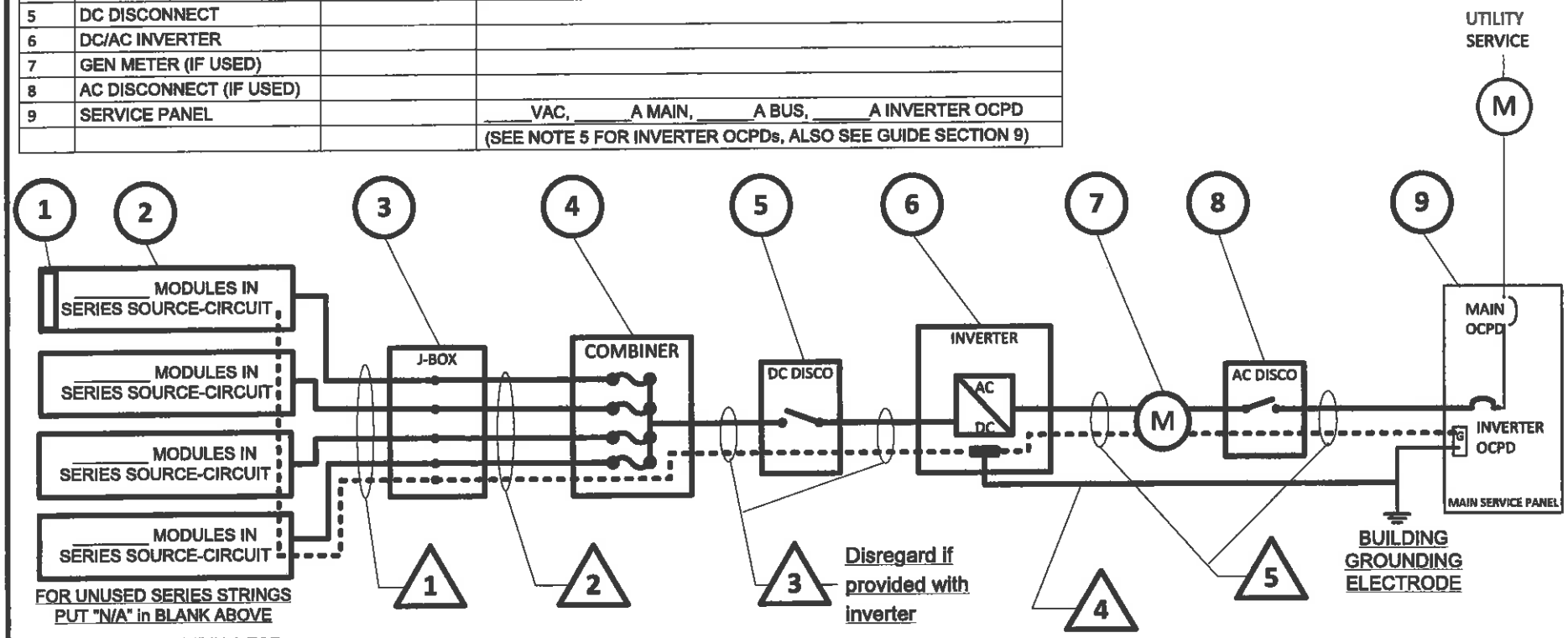
1. Show array supports, framing members, and foundation posts and footings.
2. Provide information on mounting structure(s) construction. If the mounting structure is unfamiliar to the local jurisdiction and is more than six (6) feet above grade, it may require engineering calculations certified by a design professional.
3. Show detail on module attachment method to mounting structure.

Standard Site Plan

Contractor Name, Address and Phone:	Site Plan for Small-Scale, Single-Phase PV Systems Site Name: Site Address: System AC Size:				
Drawn By:	SIZE	FSCM NO	DWG NO		REV
Checked By:	SCALE NTS	Date:	SHEET		

STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1	SOLAR PV MODULE		
2	PV ARRAY		
3	J-BOX (IF USED)		
4	COMBINER (IF USED)		
5	DC DISCONNECT		
6	DC/AC INVERTER		
7	GEN METER (IF USED)		
8	AC DISCONNECT (IF USED)		
9	SERVICE PANEL		____VAC, _____A MAIN, _____A BUS, _____A INVERTER OCPD
			(SEE NOTE 5 FOR INVERTER OCPDs, ALSO SEE GUIDE SECTION 9)



CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 ☐ or PV WIRE ☐			N/A	N/A
	BARE COPPER EQ. GRD. COND. (EGC)			N/A	N/A
2	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
3	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	INSULATED EGC				
4	DC GROUNDING ELECTRODE COND.				
5	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	INSULATED EGC				

Contractor Name, Address and Phone:

Drawn By:

Checked By:

One-Line Standard Electrical Diagram for Small-Scale, Single-Phase PV Systems

Site Name: _____

Site Address: _____

System AC Size: _____

SIZE	FSCM NO	DWG NO	REV

SCALE	NTS	Date:	SHEET

PERMIT PROCESS FOR PV SYSTEMS

NOTES FOR STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	
MODULE MODEL	
MAX POWER-POINT CURRENT (I_{MP})	A
MAX POWER-POINT VOLTAGE (V_{MP})	V
OPEN-CIRCUIT VOLTAGE (V_{OC})	V
SHORT-CIRCUIT CURRENT (I_{SC})	A
MAX SERIES FUSE (OCPD)	A
MAXIMUM POWER (P_{MAX})	W
MAX VOLTAGE (TYP 600V_{DC})	V
VOC TEMP COEFF (mV/°C☐ or %/°C☐)	
IF COEFF SUPPLIED, CIRCLE UNITS	

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE

NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS *(NEC XXX.XX)*

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	
INVERTER MODEL	
MAX DC VOLT RATING	V
MAX POWER @ 40°C	W
NOMINAL AC VOLTAGE	V
MAX AC CURRENT	A
MAX OCPD RATING	A

SIGNS–SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE	
RATED MPP CURRENT	A
RATED MPP VOLTAGE	V
MAX SYSTEM VOLTAGE	V
MAX CIRCUIT CURRENT	A
WARNING: ELECTRICAL SHOCK HAZARD–LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION	

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION	
AC OUTPUT CURRENT	A
NOMINAL AC VOLTAGE	V
THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)	

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP _____°C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE _____°C

2.) 2005 ASHRAE FUNDEMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

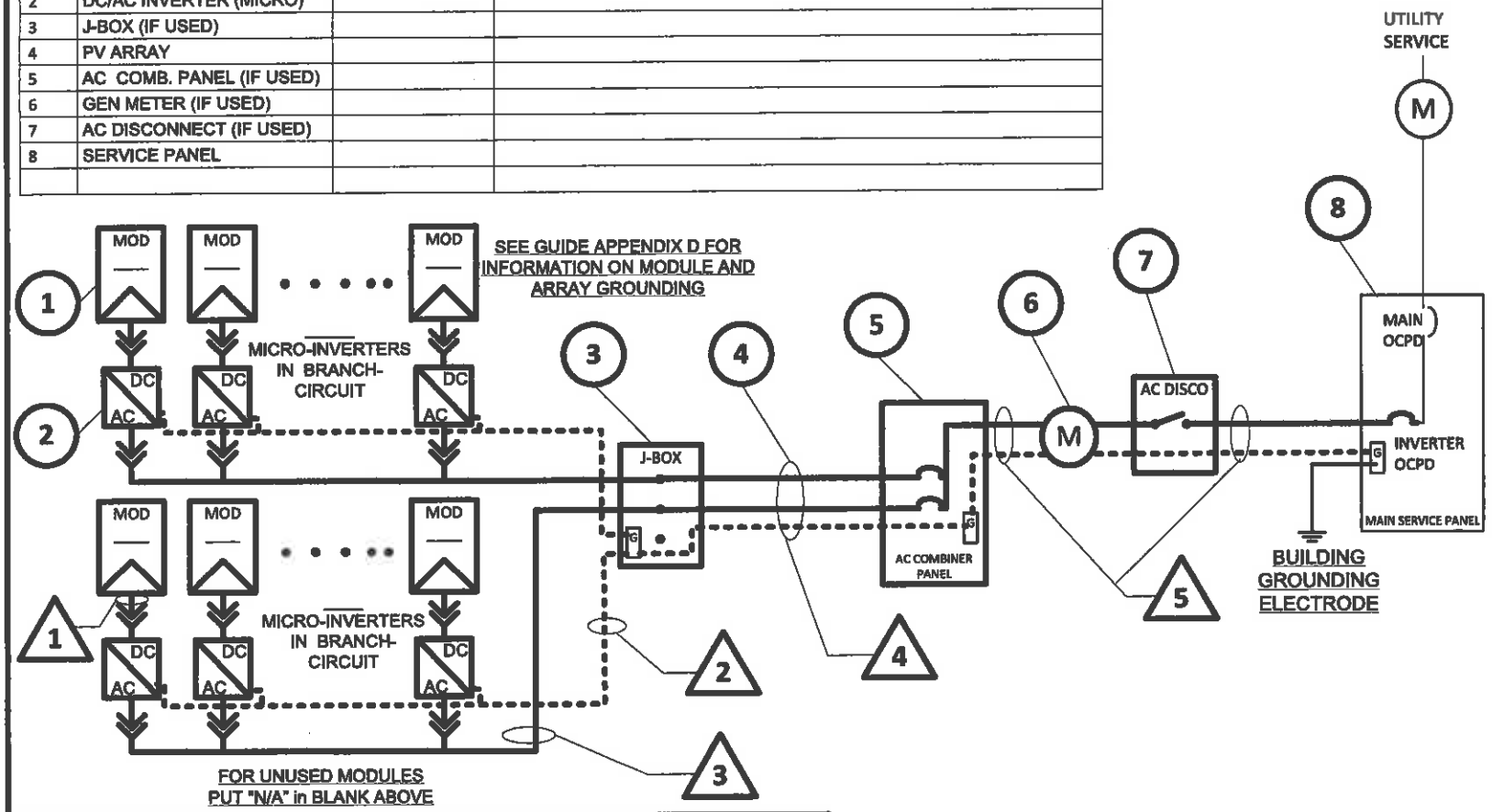
4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

