City of Thornton

Plan Review Submittal Requirements And Required Inspections for Solar Photovoltaic Systems

Permit Application

Plans must be submitted electronically. A separate plan review is required for each property or address. Applications and drawings must be upload to the city's permit portal at https://cityviewportal.cityofthornton.net/ **. Complete submissions must include:**

1. Completed building permit application.
2. One (1) set of construction drawings as described below.
3. All Commercial System plans are required to bear the stamp and signature of a design professional licensed by the state of Colorado.
4. Each application must include all of the drawings, calculations and cut sheets as described below.

The applicable design codes are: 2017 NEC, 2018 IRC, 2018 IBC, 2018 IEBC and 2018 IFC.
Design load criteria: 90 MPH 3 second gust, exposure C, snow load 30 lbs/sq. ft.

Electrical Plans

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 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.

   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.
3. For other than single family dwellings, 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. 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.

4. 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.

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 in order to verify that the existing structure is adequate for the additional equipment dead loads and wind uplift loads.
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

Two inspections are required for the installation of PV systems. Access to all portions of the system, including ladders, is required to be provided by the contractor/installer.

1. Rough Inspection will occur when at least 50% but not more than 75% of the panels have been installed. At this inspection we will look at racking, PV panel listing, bonding of rails, and system grounding.
2. Final Inspection will occur following the completion of the installation.

The following language related to roof array layouts is excerpted from the International Residential Code as locally amended by the City

R324.6.1 Pathways. Not fewer than two pathways, on separate roof planes from lowest roof edge to ridge and not less than 36 inches (914 mm) wide, shall be provided on all buildings. Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge on the same roof plane as the photovoltaic array, on an adjacent roof plane, or straddling the same and adjacent roof planes. Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions such as vent pipes, conduit, ~~or~~ mechanical equipment, and roof eaves less than 7 feet (2134 mm) above and within the required access aisle.

R324.6.2Setback at ridge.

For photovoltaic arrays occupying not more than 33 percent of the plan view total roof area, not less than an 18-inch (457 mm) clear setback is required on both sides of a horizontal ridge. For photovoltaic arrays occupying more than 33 percent of the plan view total roof area, not less than a 36-inch (914 mm) clear setback is required on both sides of a horizontal ridge.