



*County of Gloucester*

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## **RESIDENTIAL PHOTOVOLTAIC SYSTEMS**

### **Guidelines for Proper Installation and Inspections**

The following are helpful guidelines for the proper installation of a residential photovoltaic system. Compliance with these guidelines should help with the installation as well as the inspection process. **PLEASE NOTE:** This is not intended to be an all-inclusive installation document, refer to the National Electrical Code (NEC) for any additional requirements.

#### **General Requirements:**

##### **Building / Equipment / Roof Plan Information:**

1. Provide a roof plan diagram illustrating:
  - The total roof area, roof edges, any parapet walls, change of elevations, roof-top equipment.
  - Show the location on the roof where the solar system is to be installed.
  - Include the size and total area of the proposed system to be installed on the roof.
2. Specify type of roof assembly and roofing material.
  - If a trussed roof system, please provide manufactured roof truss design or engineered design with the additional loads for the solar system.
3. Submit roof clearance requirements for the proposed solar system per the manufactures installation instructions.
4. Submit a detail of required roof penetration flashings.

##### **Structural Design Requirements for Solar Systems**

1. Provide documentation and/or verification that the exposed solar panel equipment and means of attachment meets wind load requirements (100 mph, 3-second gust) for Gloucester County.
2. Provide manufactures installation instructions for the support framing and structure attachment.

##### **Electrical Design Requirements for Solar Systems**

1. Submit manufactures installation instructions.
2. Submit a complete Electrical Diagram and documentation showing:
  - Point of system grounding connection.
  - System dedicated overcurrent device and disconnecting means.
  - Specifications for the power inverter equipment.
  - Specifications for the interconnection system equipment.
  - Submit load calculations.
3. Submit a floor plan showing location of all electrical equipment.
4. **Note:** Residential systems exceeding **400 amps** shall be designed in accordance to the NEC Article 690 Solar Photovoltaic Systems.

**Inspections:** (There are only 2 inspections that are required.)

**Building Structural Rough-In Inspection**

- Roof or building structure modifications.
- The photovoltaic panel attachment to the building structure.

**Photovoltaic System Final Inspection**

- Installation of the photovoltaic panels.
- Installation of all electrical equipment.

**It is the responsibility of the contractor who is managing the installation to call and schedule these inspections when the work is completed and ready for each inspection.**

**Final Photovoltaic System Inspection**

This final inspection shall not be scheduled until the installation is complete. **A copy of the manufacturer's specifications and installation instructions are required to be on site for the inspection.** Failure to have these on at the site will be cause for refusal of inspection.

The electrician [or his representative] who holds the electrical permit for the photovoltaic system installation shall be on site at the time of this Final Photovoltaic System Inspection to open all equipment to allow for the proper inspection.

The county inspector will witness the operation of Photovoltaic System. The electrician shall provide a test meter and check for proper voltage and frequency.

All electrical panels connected to photovoltaic system shall be clearly labeled.

The electric meter and the main electrical panel are required to have a "plaque or label" indicating the location of the photovoltaic system disconnecting means.

## **HELPFUL INSTALLATION CHECKLIST**

### **PV ARRAYS**

- PV modules labeled and listed to UL Standard 1703. [NEC 110.3] & [NEC 690]
- Mechanical attachment in accordance with manufacturer's installation instructions.
- Roof penetrations secure and weather tight.

### **GROUNDING AND BONDING**

- Check PV connection to new or existing grounding electrode. Check grounding electrode conductors, should only be spliced with listed irreversible compression connections or exothermic welding. [NEC 110.3] & [690]
- Verify that the DC grounding electrode from the inverter, charge controller or separate ground-fault device is connected to the grounding electrode or grounding bar in the load center. [NEC 250] & [NEC 690]
- Check that metallic raceways or enclosures are bonded. [NEC 250]
- Verify the integrity of the DC grounding connections for modules, racks and arrays. Note: check manufacturer's installation instructions the PV modules with attached PV Wire may allow the use of ungrounded PV arrays. [NEC 690.35]
- Verify that the PV disconnect is bonded and grounded. [NEC 250]

## **WIRING METHODS**

- A copy of the manufacturer's specifications and installation instructions are required to be on site for the inspection.**
- Verify correct conductor insulation. Conductor insulation rated at 90 degrees centigrade when in conduit or cables are exposed to sunlight. [Table 310.15(B) (3) (c).
- Verify temperature-corrected ampacity rating for conductors. [NEC 310.15]
- Check that conductors are properly terminated. [NEC 110.14]
- Wet-rated conductors used in conduits in exposed locations. [NEC 100, Definition of WET Location].
- Check electrical connections for proper environment (such as; inside, outside, wet, direct burial).
- Verify the use of metal raceways or metallic cable assembly for PV DC circuits inside of the building.
- Verify that all disconnects are properly connected with the line side to the correct circuit and switch poles are connected on the load side.
- Verify that the DC circuit conductor is not broken by a switch, breaker or fuse unless part of a ground-fault device.
- Check ratings on overcurrent devices and disconnects for appropriate ratings and listed for DC operation. [NEC 690.9]
- Verify that the system has a ground-fault device either built into the inverter or a separate ground-fault device.
- Verify that the inverter output circuits are properly sized per manufacturer's installation instructions.
- Verify that the PV disconnect is correctly connected to prevent back feed currents from module circuits, charge controller or batteries. [NEC 690.9]

## **BATTERIES**

- Installed in a well vented area and not a living area.
- Connected with an approved wiring method per manufacturer's installation instructions.
- Battery conductor routing and protection requirements per manufacturer's installation instructions.
- Battery cables to inverters, DC load Centers and charge controllers in conduit
- Conduits enter the battery enclosure below the tops of the batteries. [NEC 300.4]