

 Building Division	PHOTOVOLTAIC INSPECTION City of Palo Alto (CPA) Building Inspection Division 285 Hamilton Ave. Inspection Request: 650 329-2496 IVR# 701, 702, 703	Revision Date: 01/12/11
		General Requirements/Checklist for: Residential Codes Enforced: 2010 CEC/2008NEC Palo Alto Municipal Code (PAMC)
The information provided in this document is general and intended as a guide only. Each project is unique and additional requirements may be enforced as deemed appropriate.		

WARNING

- Failure to complete items below prior to inspection may result in a re-inspection fee.
- **METER REMOVAL AND SERVICE DISCONNECT/RECONNECT ARE TO BE PERFORMED BY UTILITIES PERSONNEL ONLY. CONTRACTORS WHO TAMPER WITH CPA UTILITIES EQUIPMENT WILL BE ISSUED A CITATION. CITATIONS WILL BE ASSESSED AT \$500.00 PER INCIDENT PER PAMC 12.20.010.**

PROJECT INFORMATION

- Permit #: _____
- Project address: _____
- Date: _____

PRIOR TO INTALLATION

- Prior to installation plans shall be submitted and approved.

REQUIRED INSPECTIONS:

- STRUCTURAL ATTACHMENT
- RACKING/INVERTERS FOR MICRO INVERTER INSTALLATION
- ROUGH WIRING/CONDUIT
- CPA ELECTIC METER SHOP (650-496-6987)
- FINAL

GENERAL REQUIREMENTS

- The approved plans, permit and installation instructions shall be on site at time of inspection.
- Field installation shall be per code/plan. Changes shall be submitted to the city for approval prior to inspection.
- Structural attachments must be inspected prior to cover.
- Junction boxes installed under the array and are not readily accessible, the module shall be removed for inspection
- If a new roofing system is going to be installed, a separate roofing permit and inspections are required. See checklist for specific roof being installed. Flashing and counter flashings are required.

- Where dc wiring is installed inside the structure a separate rough inspection must be scheduled at the all trades inspection.
- DC wires installed inside the structure shall be installed in a metallic raceway. *CEC 690.31 (E)*
- *Dc wires shall be installed in a metallic raceway where the maximum system voltages are greater than 30 volts. *CEC 690.31(A)*
- Where dc conductors are installed underground, conductors shall be buried 18" or more below grade and a warning tape installed 12" above the conduit. Label conduit per the "Sign and Label" requirements.
- Installer shall have ladder on site and set up at time of inspection. The ladder shall be extended 36" above the roof and ladder shall be secured at roof.
- All equipment shall be open and ready for inspection.

TORQUE REQUIREMENTS

- Contractor to provide a list of torque specification of circuit breakers at time of final inspection.
- Torque all connections per manufacturer's listing. (Electrical contractor to be onsite with torque wrench and torque screwdriver of the audible type. (Ratcheting). (*CEC 110.3 (b)*)

INSPECTION

- The inspector shall check existing panel for hot spots or unsafe conditions. If existing panel is found to be unsafe, it may be necessary for the property owner to hire a licensed electrician to make repairs or replace equipment. Repairs/replacement shall happen prior to photovoltaic hook up.
- Verify green sticker from utilities is posted on main electrical service. *Call the meter shop at 650-496-6987 to schedule an inspection from the meter shop.*
- Contractor shall be on site with torque wrench and torque screwdriver of the audible type. (Ratcheting)
- Check torque at all connections per manufacturer's specifications at all equipment including module clips and racking system.
- All connections shall be secure.
- All metallic raceways and equipment shall be bonded and electrically continuous.
- Ground bushing is required around remaining pre-punched concentric or eccentric knockouts on the dc side. *CEC 250.97*
- Where dc conductors are installed underground, conductors shall be buried 18" or more below grade and a warning tape installed 12" above the conduit. Label conduit per the "Sign and Label" requirements.

