

## Permit Applicant Checklist for Residential Solar Energy Installations



Before approval and issuance of permit(s) for Solar Thermal/Photovoltaic installations, applicant shall submit the following minimum information. Required drawings shall be scaled and dimensioned, readable, and legible. Additional information may be requested for a building permit. Other permits are also required.

Building integrated solar installations, where the solar collector replaces or substitutes for a component of a building or structure such as roof, shingle, or awning, do not require completion of this checklist separately from the building permit application for the building, structure, or building modification.

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. For *electric* (photovoltaic) systems:
  - a. What is the system KW rating (DC)? \_\_\_\_\_
  - b. Is this an inter-tie or stand alone system? (Circle one)
  - c. Does the system include battery backup or an uninterrupt power supply (UPS)?  
yes \_\_\_ no \_\_\_  
If yes, give the number, size and location of the batteries.  
\_\_\_\_\_
5. For *thermal* systems:
  - a. What is the total size of the solar collectors (sq. ft.)? \_\_\_\_\_
6. 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.  
\_\_\_\_\_  
\_\_\_\_\_

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## Required Drawings and Plans

7. 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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c. Is system to be mounted according to panel and rack manufacturers' instructions?

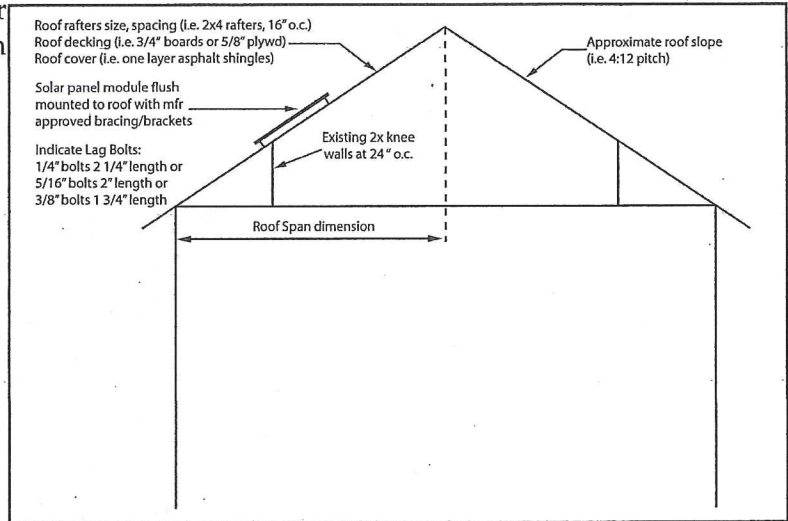
yes \_\_\_ no \_\_\_

If no, please explain. Attach explanation if more space is needed.

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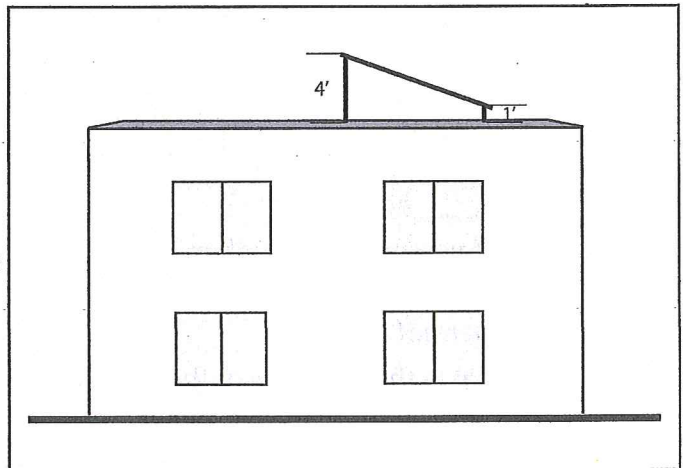
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*Example of a framing cross-section illustration*

8. Provide an elevation of the structure indicating the appearance of the proposed solar installation (see example to the right). Note the finished height of the system above the roof or, if ground-mounted, above the ground.

