

CITY OF MILPITAS

Building & Safety Department
455 E. Calaveras Blvd.
Milpitas, CA 95035
408-586-3240
www.ci.milpitas.ca.gov



RESIDENTIAL PHOTOVOLTAIC (PV)

1. PERMIT INFORMATION:

- ☐ The installation of a photovoltaic solar electric system requires a permit.
- ☐ **Homeowners Association:** If the property is regulated by a Home Owners Association, any exterior work must have written approval of the Association and the written approval must be attached to the 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 2016 California Residential Code (CRC) or 2016 California Building Code, 2016 California Electrical Code (CEC), 2016 California Mechanical Code (CMC), 2016 California Plumbing Code (CPC), 2016 California Energy Code, 2016 California Green Building Code and 2016 Milpitas Municipal Code (MMC)..
- ☐ Equipment must be installed in accordance with it's listing and the manufacturer's installation instructions [CEC 110.3(B)].
- ☐ All work shall comply with CEC Article 690 *Solar Photovoltaic*.

3. PLAN REQUIREMENTS

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, rapid shutdown devices, 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.

3. FIRE DEPARTMENT REQUIREMENTS

Signage

- ☐ See item #4 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.

4. 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: (State Fire Marshal)

CAUTION!
SOLAR CIRCUIT

- ☐ Appropriate signage shall be provided to identify the main A/C disconnect for the solar system (State Fire Marshal).

PHOTOVOLTAIC SYSTEM AC DISCONNECT

MAX. OPERATING CURRENT: _____ **AAC**
OPERATING VOLTAGE: _____ **VAC**

- ☐ 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).

WARNING
ELECTRIC SHOCK HAZARD.
DO NOT TOUCH TERMINALS.
TERMINALS ON BOTH THE LINE AND LOAD
SIDES MAY BE ENERGIZED
IN THE OPEN POSITION.

- ☐ 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
UNGROUND AND MAY BE ENERGIZED.

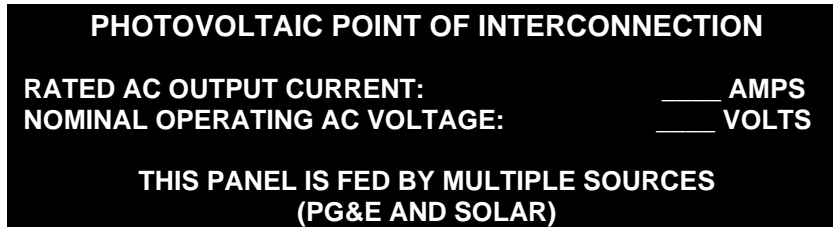
- ☐ The following sign shall be installed at the dc photovoltaic disconnecting means: (CEC 690.53)

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 buildings and structures with both utility service and a PV system, complying with CEC 690.12, shall have a permanent plaque or directory including the following wording: PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN The plaque shall be reflective, with all letters capitalized and having a minimum height of 9.5mm(3/8 in), in white on red background.
- ☐ 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)].



- ☐ 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)]



5. SMOKE ALARMS, CARBON MONOXIDE ALARMS & SPARK ARRESTERS:

- ☐ In single family and multi-family residences (including townhomes, condominiums and apartments), installation of smoke alarms, carbon monoxide alarms and spark arresters on all chimneys is required prior to the final inspection as follows:
 - **Smoke Alarms** listed in accordance with U.L. 217 and listed and approved by the California State Fire Marshal must be installed if they do not already exist in each sleeping room, outside each separate sleeping area in the immediate vicinity of the bedrooms and on each story of the dwelling. For R-3.1 occupancies, refer to CBC Section 907.2.11.2 for additional requirements. (CRC R314)
 - **Power source:** Smoke alarms shall receive their primary power from the building wiring and shall be equipped with a battery backup. Smoke alarms shall emit a signal when the batteries are low. Alarm wiring shall be directly connected to the permanent building wiring without a disconnecting switch other than as required for overcurrent protection. Smoke alarms are permitted to be solely battery operated in

existing buildings where no construction is taking place and in existing areas of buildings undergoing alterations or repairs that do not result in the removal of interior walls or ceiling finishes exposing the structure, unless there is an attic or crawl space available which could provide access for building wiring without the removal of interior finishes.