DC DISCONNECT

- Must be rated 600 Vdc.
- Where fuses are installed, verify they are rated 600 Vdc and are the same amperage as specified on the approved drawings.
- Label fuse size inside dc disconnects.
- Array conductors must be connected to the line side input terminals at the top of the main dc disconnect and conductors to inverter input shall be connected to the load side output terminals (bottom) of dc disconnect.

- The equipment grounding lug shall be as specified by the manufacturer. Verify the lug matches the part number as specified on the inside of the door.
- Scratch paint under equipment grounding lug prior to installation.
- Verify grounding lugs are located where specified by manufacturer.
- Disconnects shall be installed so that the center of the operating handle, at it's highest position, is not more than 6'-7' above the floor or working platform and shall be located in a readily accessible location. CEC 404.8(A)(1)

MAIN ELECTRIC SERVICE

- The inspector shall check existing panel for hot spots or unsafe conditions. If existing panel is found to be unsafe, it may be necessary for the property owner to hire a licensed electrician to make repairs or replace equipment. Repairs/replacement shall happen prior to photovoltaic hook up.
- Verify utility ac disconnect is located within sight and within 10 feet of main electrical service. AC disconnect shall be readily accessible with visible-blades, and lockable.
- *Verify utility point of interconnection (circuit breaker) is per plan, does not exceed 20% of the bus rating and is installed at the opposite end from the input feeder. CEC 690.64(B)(2) and 690.64(B)(7)
- Circuit breakers shall be of the same manufacturer as the main electrical service.
- When a back fed breaker is the method of utility interconnection, breaker **shall not** read "line and load"
- All underground conduits shall be sealed. Sealants must be listed for such use. (example: duct seal) CEC 300.5, 230.8
- Verify existing ac grounding electrode system UFER or driven ground rod. The connection to the grounding electrode shall remain accessible. CEC 250.68 (a)
- If there is not an existing ac grounding electrode, PV contractor shall install a second ground rod at the main electrical service per CEC 250.52(5).
- Verify grounding electrode system from inverter to additional ground rod then bonded to existing ac grounding electrode or provide grounding electrode conductor directly from inverter to existing grounding electrode with separate attachment.
- Where and existing grounding electrode system is a driven ground rod, an additional ground rod shall be driven. Ground rods shall be a minimum of 6' apart. CEC 250.56

PANELBOARD

- Where the system is backfeeding a panelboard, the breaker must be installed at the opposite end from the input feeders or main circuit location. Exception: Where the rating of the panelboard is less than the sum of the OCPD supplying it. CEC 690.64.(B)(7)

INVERTER LOCATION

- AC and DC disconnects shall be located at inverter. *CEC 690.14 (a)-(c)*
- Verify maximum/minimum height requirements per mfg.
- Array conductors must be connected to the line side input terminals at the top of the main **DC disconnect** and conductors to inverter input shall be connected to the load side output terminals (bottom) of DC disconnect.
- At **AC utility disconnect**, top/line side terminals will have circuit from AC load center/main service connected to terminals, bottom/load side terminals will have circuit from inverter connected to these terminals.
- Verify clear plastic barrier is returned to its original position separating the ac/dc wiring from the communication wires.
- Supports:** EMT, IMC, and RMC shall be securely fastened in place at least every 10' and within 3' of each outlet box, junction box, device box, cabinet, conduit body or other termination. *CEC Article 342.30 (A), 344.30 (A), 358.30 (A)*
- If electrical equipment is located near the gas meter, verify clearances are met. See gas meter standard drawing # std-gd-02 for clearance requirements.

