

CITY & COUNTY OF DENVER COMMUNITY PLANNING & DEVELOPMENT BUILDING PERMIT POLICY		
<b>Subject: COMMERCIAL SOLAR PHOTOVOLTAIC (PV) ENERGY SYSTEMS PERMITS</b>		
<b>Approved: Eric Browning - Chief Building Official</b>		<b>Drafted by: Pafford</b>
<b>Number: NEC 690 – 2023 NEC</b>	<b>Issued Date: November 2, 2004 Reissued: March 01, 2023</b>	<b>Page: 1 of 4</b>

## REFERENCE

**2022 Denver Building Code (DBC) Section 1 Administration Section 131, 2022 Denver Commercial Building Code (DCBC) Chapter 16, 2023 National Electrical Code (NEC) Articles 690 & 705, 2022 Denver Mechanical Code (DMC) Chapter 14, Denver Revised Municipal Code (DRMC) Chapter 30**

## PROCEDURE

The procedure to obtain a permit (or permits, where applicable) for a commercial solar photovoltaic (PV) system is outlined below. This applies only to commercial and multifamily buildings and structures, and DCBC townhomes.

1. Ensure that the Zoning and Landmark conditions listed below have been addressed if they apply.
  - a. **When zoning permits are required before obtaining electrical permits:** If the panels will be installed at an angle unequal to the slope of the roof and do not meet the definition of “solar panel, flush mounted” per Denver Zoning Code Section 13.3, or if a generator or energy storage system is a part of the project and will be located on the exterior of the structure or on the site, a zoning permit must be obtained for the PV system(s) before applying for an electrical permit. Contact Commercial Zoning Team at [zoning.review@denvergov.org](mailto:zoning.review@denvergov.org) or 720-865-3000 for questions.
  - b. **When Landmark Preservation approval is required before obtaining electrical permits:** If the structure or site on which the PV system or related equipment (energy storage, generator, etc.) will be mounted is a designated structure for preservation or is in a district designated for preservation under the provisions of the Denver Revised Municipal Code (DRMC) Chapter 30, you must obtain approvals from Landmark Preservation before applying for electrical permits. Contact Landmark Preservation at [landmark@denvergov.org](mailto:landmark@denvergov.org) or 720-865-2719 for questions.
2. After obtaining Landmark approvals and Zoning permits, submit plans and calculations through the ePermits portal at [www.denvergov.org/epermits](http://www.denvergov.org/epermits) for the appropriate electrical (and potentially construction) permits.
3. All commercial systems regardless of kW DC rating and all solar hot water systems will be queued in alignment with other larger and more complex projects that necessitate multi-agency reviews.

## POLICY

### Solar Hot Water Systems – Submittal Requirements

For commercial and multifamily buildings and structures, and DCBC townhouses solar hot water systems, engineered plumbing plans are required for review and are to be submitted through the ePermits portal. Contact the Mechanical/Plumbing plan review team at [mechplumb.review@denvergov.org](mailto:mechplumb.review@denvergov.org) for questions.

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### **Commercial Solar Photovoltaic Systems Policy – Submittal Requirements**

A professional engineer’s seal and electronic signature is required for all commercial and multifamily buildings and structures, and DCBC townhome PV installations.

The documentation listed below is required when submitting plans for review at the time of permit application.

1. Manufacturer’s specification sheets and listing information for PV equipment, inverters, and other special equipment, including the system manufacturer, model name and number.
2. One-Line Diagram: Indicate all conductor sizes and insulation types, conduit sizes, fuse and circuit breaker ratings, inverter ratings, ground fault protection device (GFPD), AC and DC disconnect ratings. Specify the PV module’s nameplate short circuit current (Isc) and open circuit voltage (Voc). If disconnects, breakers, fuses, GFPD, etc. are part of a larger piece of equipment, show them as such by indicating how they are connected to the other devices and indicating their ratings. The inverter must be shown as either a source connection to a service per one of the three methods in 705.11(A), or as a load-side source connection permitted to be connected to the load side of the service disconnecting means at any distribution equipment on the premises, with the feeders or distribution equipment meeting the relevant sections of 705.12(A) and 705.12(B). The grounding electrode system must be shown on the one-line diagram (NEC 690.47).
3. Electrical Calculations: Submit conductor ampacity calculations based upon 156% multiplied by the short circuit current (Isc) (NEC 690.8), or where the PV system rating is greater than 100 kilowatts, submit a documented and stamped PV system design using an industry standard method and provided by a licensed professional electrical engineer to indicate the maximum current value. The current value obtained by using the method indicated in NEC 690.8 cannot be less than 70% of the value calculated using NEC 690.8(A)(1)(1). Also include the temperature derating correction factor per NEC Table 690.31(A)(3)(2). For all roof-mounted flexible wiring, use a worst-case ambient temperature of 61-65°C (141-149°F).
4. The maximum PV system voltage is equal to the open circuit voltage multiplied by the number of modules in the series, multiplied by the NEC lowest expected ambient temperature derating correction factor from Table 690.7(A) for the -21°C to -25°C (-5°F to -13°F) range.
5. Provide calculations indicating that the equipment grounding conductor is sized correctly (NEC 690.43 and 690.45).
6. Details that show how the panels will be mounted (attached to the frame) and how the frames will be mounted to the roof.

