PHOTOVOLTAIC (PV) SUBMITTAL REQUIREMENTS

Building Division · 101 2nd Street · Isleton · CA · 95641 · 916.777.7770

1. PERMIT INFORMATION:

- ☐ The installation of a photovoltaic solar electric system requires a permit.
- ☐ A solar permit does not include replacement or upgrading of the existing electrical panel or service (a separate electrical permit must be obtained).
- ☐ A Building Permit may be issued only to a State of California Licensed Contractor or the Homeowner.
- ☐ If the work is performed by the Homeowner personally or by his/her workers, and an inspection indicates the work cannot be completed satisfactorily, then a licensed contractor must perform the work.
- ☐ If the Homeowner hires workers, State Law requires the Homeowner to obtain Worker's Compensation Insurance. Proof of this insurance is required prior to inspection.

2. INSTALLATION REQUIREMENTS

- ☐ **Building Codes:** All work must comply with the 2019 California Building Code (CBC), 2019 California Residential Code (CRC), 2019 California Electrical Code (CEC), 2019 California Mechanical Code (CMC), 2019 California Plumbing Code (CPC), 2019 California Energy Code based upon 2019 Building Energy Efficiency Standards (CEnC)).
- ☐ Equipment must be installed in accordance with its listing and the manufacturer's installation instructions [CEC 110.3(B)].
- ☐ All work shall comply with CEC Article 690 *Solar Photovoltaic*.

3. PLAN REQUIREMENTS

Three (3) sets of plans need to be submitted containing the following items:

- ☐ Plan view showing location of the PV installation and layout of existing roof framing members that support the system, or site plan if panels are not mounted on the roof.
- ☐ Details on mounting of PV modules, type and number of roof coverings, and subsequent weatherproofing of the roof.
- ☐ Electrical single-line diagram clearly identifying all devices installed in the PV system and indicating total kVA rating of the system.
- ☐ Clearly identify the point of interconnection with the utility supplied wiring system and provide details on main breaker, PV breaker and rating of bussing.
- ☐ Indicate type and size of all conduit and conductors throughout the PV system.

- ☐ Provide manufacturer's cut-sheets and installation instructions for all PV modules, mounting systems, combiner boxes (if used), inverters, and disconnects.
- ☐ Provide structural calculations, prepared by a registered California design professional, if the total weight of the photovoltaic system is over five pounds per square foot.
- ☐ The installation of the PV system shall conform to the requirements of CEC Article 690 and any other applicable articles or standards.

A sample of the plan view and electrical one-line diagram pages are attached.

4. FIRE DEPARTMENT REQUIREMENTS

Signage

- ☐ See item #5 below.

Roof access for venting:

- ☐ Ridge clearance: Modules should be located no higher than three feet (3) below the ridge.
- ☐ Residence or building with single ridge (gable roof): Modules shall be located in a manner that provides two (2) three-foot (3') wide access pathways from the eave to the ridge on each roof slope where modules are located.
- ☐ Residence or building with hip roof layouts: Modules shall be located in a manner that provides one (1) three-foot (3') wide clear access pathway from the eave to the ridge on each roof slope where modules are located. The access pathway should be located at a structurally strong location on the building.
- ☐ Residence or building with hips and valleys: Modules should be located no closer than one and one half foot (1.5') to a hip or a valley.

5. SIGNAGE

- ☐ All warning signs shall be red background with white 3/8" lettering, all capital letters, Arial or similar font. Material used for signage must be weather resistant. It is recommended that Underwriters Laboratories Marking and Labeling System 969 (UL 969) be used as standard to determine weather rating. Labels on raceways and other equipment shall be reflective, weather resistant, and suitable for the environment. (State Fire Marshal)

- ☐ Premises having PV systems shall be identified. The marking (signage) may be placed within the main service disconnect. If the main service disconnect is operable with the service panel closed, the marking should be placed on the outside cover. Marking shall conform to the following: (State Fire Marshal)

CAUTION!
SOLAR ELECTRIC
SYSTEM CONNECTED

☐ Marking is required on all interior and exterior DC conduit, raceways, enclosures, cable assemblies, and junction boxes to alert the Fire Service to avoid cutting them, every 10 feet, at turns and above and/or below penetrations and all DC combiner and junction boxes Marking shall conform to the following:

CAUTION!
SOLAR CIRCUIT

☐ Appropriate signage shall be provided to identify the main A/C disconnect for the solar system.