9. Provide a site plan indicating the buildings and features of the property (see example on following page). 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 an elevation*

## Rooftop Solar Installations

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

yes \_\_\_ no \_\_\_ (If no, go to question 12)

# Permit Applicant Checklist for Residential Solar Energy Installations



11. 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.

a. Does the roof structure use 2x4 or larger rafters, spaced no wider than 24 inches on center?

yes \_\_\_ no \_\_\_

b. If a *solar thermal* installation, is the collector/racking system fastened to each rafter passing under the collector?

yes \_\_\_ no \_\_\_

12. *Non-flush-mounted installations* have different potential structural considerations. If the answer to question 10 (is the system flush-mounted?) is no, please provide the following additional information.

a. Is the finished pitch of the collector at or less than a 12/12 pitch?

yes \_\_\_ no \_\_\_

b. Is the collector or racking fastened to the roof within one foot of the roof peak?

yes \_\_\_ no \_\_\_

c. Is the collector/racking system fastened to each rafter passing under the collector?

yes \_\_\_ no \_\_\_

d. Is the horizontal span (roof span dimension) of the rafter less than 7.75 feet for 2x4 rafters or 11.5 feet for 2x6 rafters?

yes \_\_\_ no \_\_\_

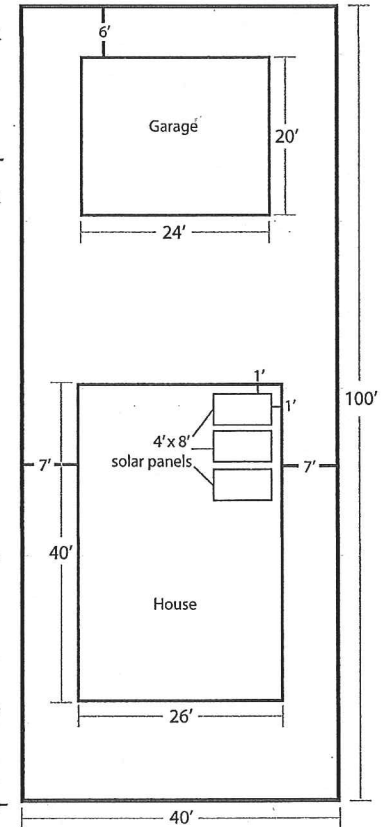
13. Roof decking and structural supports should all be in good condition without visible roof sag/deflection. Is the roof structure in good condition, having no visible sag, cracking or splintering of rafters, or other potential structural defect? If roof structure is accessible, please provide a photo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

yes \_\_\_ no \_\_\_

14. If the answer is no to question 11, 12 a. - d., or 13 please 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:

a. 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.

b. Letter from engineer accomplishing the same as above if the engineer feels that letter format will provide the necessary information.



Example of a site plan



# Permit Applicant Checklist for Residential Solar Energy Installations



## Ground Solar Installations

15. For *ground-mounted* solar energy systems, the installation must meet property line setback standards for accessory structures, as identified in the Saint Paul Zoning Code (Section 65.921, 65.501). Verification of the property line and appropriate setback is required, either through identification of property pins or completing a survey. Identify the method used to verify property lines and setbacks.
- Located property pins    Completed survey (attach)    Other (attach explanation)

## Electrical Information

15. Specify the locations of all equipment and disconnects (on a separate page, if necessary) (e.g., AC disconnect located on exterior face of \_\_\_ wall of house, inverter 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 to this checklist.
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.