5) TOTAL OF _____ INVERTER OCPD(s), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☐ NO ☐

Contractor Name, Address and Phone: _____ _____ _____ _____	Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems Site Name: _____ Site Address: _____ System AC Size: _____			
Drawn By:	SIZE	FSCM NO	DWG NO	REV
Checked By:	SCALE NTS	Date:	SHEET	

MICRO-INVERTER ELECTRICAL DIAGRAM

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1	PV DC or AC MODULE		
2	DC/AC INVERTER (MICRO)		
3	J-BOX (IF USED)		
4	PV ARRAY		
5	AC COMB. PANEL (IF USED)		
6	GEN METER (IF USED)		
7	AC DISCONNECT (IF USED)		
8	SERVICE PANEL		



CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 ☐ or PV WIRE ☐	MFG	MFG Cable	N/A	N/A
2	GEC ☐ EGC ☐ X ALL THAT APPLY			N/A	N/A
3	EXTERIOR CABLE LISTED W/ INV.	MFG	MFG Cable	N/A	N/A
4	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	GEC ☐ EGC ☐ X ALL THAT APPLY			SAME	SAME
	NO DC GEC IF 690.35 SYSTEM				
5	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	GEC ☐ EGC ☐ X ALL THAT APPLY			SAME	SAME

Contractor Name, Address and Phone:	One-Line Standard Electrical Diagram for Micro-Inverter PV Systems
	Site Name:
	Site Address:
	System AC Size:
Drawn By:	SIZE / FSCM NO / DWG NO / REV
Checked By:	SCALE: NTS / Date: / SHEET

PERMIT PROCESS FOR PV SYSTEMS

NOTES FOR MICRO-INVERTER ELECTRICAL DIAGRAM

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	
MODULE MODEL	
MAX POWER-POINT CURRENT (I_{MP})	
MAX POWER-POINT VOLTAGE (V_{MP})	
OPEN-CIRCUIT VOLTAGE (V_{OC})	
SHORT-CIRCUIT CURRENT (I_{SC})	
MAX SERIES FUSE (OCPD)	
MAXIMUM POWER (P_{MAX})	
MAX VOLTAGE (TYP 600V_{DC})	
VOC TEMP COEFF (mV/°C☐ or %/°C☐)	
IF COEFF SUPPLIED, CIRCLE UNITS	

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE

NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS *(NEC XXX.XX)*

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	
INVERTER MODEL	
MAX DC VOLT RATING	
MAX POWER @ 40°C	
NOMINAL AC VOLTAGE	
MAX AC CURRENT	
MAX OCPD RATING	

SIGNS–SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

No sign necessary since 690.51 marking on PV module covers needed information

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION	
AC OUTPUT CURRENT	
NOMINAL AC VOLTAGE	

THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix E):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP ____°C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE ____°C

2.) 2009 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES☐ NO☐ N/A☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES☐ NO☐ N/A☐