- **Interconnection:** Where more than one smoke alarm is required to be installed within an individual dwelling unit or sleeping unit, the smoke alarms shall be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit, except interconnection is not required in buildings that are not undergoing alterations, repairs or construction of any kind and where alterations or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure, unless there is an attic or crawl space available which could provide access for interconnection without the removal of interior finishes. The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.
- **Carbon Monoxide Alarms:** An approved carbon monoxide alarm listed as complying with UL 2034, approved and listed by the California State Fire Marshal, installed and maintained in accordance with NFPA 720 and the manufacturer's instructions shall be installed if they do not already exist in existing dwellings or sleeping units having a fossil fuel-burning heater or appliance, fireplace or an attached garage as follows: outside each separate dwelling unit sleeping area in the immediate vicinity of bedroom(s) and on every level of dwelling unit. Carbon monoxide detection systems that include carbon monoxide detectors and audible notification appliances, installed and maintained as required for carbon monoxide alarms and NFPA 720 shall be permitted. The carbon monoxide detectors shall be listed as complying with UL 2075. (CRC R315)
- **Power supply and Interconnection:** Refer to the requirements above for smoke alarms for connection to the building wiring, exceptions allowing battery only alarms and interconnection of the alarms when more than one is installed.
- **Spark arresters:** When the value of the work exceeds \$1,000, a spark arrester must be installed on fireplace chimneys if one does not already exist per MMC Section II-3-2.06. Spark arresters shall be constructed in conformance with CRC Section 1003.9.1.
- ❑ If access to the interior of the dwelling by the Building Inspector cannot be scheduled for inspection of the smoke and carbon monoxide alarms and the work being performed is exterior only (such as re-roofing, re-siding, patio covers, swimming pools and the like), a "Smoke Alarm, Carbon Monoxide Alarm and Spark Arrester Certificate" can be signed by each property owner and provided to the inspector prior to final inspection.