PHOTOVOLTAIC SYSTEM AC DISCONNECT

MAXIMUM OPERATING CURRENT: _____ VAC
OPERATING VOLTAGE: _____ AAC

☐ Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means (CEC 690.17).

PHOTOVOLTAIC SYSTEM AC DISCONNECT

MAXIMUM OPERATING CURRENT: _____ VAC
OPERATING VOLTAGE: _____ AAC

☐ Ungrounded photovoltaic power systems shall be labeled with the following warning at each junction box, combiner box, disconnect, and device where energized, ungrounded circuits may be exposed during service: [CEC 690.35(F)]

WARNING
ELECTRIC SHOCK HAZARD.
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.

☐ The following sign shall be installed at the dc photovoltaic disconnecting means: (CEC 690.53)

PHOTOVOLTAIC SYSTEM DC DISCONNECT

RATED MAX. POWER-POINT CURRENT: ____ ADC
RATED MAX. POWER-POINT VOLTAGE: ____ VDC
MAXIMUM SYSTEM VOLTAGE: ____ VDC
SHORT-CIRCUIT CURRENT: ____ ADC
CONTROLLER MAX. RATED OUTPUT CURRENT: ___ ADC

☐ Photovoltaic power systems employing energy storage shall also be marked with the maximum operating voltage, including any equalization voltage and the polarity of the grounded circuit conductor (CEC 690.55).

☐ All interactive system(s) points of interconnection with other sources shall be marked at an accessible location at the disconnecting means (CEC 690.54). Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor supplied from multiple sources shall be marked to indicate the presence of all sources [CEC 690.64(B)(4)].

PHOTOVOLTAIC POINT OF INTERCONNECTION

RATED AC OUTPUT CURRENT: AMPS
NOMINAL OPERATION AC VOLTAGE: VOLTS

THIS PANEL IS FED BY MULTIPLE SOURCES
(PG&E AND SOLAR)

☐ Any structure or building with a photovoltaic power system that is not connected to a utility service source and is a stand-alone system shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible location. The plaque or directory shall indicate the location of system disconnecting means and that the structure contains a stand-alone electrical power system. (CEC 690.56(A)

☐ Buildings or structures with both utility service and a photovoltaic system shall have a permanent plaque or directory providing the location of the service disconnecting means and the photovoltaic system disconnecting means if not located at the same location [CEC 690.56(B)].

☐ Unless the panelboard is rated not less than the sum of the ampere ratings of all overcurrent devices supplying it, a connection in a panelboard shall be positioned at the opposite (load) end from the input feeder location or main circuit location. The bus or conductor rating shall be sized for the loads connected in accordance with CEC Article 220. A permanent warning label shall be applied to the distribution equipment with the following: [CEC 690.64(B)(7)]

WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT DEVICE

☐ ***Residential Photovoltaic Solar – Rapid Shutdown***

Rapid Shutdown system must be installed per the California Electrical Code Section 690.12. In addition, the equipment that performs the rapid shutdown shall be listed and identified.

6. INSPECTION PROCEDURES

☐ A rough inspection shall be scheduled if any work is inside walls or ceilings and will be covered with finish materials. A final inspection should be scheduled after all work is complete. For each inspection, the Permit Card and the Approved Job Copy of the Drawings must be presented to the inspector. Permits expire 180 days after the last passed inspection.