### **Structural Enhancements – Submittal Requirements**

1. Calculations performed by a Colorado registered professional engineer must be submitted for review to substantiate that the structure can support the design loads specified in DCBC Chapter 16. Details and calculations for the panel connections to the roof must be included.
2. If structural alterations are required for a commercial or multifamily building or structure, or DCBC townhomes, sealed and electronically signed drawings must be logged in for a structural review. A separate permit will be issued for this work to an appropriately licensed contractor.

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### Solar Photovoltaic Systems – Inspections

1. A qualified person must be present at the time of a PV electrical inspection. A qualified person is as follows:

For commercial and multifamily buildings and structures, and DCBC townhomes, the qualified person can be either a:

- a. Licensed master electrician,
  - b. Licensed journeyman electrician, or
  - c. NABCEP-certified (North American Board of Certified Energy Practitioners) solar installer capable of testing the rapid shut down system. If a certified solar installer is present, then the dead front of the electrical panel shall be removed by the electrical inspector.
2. When structural enhancements are required, a rough framing inspection must be requested.
  3. At time of inspection, the contractor must submit written documentation stating that “All grounding and bonding regarding the array has been performed as per NEC Article 690.41 through 690.47, and furthermore, all equipment installed on the roof complies with all NEC guidelines.”
  4. A ladder must be provided by the customer for commercial PV electrical inspections where any component of the system is mounted on the roof.
  5. The rapid shut down system must be tested at the final electrical inspection with the inspector present.
    - a. If the rapid shut down system is located on the AC side of the system, then this test must be conducted by a licensed electrician.
    - b. If the rapid shut down system is located on the DC side of the system, then a NABCEP certificate holder can conduct this test, in addition to any licensed electrician. The solar installer must provide proof of their NABCEP certificate, which may be done by providing the inspector a photo of the certificate, a copy of the certificate, or by showing the inspector their name on the NABCEP website with a driver’s license to verify.

### Permits for Reroofing a Structure Containing Solar PV Panels

When applying for a roofing permit to replace or repair a roof on an existing building that includes solar PV panels, a Quick Permit (Electrical) can be issued through the Epermits portal for the removal and reinstallation of the panels, provided there were no changes to the previously approved solar PV system. The scope of work must state if the existing PV on the roof will be removed and reinstalled per the previously reviewed and permitted PV project plans and details. A roofing permit will be required for the roofing replacement or roofing repair.

At time of the electrical inspection, the contractor must submit written documentation stating that “All grounding and bonding regarding the array has been performed as per NEC Article 690.41 through 690.47, and furthermore, all equipment installed on the roof complies with all NEC guidelines.”

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For the electrical inspector to final the electrical permit, the PV installer must provide a letter to the inspector at the time of the final electrical inspection that states that no modifications to the permitted PV system were made, and the PV system was only removed and will be reinstalled following the completion of the roofing replacement or roofing repair. The letter must be on the company letterhead of the PV company that removed and will reinstall the system.

If any changes are proposed to the PV system other than the relocation of the solar panels, then plans must be submitted, and a new electrical permit must be issued. The electrical permit will be finalized after the roof permit.

### **FEES**

*Solar systems have reduced building permit fees. A \$50 flat building permit fee will be applied to both single-family residential and commercial PV system installations. Where other non-solar work is required under the project, the \$50 flat fee will only apply to the solar PV system portion of the project. The permit fee for the non-PV work shall be based on the actual valuation of that work.*

**END OF DOCUMENT**