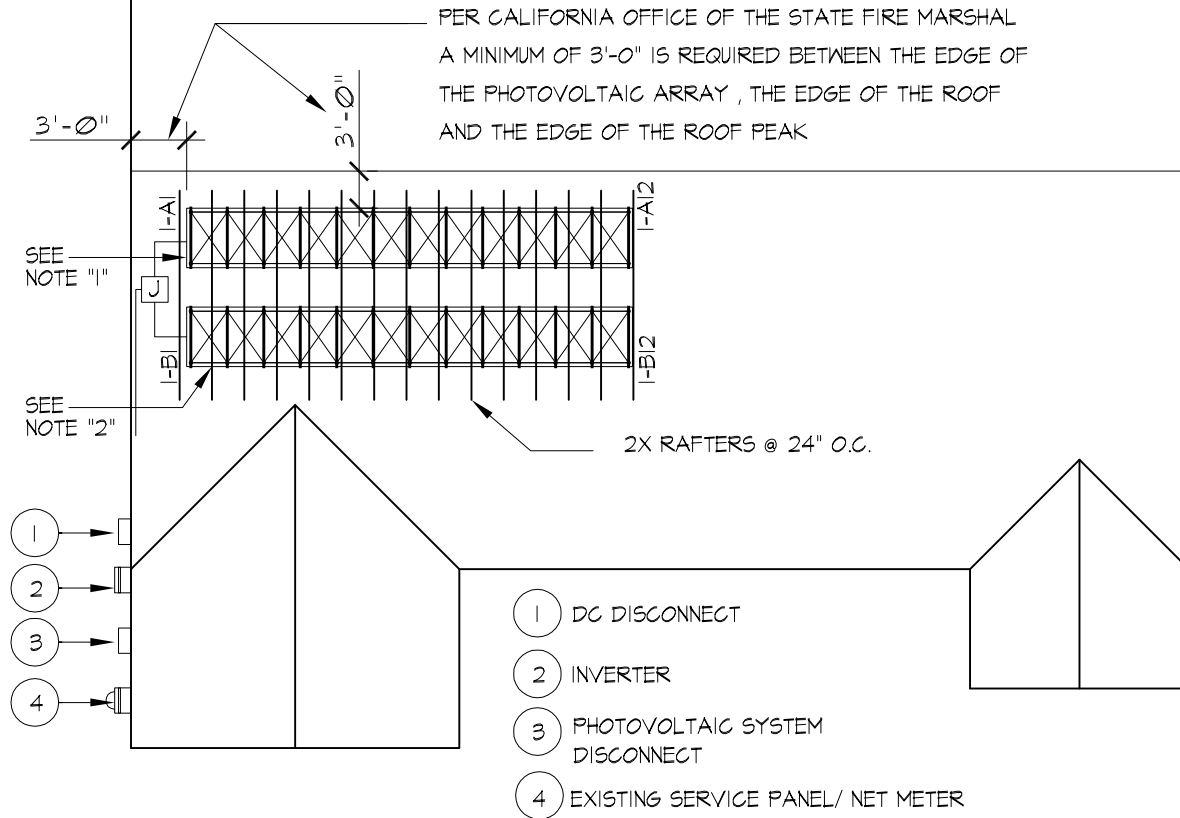
6. INSPECTION PROCEDURES

- ❑ 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 commercial projects require a final inspection and approval from the Fire Department prior to the final inspection being performed by the Building Department. Call (408) 586-3380 to schedule. Note: Inspections must be scheduled 48 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 lb rating, in good condition and designed for its intended use.

7. QUESTIONS:

- ❑ If you have any questions regarding your project contact the Building & Safety Department at (408) 586-3240.

PV ARRAY LAYOUT & WIRING PLAN



MOUNTING NOTES:

- PANELS MOUNTED ON ALUMINIM RACKING
- PV ARRAY MOUNTS TO ROOF STRUCTURE WITH 5/16" LAGS EMBEDDED 2 1/2" INTO RAFTERS OR SEE NOTE 5 BELOW
- PV PANELS ARE ANCHORED @ 48" O.C.
TRUSSES/ RAFTERS ARE 24" O.C.. OR SEE NOTE 5 BELOW
- WEIGHT OF PV MODULES AND ASSEMBLY SHOULD BE LESS THAN 5 LBS PER SQUARE FOOT.
- ALL INSTALLATION MUST COMPLY WITH MANUFACTURER'S INSTALLATION INSTRUCTION.

ARRAY CONDUIT & WIRING ARRANGEMENT

- 1- FREE-AIR / 1/2" CONDUIT SLEEVE **
- (2) #12 AWG; R, W
- 2- TO DC DISCONNECT
- 1/2" CONDUIT
- (4) #12 AWG; (2) R, (2) W
- (1) #8 GND