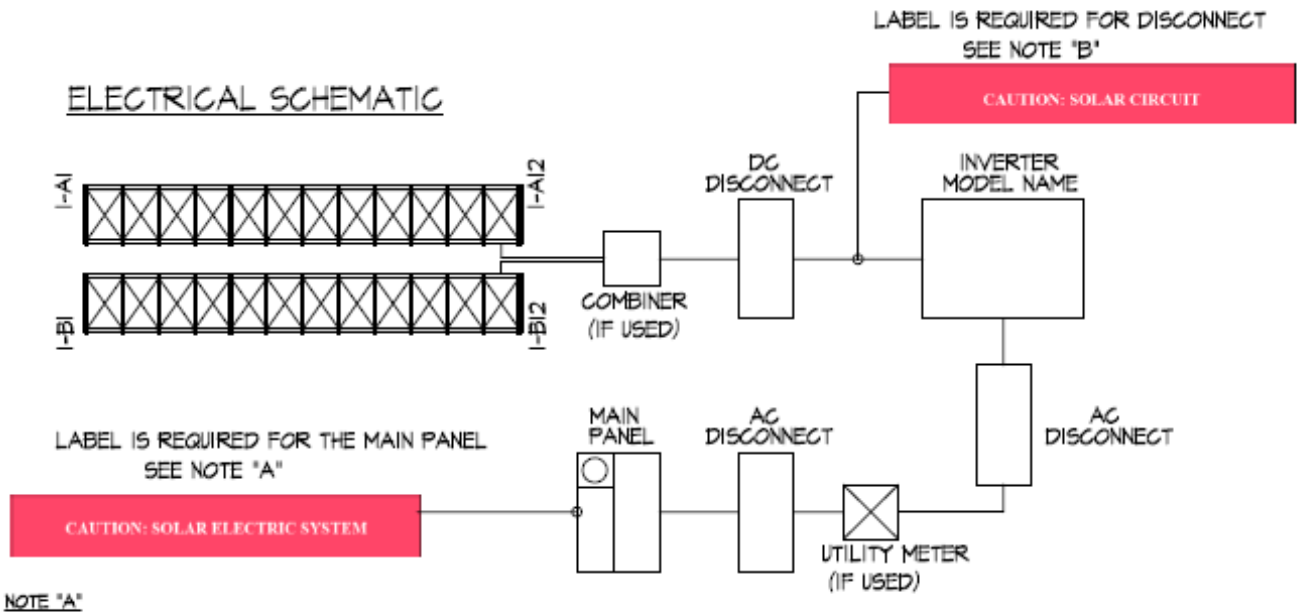
☐ All photovoltaic projects require a final inspection performed by the Building Division. Call (916) 777-7770 to schedule. Note: Inspections must be scheduled 24 hours in advance.

☐ The contractor or owner must provide roof access (ladder to roof) for the all required inspections. Ladders must be OSHA approved, minimum Type I with a 250 lbs. rating, in good condition and designed for its intended use.

7. QUESTIONS:

If you have any questions regarding your project contact the Building Division by phone at (916) 777-7770 or email us at http://www.cityofisleton.com/contact.html

ELECTRICAL SCHEMATIC



NOTE "A"

MAIN SERVICE DISCONNECT

FOR RESIDENTIAL APPLICATIONS, THE MARKING MAY BE PLACED WITHIN THE MAIN SERVICE DISCONNECT. IF THE MAIN SERVICE DISCONNECT IS OPERABLE WITH THE SERVICE PANEL CLOSED, THE MARKINGS SHOULD BE PLACED ON THE OUTSIDE COVER.

MARKING CONTENT AND FORMAT

MARKING CONTENT: CAUTION: SOLAR ELECTRIC SYSTEM CONNECTED
BACKGROUND: RED BACKGROUND,
LETTERS: WHITE LETTERING, MINIMUM 3/8" LETTER HEIGHT, ALL CAPITAL LETTERS, ARIAL OR SIMILAR FONT, NON-BOLD
MATERIAL: REFLECTIVE, WEATHER RESISTANT MATERIAL SUITABLE FOR ENVIRONMENT (DURABLE ADHESIVE MATERIALS MAY MEET THIS REQUIREMENT)

CONDITION	ALLOWABLE CONDUCTOR TYPE(S)
FREE-AIR	USE - S/RHH/RHW-2
RACEWAY ROOF-TOP	THWN - 2 OR XHHW-2 OR RHH/RHW-2
RACEWAY OR CABLE INDOORS OR SHADED	THHN OR THWN OR XHHW *
RACEWAY UNDERGROUND	THHN OR THWN OR XHHW *
* MAY SUBSTITUTE "-2" RATED CONDUCTORS	

