City of Thornton

# PLAN REVIEW SUBMITTAL REQUIREMENTS AND REQUIRED INSPECTIONS FOR SOLAR PHOTOVOLTAIC SYSTEMS

## PERMIT APPLICATION

**Plans must be submitted electronically via online portal. Go to: https://cityviewportal.thorntonco.gov/. Instructions are available on "Portal Help" on registration and solar permit submittals. A separate plan review is required for each property or address. Complete submissions must include:**

**A set of construction drawings as described below,**

1. All commercial systems, and the structural potion of residential plans, are required to bear the stamp and signature of a professional engineer licensed to practice in the State of Colorado.
2. PV System construction and specification sheets shall come in one plan set. The plan pages must be of one uniform size. Any size is acceptable. An area for the plan review stamp must be made available within the title block. That area must be in the same place throughout the plan set.
    - The plan set does not require photos of the existing electrical panel.
    - A separate line diagram is not required to be in the submittal package.
    - Any revisions made after the permit has been issued must be submitted as a revision within an entire plan set. Clouds around revisions are required.

**Also, a signed contract with the total cost of the labor and material. This amount must match the value entered on the permit application. Make sure to separate out any main panel upgrade valuation into the required MPU permit.**

**The applicable design codes are**: 2020 NEC, 2021 IRC, 2021 IBC and 2021 IFC.
**Design load criteria**: 80 mph basic wind speed with a 110 mph 3 second gust, exposure C, snow load 30 lbs./sq. ft.

**Electrical Plans**

For residential single family dwellings:

1. Provide a layout plan of the building with the location of all service equipment, disconnecting means, meters, inverters, junction boxes, batteries and arrays clearly identified. The layout plan must also depict all required fire access aisles and ridge ventilation setbacks for arrays with dimensions as required by the International Fire Code or the International Residential Code as amended by the City of Thornton.

2. Provide a one-line diagram in the plan set that includes: number and wattage of modules,
- conductor sizes and insulation types,
- conduit sizes,
- fuses and circuit breaker ratings,
- inverter ratings,
- AC & DC disconnect ratings,
- the buss rating and main disconnect size of main distribution panels,
- batteries and, grounding means,
- all components must be listed and labeled,
- if the PV disconnect is located on the bus bar, then it must be lockable.

For other than single family dwellings:

1. Provide the calculations, including the temperature derating factors and voltage drop, used to determine wire sizes, fuses and breakers. (*Roof mounted systems should use worst case ambient temperature of 56-60 degrees C.*) Calculations must show that the PV system voltage does not exceed the maximum rated dc inverter input voltage or the rated voltage of any other connected equipment. If the main panel is de-rated, then an audit of that de-rate must appear on the line diagram page along with the name of the licensed electrician or engineer responsible for the audit. Provide the calculations used to size equipment grounding conductors in accordance with the currently adopted code. For systems 8,000 KVA with three of more arrays, provide the fault-current calculations for each array circuit.

2. Provide manufacturer's cut sheets and listing information for modules, inverters, batteries and mounting systems. Installation instructions for mounting systems or mounting feet are not required. However, research reports or stamped engineer letters from the manufacturers must be submitted for mounting systems and mounting feet to verify that the systems are designed to comply with local wind and snow loads. Mounting feet cut sheets must show how the feet will be flashed. Cut sheets for modules, inverters and batteries must show that the proposed equipment is labeled by UL, ETL or $CSA_{us}$. Module cut sheets must include the manufacturer's specific grounding instructions for the module in accordance with UL 1703.

**Note:** For systems 10,000 KVA and larger provide approximate wire lengths of each wire segment.

**Please note the city requires that where the service equipment includes a split buss panel, the PV system must be connected by means of a line-side tap**.

**Structural Plans**

1. Roof installations for both residential and commercial projects require a structural engineering analysis of the building by an engineer licensed by the state of Colorado to verify that the existing structure is adequate for the additional equipment dead loads and

wind uplift loads. The engineer letter must be separate from the plans and uploaded as an individual file. If the engineer specifies structural upgrades to support the additional weight, the details of those upgrades must be present on the PV installation plan set.

2. Plans or instructions must be submitted that indicate the locations of array mounting feet and that include the minimum size and type of fastener needed to attach the feet to the roof in order to comply with the wind load requirements.

## INSPECTIONS

**Finals will be done virtually between 8:00 am and 10:00 am and will occur following the completion of the installation. Make sure to provide the contact name and phone number for the on-site technician.**

**Note: Panel upgrades when done in conjunction with any PV applications will require a separate permit. If a panel replacement is discovered during an inspection of a PV system, the inspection process will cease until a permit is issued for the upgrade. The permit/inspections, for the new service must be completed before the PV system will be passed. The inspection for the panel upgrade can be done at the same time as the final electrical inspection for the PV permit.**