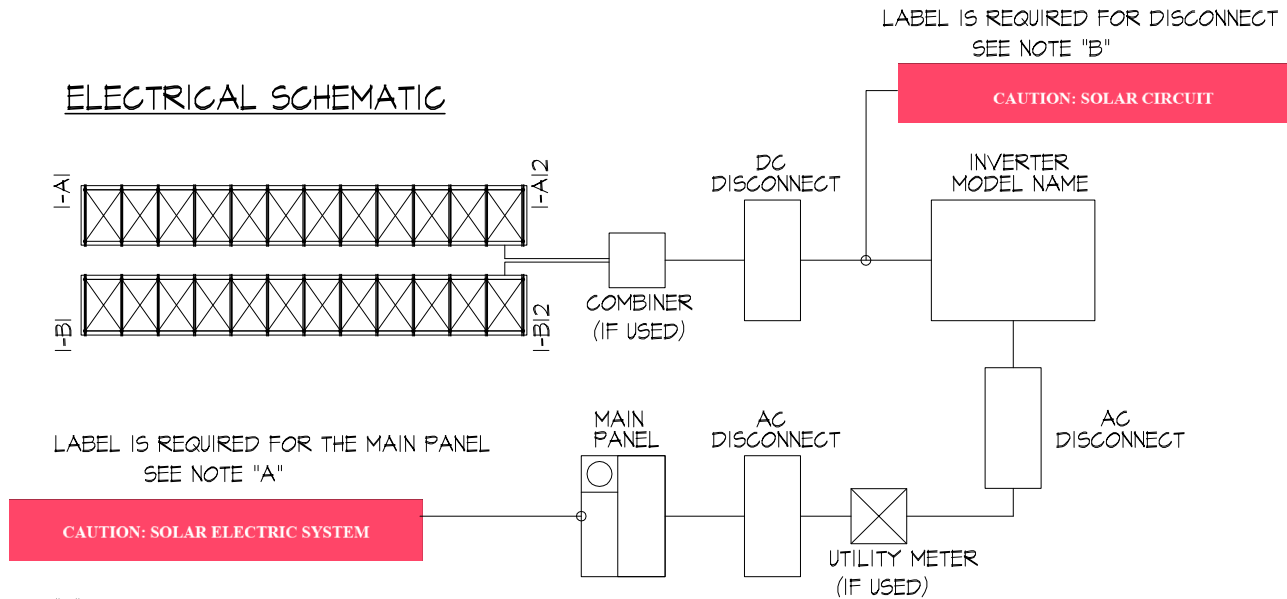
** SLEEVE PROVIDES PROTECTION FROM PHYSICAL DAMAGE PER NEC 300.13 & 300.18

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			DATE:
			NOV. 2008
			DRAWN BY:
			BK.

City of Milpitas
Building & Safety Division
SOLAR PANEL INSTALLATION

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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 MARKING 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)

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

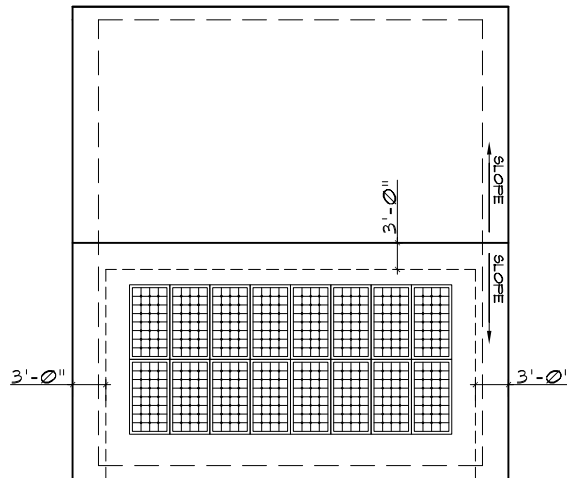
1. BOND PV SYSTEM AND PV RAIL ASSEMBLY TO SERVICE ELECTRODE
2. CONNECT AC TO CUSTOMER SERVICE VIA 1 DP 6E 15 AMP BREAKER
3. ELECTRICAL INSTALLATION IN ACCORDANCE WITH 2010 CALIFORNIA ELECTRICAL CODE