NOTE "B"

MARKING FOR DIRECT CURRENT CONDUIT, RACEWAYS, ENCLOSURES, CABLE ASSEMBLIES, AND JUNCTION BOXES

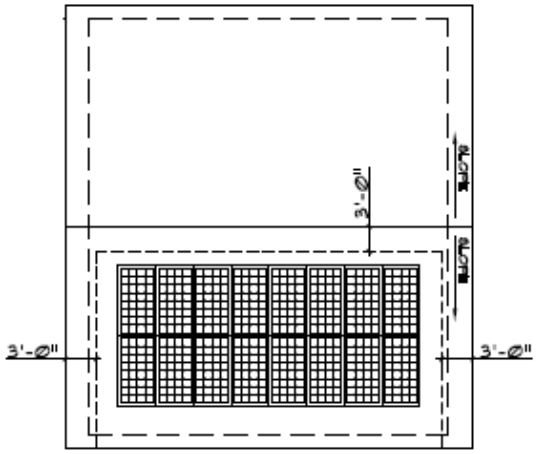
MARKING IS REQUIRED ON ALL INTERIOR AND EXTERIOR DC CONDUIT, RACEWAYS, ENCLOSURES,CABLE ASSEMBLIES, AND JUNCTION BOXES TO ALERT THE FIRE SERVICE TO AVOID CUTTING THEM.
MARKING SHOULD BE PLACED ON ALL INTERIOR AND EXTERIOR DC CONDUIT, RACEWAYS, ENCLOSURES, AND CABLE ASSEMBLIES, EVERY 10 FEET, AT TURNS AND ABOVE AND/OR BELOW PENETRATIONS AND ALL DC COMBINER AND JUNCTION BOXES.

MARKING CONTENT AND FORMAT

MARKING CONTENT: CAUTION SOLAR CIRCUIT
BACKGROUND: RED BACKGROUND,
LETTERS: WHITE LETTERING, MINIMUM 3/8" LETTER HEIGHT, ALL CAPITAL LETTERS, ARIAL OR SIMILAR FONT, NON-BOLD
MATERIAL: REFLECTIVE, WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT (DURABLE ADHESIVE MATERIALS MAY MEET THIS REQUIREMENT)

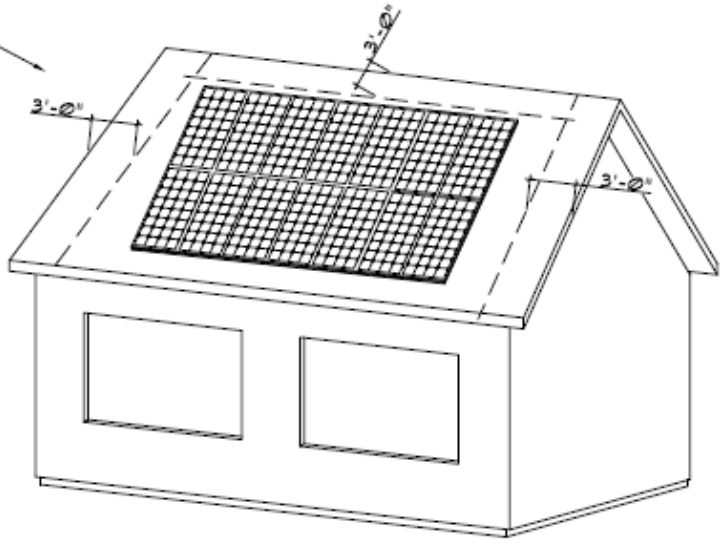
GENERAL NOTE

1. BOND PV SYSTEM AND PV RAIL ASSEMBLY TO SERVICE ELECTRODE
2. CONNECT AC TO CUSTOMER SERVICE VIA 1 DP GE 15 AMP BREAKER
3. ELECTRICAL INSTALLATION IN ACCORDANCE WITH 2010 CALIFORNIA ELECTRICAL CODE



