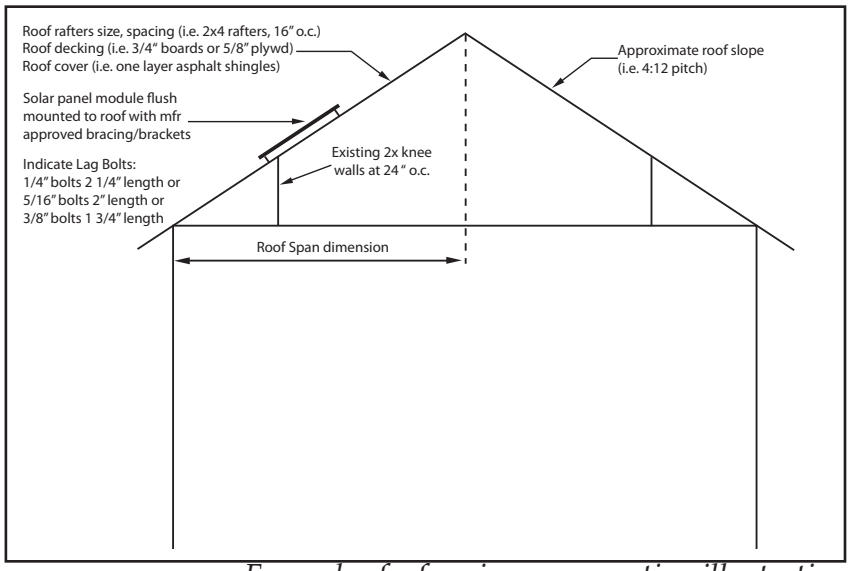
Permit Applicant Checklist for Residential Solar Electric System

Before approval and issuance of permit (s) for Solar Panel/Photovoltaic systems, applicant shall submit the following minimum information. Required drawings shall be scaled and dimensioned, readable, and legible. Additional information may be requested.

1. Fully completed application for a building permit, including the following information:
   a. Project address;
   b. Owner's name, address, phone number;
   c. Name, address and phone number of the person preparing the plans;
   d. Description of proposed work, including both solar equipment installation and all associated construction;
2. Contractor's license _____
3. Name of company conducting the installation _____
   _____
4. What is the system KW rating (DC)? _____
5. Is this an inter-tie or stand alone system? (Circle one)
6. Does the system include battery backup or an uninterrupted power supply (UPS) ?
   yes____ no____
   a. If yes, give the number, size and location of the batteries.
      _____
7. If rooftop mounted, identify the following:
   a. Roof type ☐ Flat roof (nominal pitch) ☐ Sloped (identify pitch) _____
   b. The type of existing roofing (shingles, tile, metal, ballasted, membrane, etc).
      _____
   c. The number of roofing layers that will be under the panels _____ (no more than 2 layers of roof shingles are allowed).
   d. Identify the condition of the roofing material and appropriate age.
      _____
      _____
      _____



Example of a framing cross-section illustration

Required Drawings and Plans

8. Provide construction drawings that include a building section detail and complete notation of method of fastening equipment to the roof of the subject property, including the following details:

a. Cross section that identifies rafter size, spacing and span dimension and approximate roof slope.

b. Identify style, diameter, length of embedment of bolts (i.e., 5/16" lags with minimum 3" embedment into framing, blocking, or bracing).