ROOF TOP INSPECTION

- Conductors shall be protected from physical damage. (e.g. EMT) *CEC 300.3 (B), 691.31 (B)*
- *Connectors require the use of a tool to open. *CEC 690.33(C)* Connectors shall also be marked "Do Not Disconnect Under Load" or Not for Current Interrupting." *CEC 690.33(E)(2)*
- All equipment on the roof requiring servicing shall meet the required clearances of *CEC 110.26*.
- When a new roof is being installed or where the connections of the supports are going to be covered up, an inspection is required to verify connections.
- Verify roof penetrations are flashed and counter flashed.
- Modules shall be of the same manufacturer per manufacturer's listing.
- Verify grounding lugs at the module frames are installed per the module manufacturer's installation instructions.
- Module wiring shall be properly secured and protected from damage.
- Equipment on dc side of inverter shall be rated 600vdc.
- Where three or more strings are being combined, combiner box shall be listed/factory assembled.
- Verify fuse size matches the approved plans and rated 600Vdc.
- Electrical equipment located in the attic shall be accessible.
- *An additional electrode is required near the array when the array is more than 6' from the premises wiring electrode. *CEC 690.47(D)*
- Supports:** EMT, IMC, and RMC shall be securely fastened in place at least every 10' and within 3' of each outlet box, junction box, device box, cabinet, conduit body or other termination. *CEC Article 342.30 (A), 344.30 (A), 358.30 (A)*

SIGNS AND LABELS Rev. 6/4/10

Labels shall be phenolic where exposed to sunlight. Labels required on conduit shall be permanent, weather resistant and suitable for the environment. Labels shall be red background w/white lettering. The following labels must be provided:

Article	Location of Label	Verbiage
690.5(C)	Utility-interactive inverter, battery enclosure	"WARNING: ELECTRIC SHOCK HAZARD IF A GROUND FAULT IS INDICATED, NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED"
690.14(C)(1)	On the main service when DC wiring is run through the building and the DC disconnect is located other than at the main service	DC Disconnect IS LOCATED....
690.14(C)(2)	On the AC and DC disconnects	DC Photovoltaic Disconnect AC Photovoltaic Disconnect
690.53	On the DC disconnects	Operating current ____ Operating voltage ____ Maximum system voltage ____ Short circuit current ____
690.52	At interactive points of interconnection, usually the main service	Maximum AC operating current ____ Operating AC voltage ____
690.56(B)/ 690.14(D)(4), 705.10	At the electrical service and at the photovoltaic inverter if not located at the same location	A directory providing the location of the service disconnecting means and the photovoltaic system disconnecting means
690.17	At the electrical service	"WARNING! 2 SOURCES OF POWER PV/AC @ ADJACENT LOCATION"
UTILITIES REQUIREMENT	At the main electrical service when a supply side tap is used	"CAUTION! SUPPLY SIDE TAP. OPEN AND LOCK AC PV DISCONNECT BEFORE REMOVING METER"
SFM - GUIDELINES	On dc conduit, raceways, enclosures, mark every 10', at turns, above/below penetrations	"CAUTION: SOLAR CIRCUIT"
	On the inverter where PV systems are positively grounded	POSITIVE GROUNDED SYSTEM
	Load centers used as PV circuits combiner boxes shall be labeled.	"PHOTOVOLTAIC CIRCUITS ONLY. NO ADDITIONAL CIRCUITS ALLOWED"

General Guidelines

- When transitioning occurs from free air to in conduit, install a cord grip fitting with a rubber grommet or a bushing and sealant such as Sikaflex.
- Where conductors are installed underground, section 300.5 of the CEC must be followed to ensure proper protection.

Grounding

- Grounding of the system must comply with CEC 690.47 (C). Note where an existing grounding electrode system is a driven ground rod, an additional ground rod is required per CEC 250.56.
- Each PV system must attach to the grounding electrode with a continuous grounding electrode conductor. An approved irreversible grounding splice may also be accepted.
- Connection of the grounding electrode conductor to the grounding electrode must be made with an approved connection that is listed for the application and location.
- Grounding electrode conductors must be sized to comply with article 690.47 of the CEC