ROOF PLAN

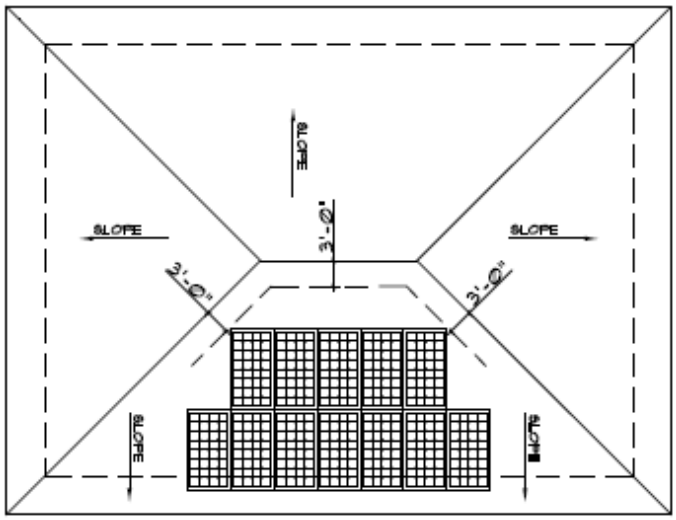
NEED 3' AT THIS RAKE ALSO TO PROVIDE ACCESS AT TWO SIDES



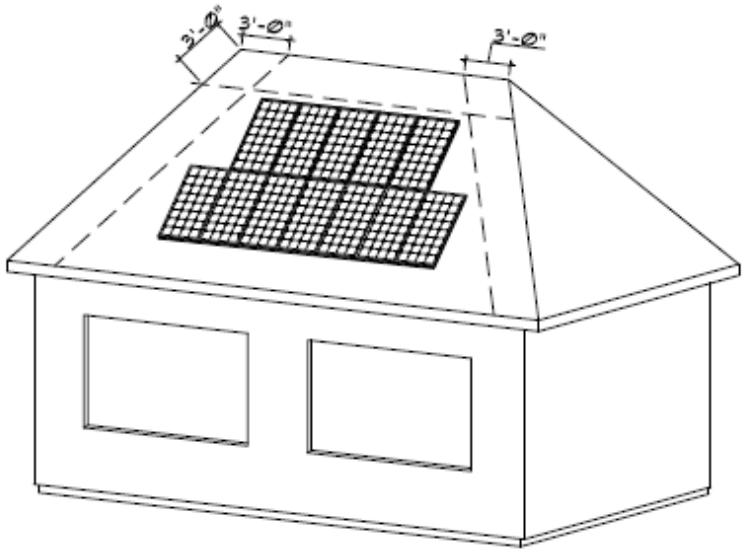
PERSPECTIVE

RESIDENTIAL BUILDINGS WITH GABLE ROOF LAYOUTS:

RESIDENTIAL BUILDINGS WITH A SINGLE RIDGE: MODULES SHOULD BE LOCATED IN A MANNER THAT PROVIDES TWO (2) THREE-FOOT (3') WIDE ACCESS PATHWAYS FROM THE EAVE TO THE RIDGE ON EACH ROOF SLOPE WHERE MODULES ARE LOCATED.