## Heritage Preservation

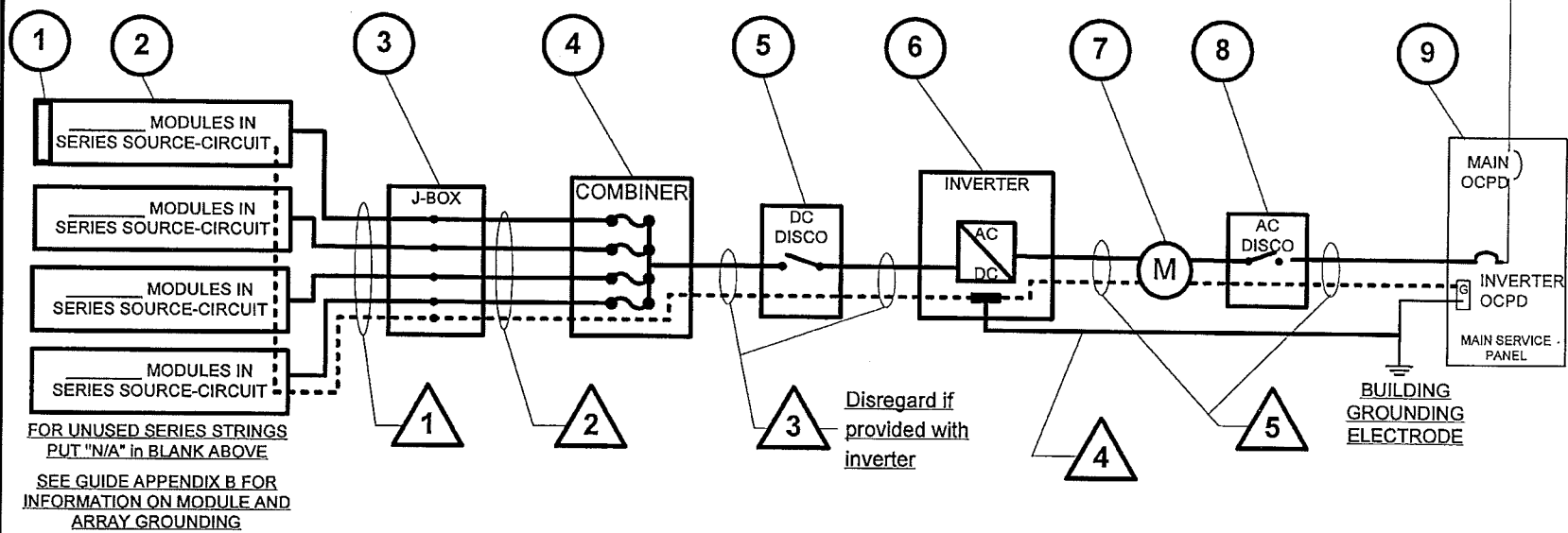
18. Legislative Code § 73.06 provides that exterior work, including installation of solar energy systems, within city designated heritage preservation sites and districts is subject to review and approval by the Heritage Preservation Commission (HPC) prior to the issuance of city permits. For a city map showing individual sites and district boundaries go to <http://www.stpaul.gov/index.aspx?NID=4080>. You may also search by a specific address by using "property look-up" at: [https://www.stpaulonestop.com/AMANDA5/eNtrprise/StPaul/m3list/a\\_PickProperty.jsp?lid=ReadOnlystpaul](https://www.stpaulonestop.com/AMANDA5/eNtrprise/StPaul/m3list/a_PickProperty.jsp?lid=ReadOnlystpaul).

Is the installation address within a heritage preservation district, or on a landmark property or building?

yes \_\_\_ no \_\_\_

Solar installations on properties with heritage preservation considerations will require additional review, either administrative review by staff or review by the Heritage Preservation Commission.

| EQUIPMENT SCHEDULE |                         |             |   |
|--------------------|-------------------------|-------------|---|
| TAG                | DESCRIPTION             | PART NUMBER | NOTES   |
| 1                  | SOLAR PV MODULE         |             |   |
| 2                  | PV ARRAY                |             |   |
| 3                  | J-BOX (IF USED)         |             |   |
| 4                  | COMBINER (IF USED)      |             |   |
| 6                  | 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 <input type="checkbox"/> or PV WIRE <input type="checkbox"/>                                   |             |                      | N/A          | N/A          |
|                                | BARE COPPER EQ. GRD. COND. (EGC)   |             |                      | N/A          | N/A          |
| 2                              | THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/> |             |                      |              |              |
| 3                              | THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/> |             |                      |              |              |
|                                | INSULATED EGC  |             |                      |              |              |
| 4                              | DC GROUNDING ELECTRODE COND.   |             |                      |              |              |
| 5                              | THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/> |             |                      |              |              |
|                                | 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 <sub>DC</sub> ) | 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 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  $I_{sc}$  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  $I_{sc}$  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,<br>Address and Phone:<br><br>_____<br>_____<br>_____ | <b>Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems</b> |         |        |            |
|   | Site Name: _____  |         |        |            |
|   | Site Address: _____   |         |        |            |
| System AC Size: _____   |   |         |        |            |
| Drawn By: _____   | SIZE  | FSCM NO | DWG NO | REV        |
| Checked By: _____   | SCALE   | NTS     | Date:  | E1.2 SHEET |