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

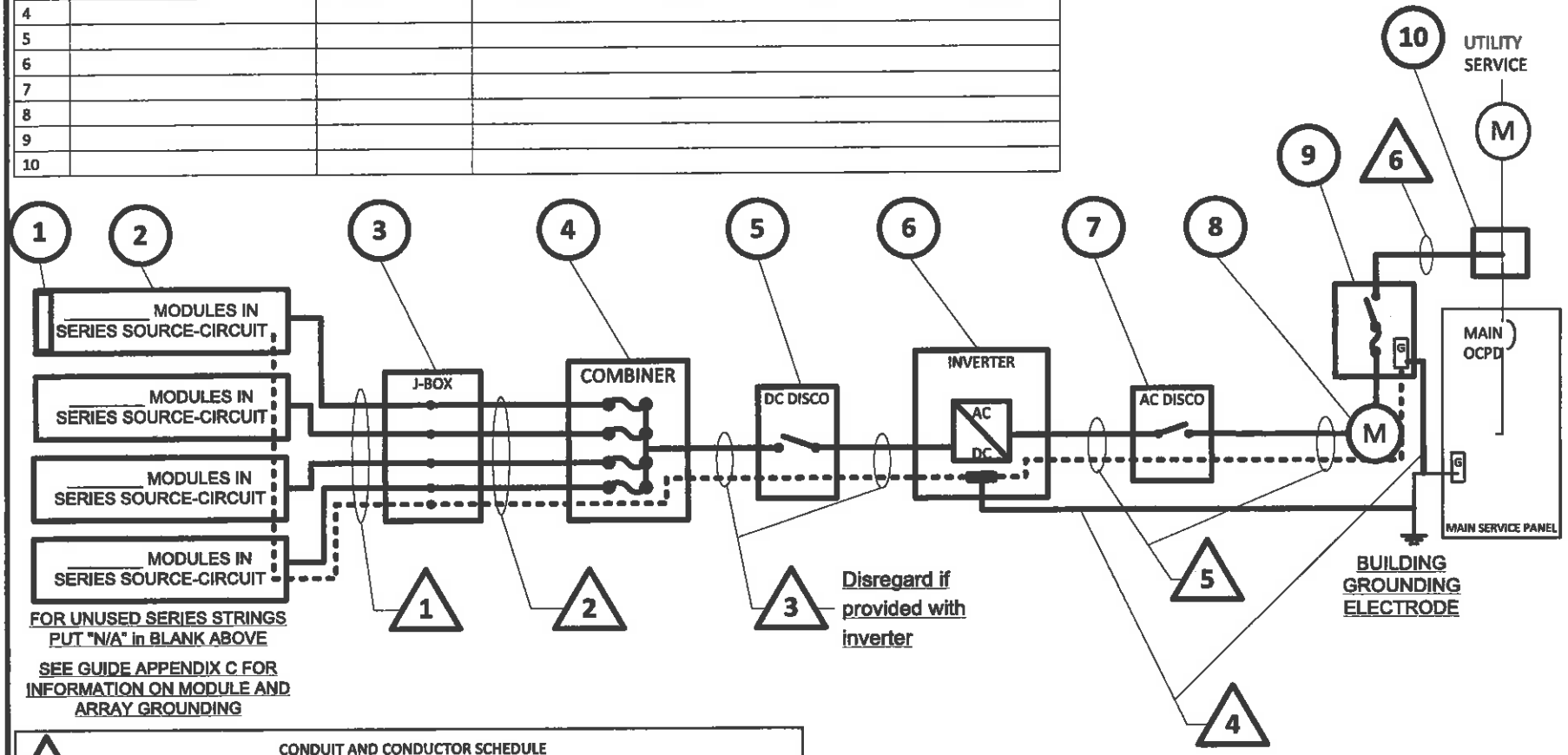
5) TOTAL OF _____ INVERTER OUTPUT CIRCUIT OCPD(s), ONE FOR EACH MICRO-INVERTER CIRCUIT. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES☐ NO☐

Contractor Name, Address and Phone:	Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems Site Name: Site Address: System AC Size:			
Drawn By:	SIZE	FSCM NO	DWG NO	REV
Checked By:	SCALE NTS	Date:	SHEET	