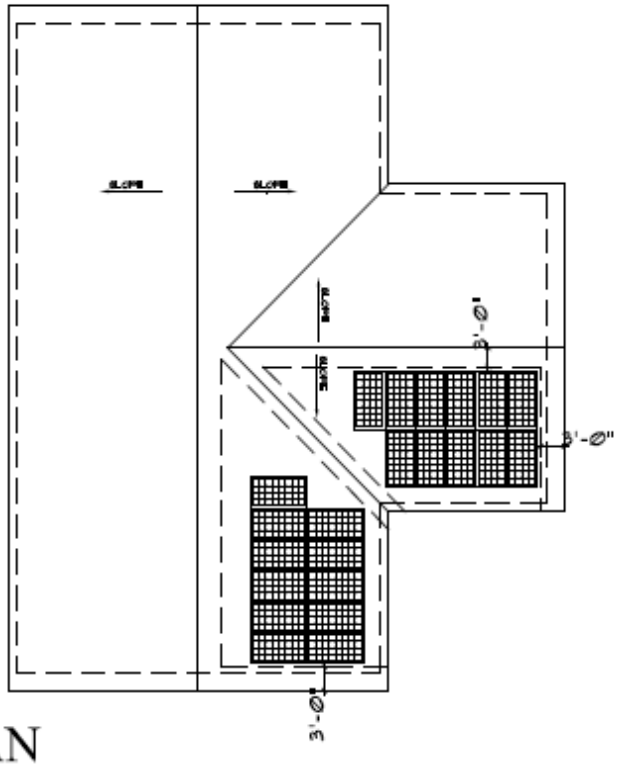
ROOF PLAN



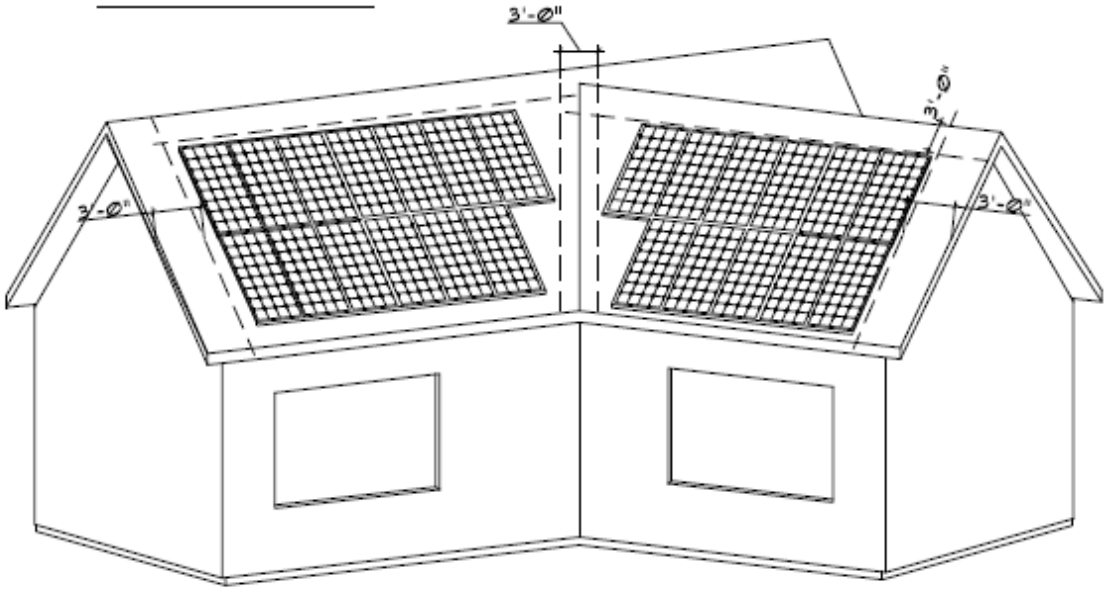
PERSPECTIVE

RESIDENTIAL BUILDINGS WITH HIP ROOF LAYOUTS:

MODULES SHOULD BE LOCATED IN A MANNER THAT PROVIDES ONE (1) THREE-FOOT (3') WIDE CLEAR ACCESS PATHWAY FROM THE EAVE TO THE RIDGE ON EACH ROOF SLOPE WHERE MODULES ARE LOCATED. THE ACCESS PATHWAY SHOULD BE LOCATED AT A STRUCTURALLY STRONG LOCATION ON THE BUILDING (SUCH AS A BEARING WALL).