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	

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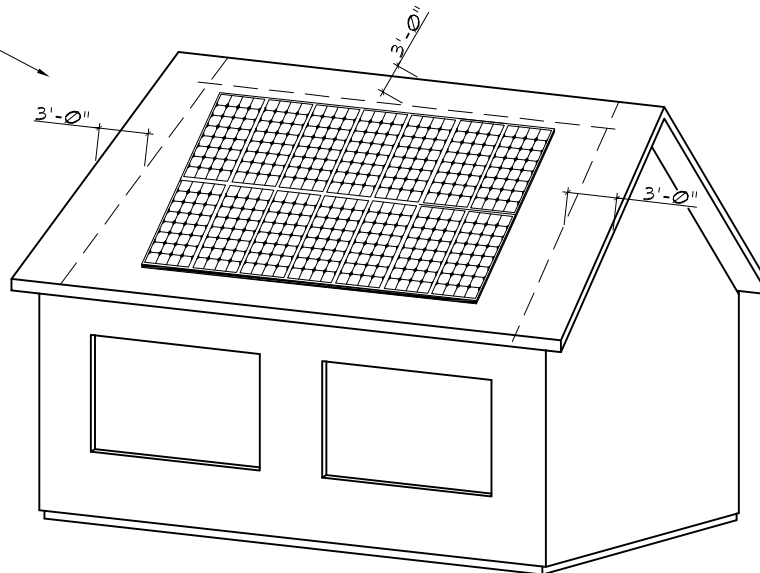
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SOLAR PANEL INSTALLATION

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ROOF PLAN

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



PERSPECTIVE

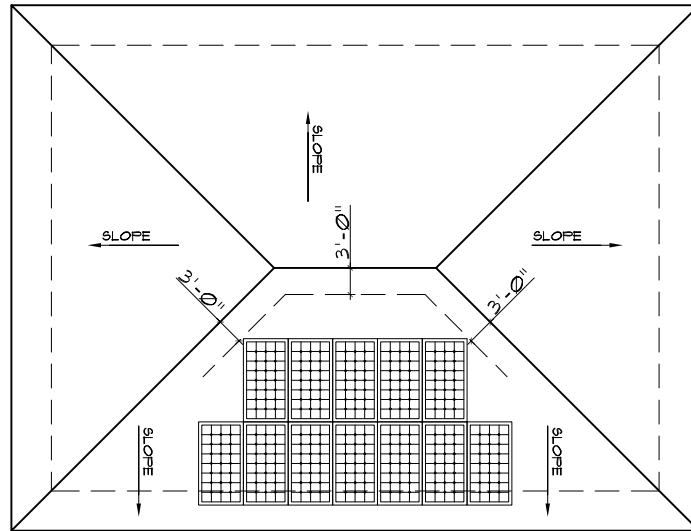
RESIDENTIAL BUILDINGS WITH GABLE ROOF LAYOUTS:

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.

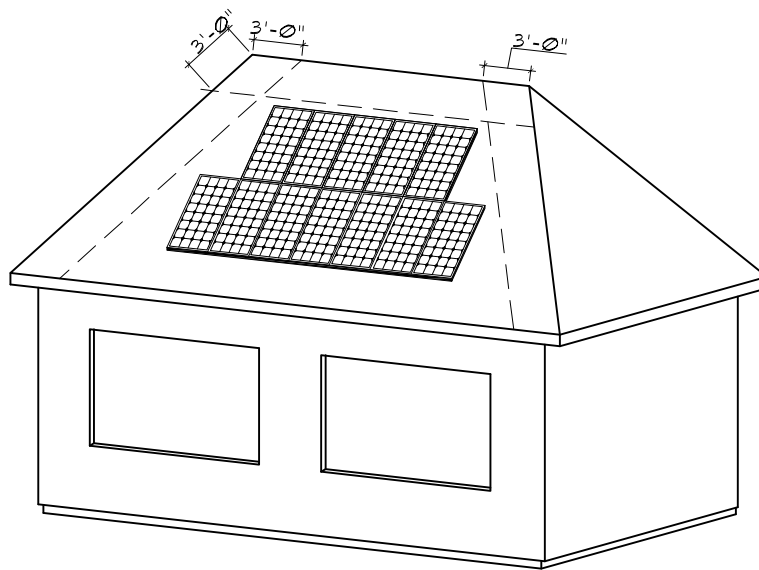
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ROOF PLAN