PERMIT PROCESS FOR PV SYSTEMS

Supply-Side Connection Electrical Diagram

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			



FOR UNUSED SERIES STRINGS PUT "N/A" in BLANK ABOVE

SEE GUIDE APPENDIX C FOR INFORMATION ON MODULE AND ARRAY GROUNDING

CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 ☐ or PV WIRE ☐				
	BARE COPPER EQ. GRD. COND. (EGC)				
2	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
3	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	INSULATED EGC				
4	GROUNDING ELECTRODE COND.				
5	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	INSULATED EGC				
6	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				

Contractor Name, Address and Phone:	One-Line Electrical Diagram for Supply-Side Connected Single-Phase PV Systems
	Site Name:
	Site Address:
	System AC Size:
Drawn By:	SIZE / FSCM NO / DWG NO / REV
Checked By:	SCALE NTS / Date: / SHEET

NOTES FOR SUPPLY-SIDE CONNECTION ELECTRICAL DIAGRAM

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	
MODULE MODEL	
MAX POWER-POINT CURRENT (I_{MP})	A
MAX POWER-POINT VOLTAGE (V_{MP})	V
OPEN-CIRCUIT VOLTAGE (V_{OC})	V
SHORT-CIRCUIT CURRENT (I_{SC})	A
MAX SERIES FUSE (OCPD)	A
MAXIMUM POWER (P_{MAX})	W
MAX VOLTAGE (TYP 600V_{DC})	V
VOC TEMP COEFF (mV/°C☐ or %/°C☐)	
IF COEFF SUPPLIED, CIRCLE UNITS	

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE

NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS *(NEC XXX.XX)*

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	
INVERTER MODEL	
MAX DC VOLT RATING	V
MAX POWER @ 40°C	W
NOMINAL AC VOLTAGE	V
MAX AC CURRENT	A
MAX OCPD RATING	A

SIGNS–SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE	
RATED MPP CURRENT	A
RATED MPP VOLTAGE	V
MAX SYSTEM VOLTAGE	V
MAX CIRCUIT CURRENT	A

WARNING: ELECTRICAL SHOCK HAZARD–LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION	
AC OUTPUT CURRENT	A
NOMINAL AC VOLTAGE	V

THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP _____°C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE _____°C

2.) 2005 ASHRAE FUNDEMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

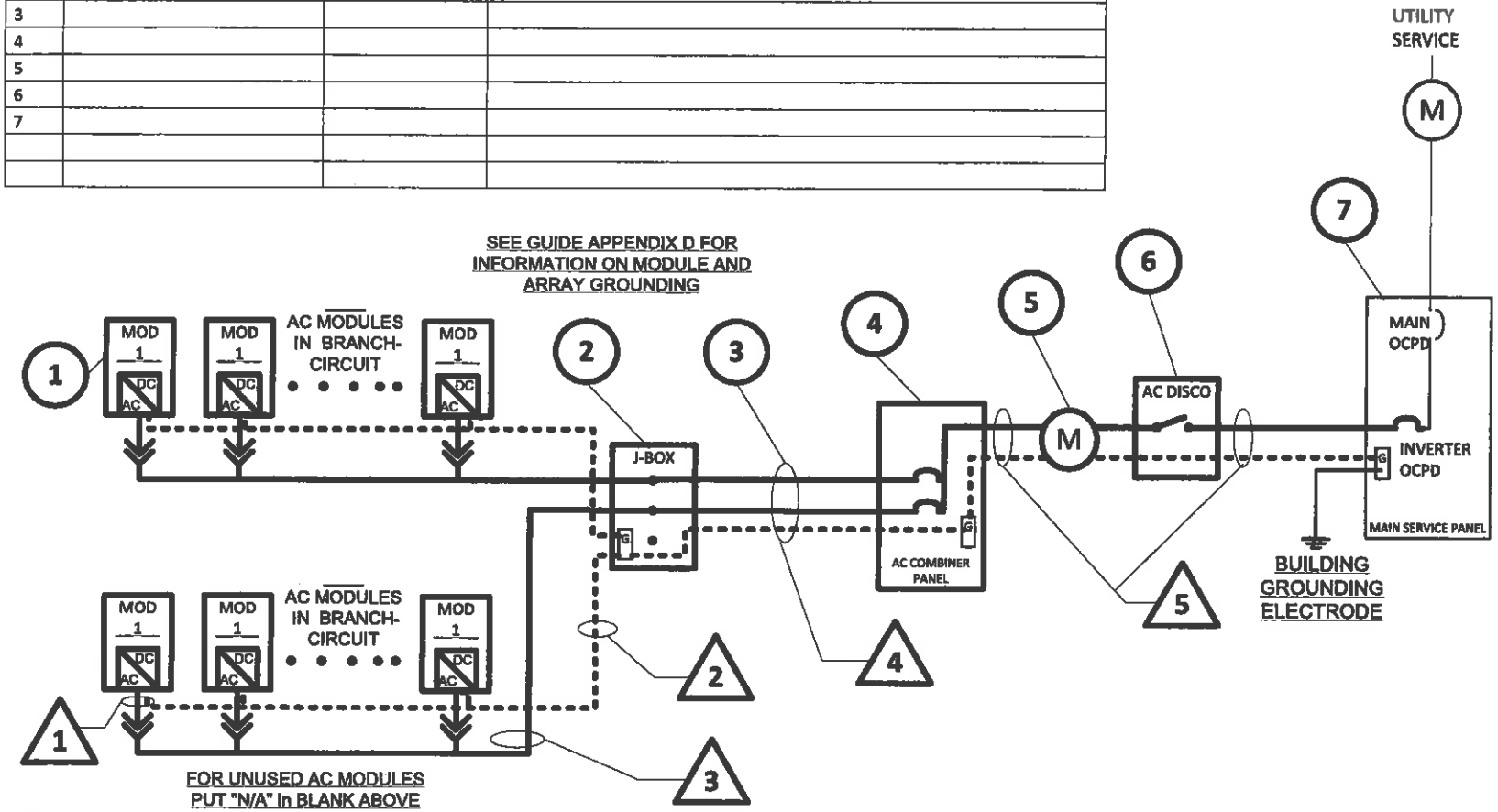
4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