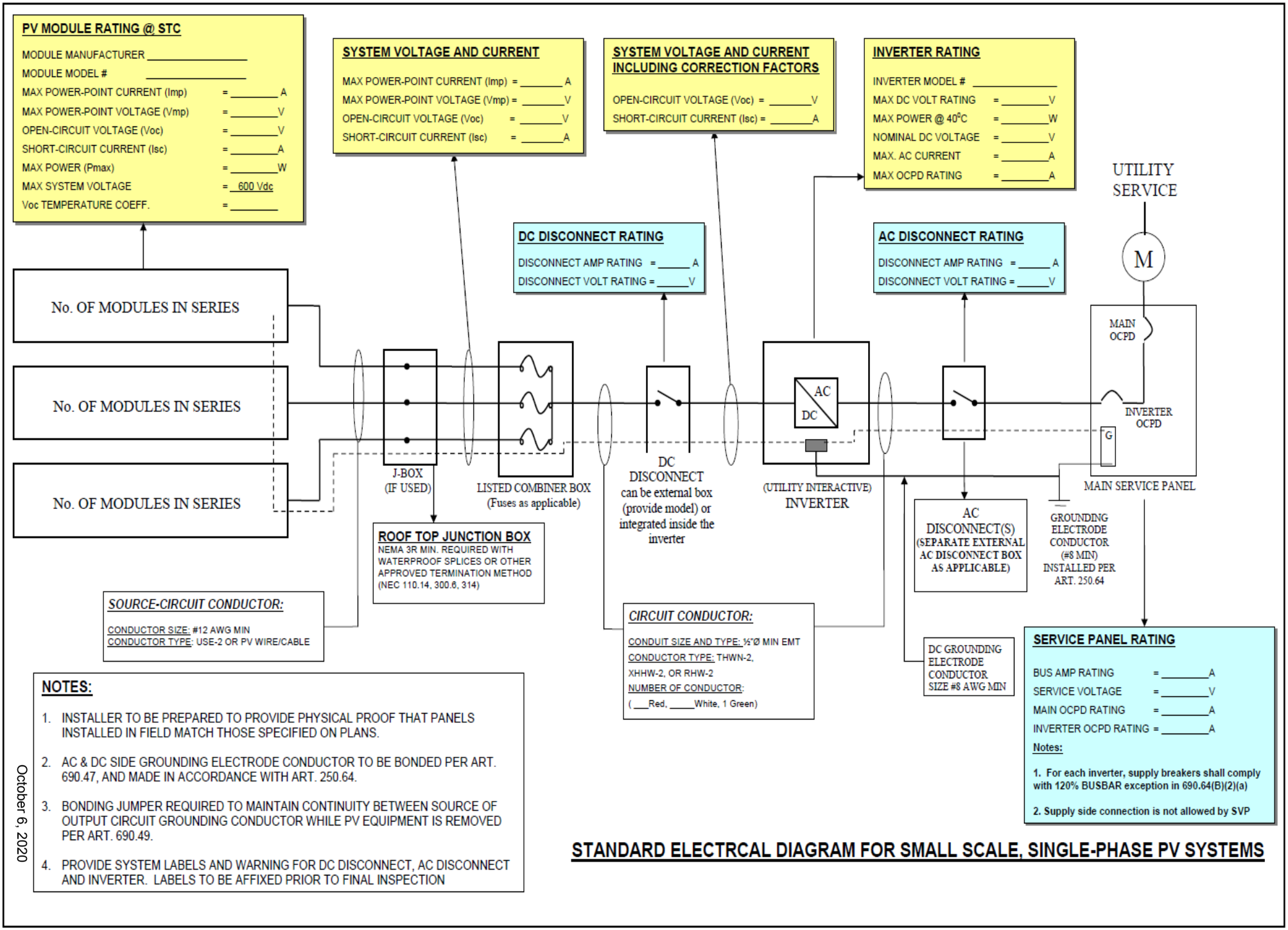
ROOF PLAN



PERSPECTIVE

HIP AND VALLEY ROOFS

HIPS AND VALLEYS: MODULES SHOULD BE LOCATED NO CLOSER THAN ONE AND ONE HALF (1.5) FEET TO A HIP OR A VALLEY IF MODULES ARE TO BE PLACED ON BOTH SIDES OF A HIP OR VALLEY. IF THE MODULES ARE TO BE LOCATED ON ONLY ONE SIDE OF A HIP OR VALLEY THAT IS OF EQUAL LENGTH THEN THE MODULES MAY BE PLACED DIRECTLY ADJACENT TO THE HIP OR VALLEY.