PERSPECTIVE

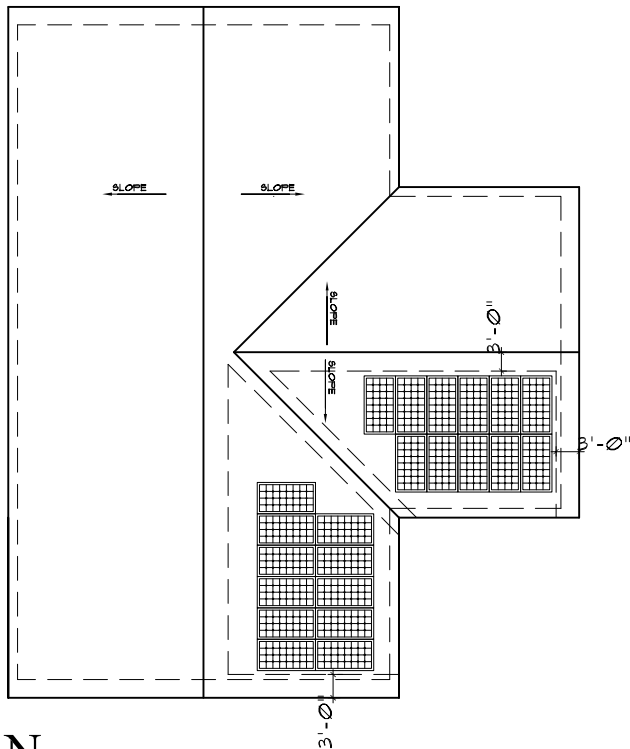
RESIDENTIAL BUILDINGS WITH HIP ROOF LAYOUTS:

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).

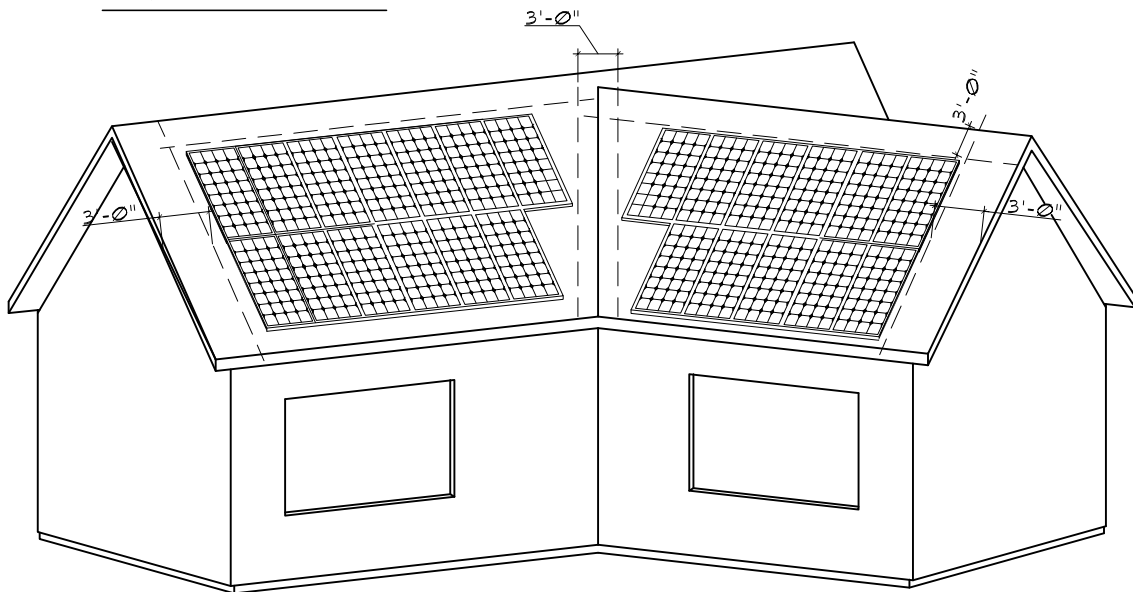
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ROOF PLAN



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.

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SAMPLE ELECTRICAL DIAGRAM FOR SMALL SCALE, SINGLE-PHASE PV SYSTEMS
Milpitas 2017