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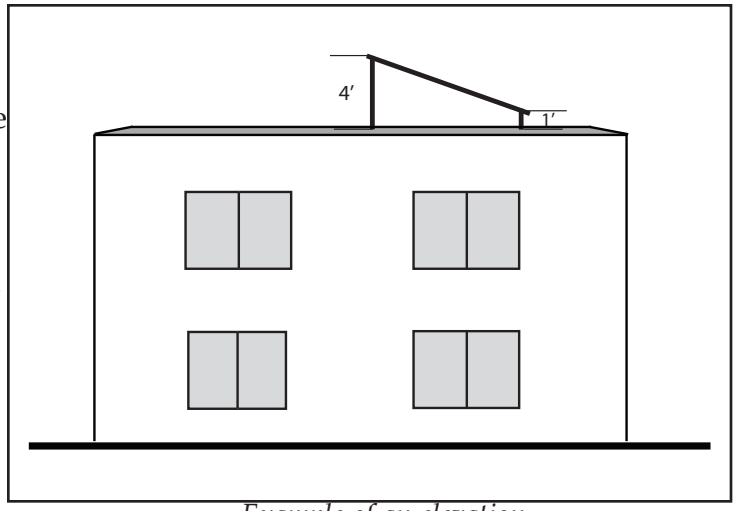
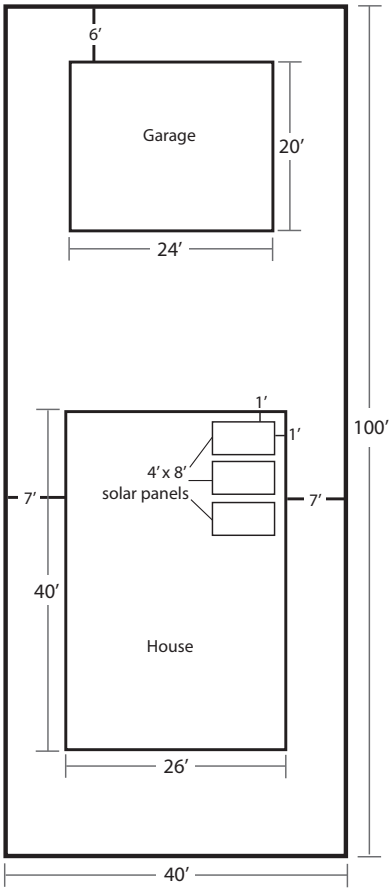
9. Provide an elevation of the structure indicating the appearance of the proposed solar installation. Note the finished height of the system above the roof or, if ground -mounted, above the ground.



Example of an elevation

10. Provide a site plan indicating the buildings and features of the property. The site plan shall show property line locations, approximate location of all structures, the location(s) of the panel installations, setback from property lines, the main service location, and, if applicable, the solar easement across adjoining properties. For roof-mounted systems identify the setback dimension from the peak and from all edges of the roof.



Example of a site plan

11. Is the equipment to be flush mounted to the roof (mounted such that the collector surface is parallel to the roof)?

    yes____ no____

12. The minimum structural threshold for installing a flush-mounted PV system is a roof structure with at least 2 x 4 rafters no more than 24" on-center spacing. Does the roof structure use 2x4 or larger rafters, spaced no wider than 24 inches on center?

    yes____ no____

13. For roof installations, roof decking and structural supports should all be in good condition without visible roof sag/deflection. Is the roof structure in good condition, having no visible sag, cracking or splintering of rafters, or other potential structural defect? If roof structure is accessible, please provide a photo showing the condition of the roof. If roof structure is not accessible, please provide an exterior photo, side view, of the roof.

    yes____ no____

14. If the answer is no to any of questions 11 - 13, please provide the following additional documentation.
    a. If not a flush mount system, provide a side elevation identifying the pitch and height of the collector and mounting system relative to the roof.
    b. Provide a study or statement regarding the proposed solar installation and all proposed structural modifications stamped by a Minnesota licensed/certified structural engineer. Approval can come in the following forms:
        i. Construction plans denoting the roof structure and any modifications to the structure if required, as well as the method of installation of solar collector on the subject property.
        ii. Letter from engineer accomplishing the same as above if the engineer feels that letter format will provide the necessary information.