PV MODULE RATING @ STC
MODULE MANUFACTURER _____
MODULE MODEL # _____
MAX POWER-POINT CURRENT (Imp) = _____A
MAX POWER-POINT VOLTAGE (Vmp) = _____V
OPEN-CIRCUIT VOLTAGE (Voc) = _____V
SHORT-CIRCUIT CURRENT (Isc) = _____A
MAX POWER (Pmax) = _____W
MAX SYSTEM VOLTAGE = 600 Vdc
Voc TEMPERATURE COEFF. = _____
SYSTEM VOLTAGE AND CURRENT
MAX POWER-POINT CURRENT (Imp) = _____A
MAX POWER-POINT VOLTAGE (Vmp) = _____V
OPEN-CIRCUIT VOLTAGE (Voc) = _____V
SHORT-CIRCUIT CURRENT (Isc) = _____A
SYSTEM VOLTAGE AND CURRENT INCLUDING CORRECTION FACTORS
OPEN-CIRCUIT VOLTAGE (Voc) = _____V
SHORT-CIRCUIT CURRENT (Isc) = _____A
INVERTER RATING
INVERTER MODEL # _____
MAX DC VOLT RATING = _____V
MAX POWER @ 40°C = _____W
NOMINAL DC VOLTAGE = _____V
MAX. AC CURRENT = _____A
MAX OCPD RATING = _____A
UTILITY SERVICE
M
DC DISCONNECT RATING
DISCONNECT AMP RATING = _____A
DISCONNECT VOLT RATING = _____V
AC DISCONNECT RATING
DISCONNECT AMP RATING = _____A
DISCONNECT VOLT RATING = _____V
No. OF MODULES IN SERIES
No. OF MODULES IN SERIES
No. OF MODULES IN SERIES
J-BOX (IF USED)
LISTED COMBINER BOX (Fuses as applicable)
DC DISCONNECT can be external box (provide model) or integrated inside the inverter
AC
DC
(UTILITY INTERACTIVE) INVERTER
MAIN OCPD
INVERTER OCPD
G
MAIN SERVICE PANEL
ROOF TOP JUNCTION BOX
NEMA 3R MIN. REQUIRED WITH WATERPROOF SPLICES OR OTHER APPROVED TERMINATION METHOD (NEC 110.14, 300.6, 314)
AC DISCONNECT(S) (SEPARATE EXTERNAL AC DISCONNECT BOX AS APPLICABLE)
GROUNDING ELECTRODE CONDUCTOR (#8 MIN) INSTALLED PER ART. 250.64
SOURCE-CIRCUIT CONDUCTOR:
CONDUCTOR SIZE: #12 AWG MIN
CONDUCTOR TYPE: USE-2 OR PV WIRE/CABLE
CIRCUIT CONDUCTOR:
CONDUIT SIZE AND TYPE: ½"Ø MIN EMT
CONDUCTOR TYPE: THWN-2, XHHW-2, OR RHW-2
NUMBER OF CONDUCTOR: (___Red, _____White, 1 Green)
DC GROUNDING ELECTRODE CONDUCTOR SIZE #8 AWG MIN
SERVICE PANEL RATING
BUS AMP RATING = _____A
SERVICE VOLTAGE = _____V
MAIN OCPD RATING = _____A
INVERTER OCPD RATING = _____A
Notes:
1. For each inverter, supply breakers shall comply with 120% BUSBAR exception in 690.64(B)(2)(a)
2. Supply side connection is not allowed by SVP
NOTES:
1. INSTALLER TO BE PREPARED TO PROVIDE PHYSICAL PROOF THAT PANELS INSTALLED IN FIELD MATCH THOSE SPECIFIED ON PLANS.
2. AC & DC SIDE GROUNDING ELECTRODE CONDUCTOR TO BE BONDED PER ART. 690.47, AND MADE IN ACCORDANCE WITH ART. 250.64.
3. BONDING JUMPER REQUIRED TO MAINTAIN CONTINUITY BETWEEN SOURCE OF OUTPUT CIRCUIT GROUNDING CONDUCTOR WHILE PV EQUIPMENT IS REMOVED PER ART. 690.49.
4. PROVIDE SYSTEM LABELS AND WARNING FOR DC DISCONNECT, AC DISCONNECT AND INVERTER. LABELS TO BE AFFIXED PRIOR TO FINAL INSPECTION
October 6, 2020
STANDARD ELECTRCAL DIAGRAM FOR SMALL SCALE, SINGLE-PHASE PV SYSTEMS