5) TOTAL OF _____ INVERTER OCPD(s), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☐ NO ☐

Contractor Name, Address and Phone: _____	Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems			
	Site Name: _____			
	Site Address: _____			
	System AC Size: _____			
Drawn By:	SIZE	FSCM NO	DWG NO	REV
Checked By:	SCALE NTS	Date:	SHEET	

AC Module Electrical Diagram

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1			
2			
3			
4			
5			
6			
7			



CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 ☐ or PV WIRE ☐	MFG	MFG Cable	N/A	N/A
2	GEC ☐ EGC ☐ X ALL THAT APPLY			N/A	N/A
3	EXTERIOR CABLE LISTED W/ INV.	MFG	MFG Cable	N/A	N/A
4	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	GEC ☐ EGC ☐ X ALL THAT APPLY				
	NO DC GEC IF 690.35 SYSTEM				
5	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	GEC ☐ EGC ☐ X ALL THAT APPLY				

Contractor Name, Address and Phone:	One-Line Standard Electrical Diagram for AC Module PV Systems
	Site Name:
	Site Address:
	System AC Size:
Drawn By:	SIZE / FSCM NO / DWG NO / REV
Checked By:	SCALE: NTS / Date: / SHEET

PERMIT PROCESS FOR PV SYSTEMS

NOTES FOR AC MODULE ELECTRICAL DIAGRAM

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE

NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS *(NEC XXX.XX)*

AC MODULE RATINGS (Guide Appendix C)

AC MODULE MAKE	
AC MODULE MODEL	
NOMINAL OPERATING AC VOLTAGE	
NOMINAL OPERATING AC FREQUENCY	
MAXIMUM AC POWER	
MAXIMUM AC CURRENT	
MAXIMUM OCPD RATING	

SIGNS–SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

N/A since no dc wiring

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION	
AC OUTPUT CURRENT	
NOMINAL AC VOLTAGE	
THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)	

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix F):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP ____°C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE ___°C

2.) 2009 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR 6 OR LESS CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR AC MODULES INVERTER OUTPUT CIRCUITS WITH 12 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER OCPD.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR AC MODULES INVERTER OUTPUT CIRCUITS WITH 16 AMPS OR LESS WHEN PROTECTED BY A 20-AMP OR SMALLER OCPD.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT (N/A)

4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

5) TOTAL OF _____ INVERTER OUTPUT CIRCUIT OCPD(s), ONE FOR EACH AC MODULE CIRCUIT. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☐ NO ☐

Contractor Name, Address and Phone:	Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems Site Name: Site Address: System AC Size:			
Drawn By:	SIZE	FSCM NO	DWG NO	REV
Checked By:	SCALE NTS	Date:	SHEET	