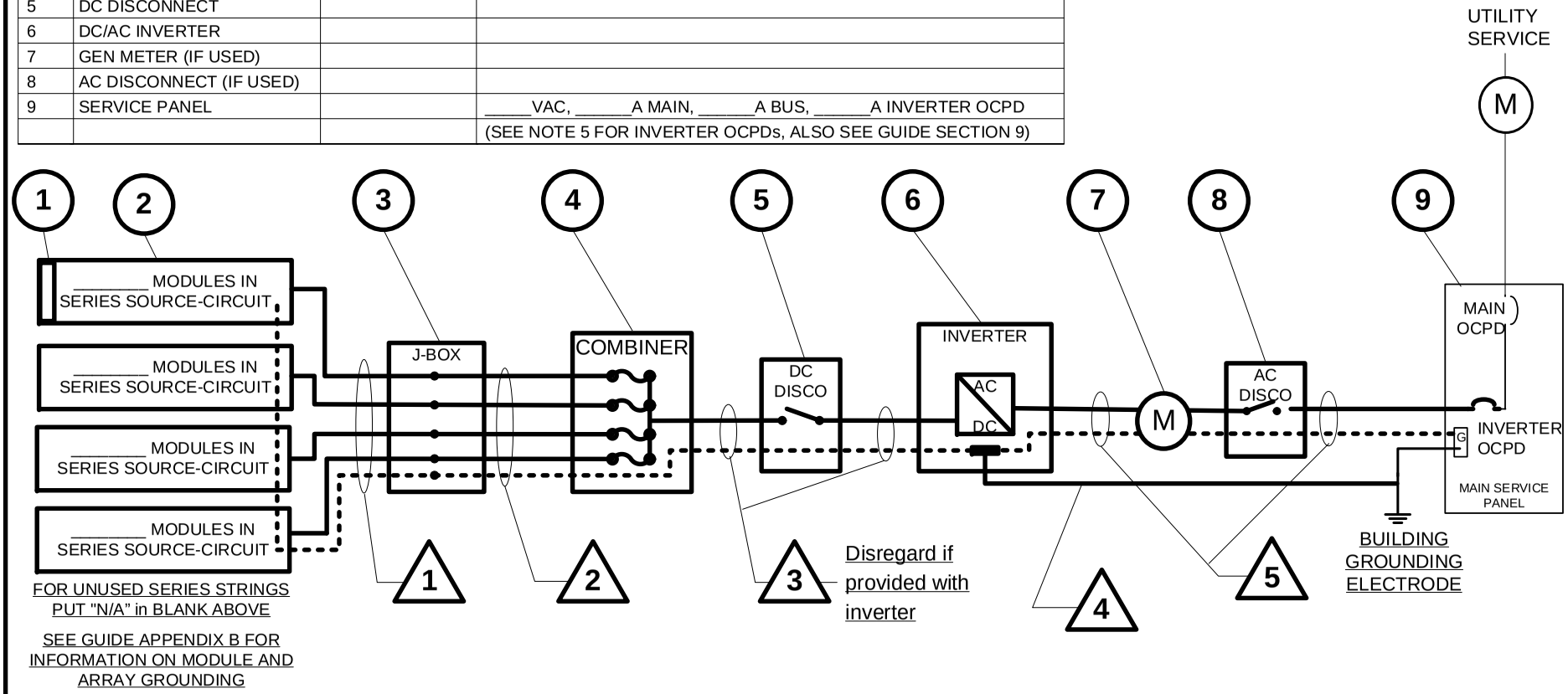
Electrical Information

15. Specify the locations of all equipment and disconnects (e.g., AC disconnect located on exterior face of ____ wall of house, invertor and DC disconnect located in the interior within _____ room).

16. Provide a single line drawing of the electrical installation which includes the following information: PV panel layout, PV power source short circuit current rating, conductor size, type, locations and lengths of runs, wiring methods, grounding points, inverter location, disconnect locations, battery locations (if applicable), point of connection to the existing electrical system. Note the existing service size and number of meters. An example of a single line drawing is attached.

17. Provide manufacturer's specification sheets on all components including but not limited to inverters and panels, which include the make, model, listing, size, weight, etc.

○ 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:

_____
_____
_____
_____

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

Site Name: _____
Site Address: _____
System AC Size: _____

Drawn By:	SIZE	FSCM NO	DWG NO	REV
			E1.1	
Checked By:	SCALE NTS	Date:	SHEET	

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/ºC ☐ or %/ºC ☐)	
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 @ 40ºC	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 _____ºC

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 _____ºC

2.) 2005 ASHRAE FUNDEMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47ºC IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1ºC). 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 47ºC OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90ºC 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, 90ºC 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 E1.2	REV
Checked By:	SCALE NTS	Date:	SHEET	