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Solar Permit Application Process

This document is to be used as a guide for understanding the Adams County Solar Permit Process and provides detailed instructions on how to submit your application whether completed through the 'simplified permit' process or the 'standard permit processes. Depending on the option you choose, in the appendix you will find the submission requirements for the 'standard submission' permit and the worksheets for the 'simplified permit' to be completed by you the contractor.

1. Assemble necessary documents for Solar System Application

a. There are two possible routes for receiving a solar permit—1. the 'simplified permit process' and 2. the 'standard permit process'. Adams County encourages our contractors to first review the simplified permit process for pre-qualifying your project for the simplified solar permit process. Conducting the simplified permit process saves time and money for both you and city staff which require only a basic engineering review. It is estimated 90% of systems being installed today qualify for the simplified permit process.

b. To pre-qualify for the 'simplified permit' process confirm the following criteria about your PV system:

- ❑ System is no larger than 15.36kWac;
- ❑ No larger than an 80A PV system circuit breaker connection
- ❑ One- or two-family rooftop installations or structure of same construction;
- ❑ The structure is not in Wind Exposure D (within 200 yards of a body water wider than a mile);
- ❑ The structure is not on a hill with a grade steeper than 5%, where topographic effects can significantly increase wind loads;
- ❑ Ground snow loads do not exceed 60 psf;
- ❑ Distributed weight of PV array is less than 4lbs/ft^2 (less than 5 lbs/ft^2 for thermal systems);
- ❑ PV technology is using either a string inverter, dc converter, or microinverter

c. Once you determine your system qualifies, follow the Simplified Residential Roof Photovoltaic Array Permit Guidelines (found in the appendix), and submit along with the appropriate diagrams depending on the technology, i.e., standard string, AC modules, etc. found at the following Solar ABCs fill-in documents:

- Expedited Permit Process for Standard String System
- Expedited Permit Process for Micro-Inverter System
- Expedited Permit Process for AC Module System

- Expedited Permit Process for Supply Side System

2. Submit Solar System Application

a. Adams County encourages the submittal of these documents through our E-Permit website at Adams County E-Permit Center . Follow the 'Submittal Instructions' for solar on the E-Permit website.

b. If conducting the simplified permit process, you can also submit your application over the counter to Development Services located on the first floor at the Adams County Government Center. In most cases, these applications can be reviewed on the same day. However, always call before pursing this option—720-523-6800.

c. If your system does not qualify for the simplified permit process, use the standard submission checklist found at the end of this document, and submit via the E-Permit center.

3. County reviews Solar System Application

a. The goal of the department is to have all applications reviewed and permits issued within 10 business days.

b. If conducting the simplified permit process and you submitted over the counter, in most cases Adams County can review and issue the permit on the same day, however call before pursuing this option—720-523-6800.

4. Solar Permit Fee is Assessed

a. Adams County's solar PV and solar thermal installation permit fees are based on the valuation of the project, but capped at **$500 for residential** and **$1,000 for commercial** project.

b. For a detailed fee list see Adams County Fee Schedule .

5. Solar Permit is Issued

a. The permit fee(s) must be paid-in-full prior to the permit being issued. The installation process can begin for the contractor once the permit has been issued by the County.

6. An inspection of the Installed Work is Performed

a. Adams County offers an **interactive online software application** that allows homeowners or contractors the ability to see **permit review**, **schedule inspections**, and **review inspection results** live. See the 'Solar' Submittal Instructions at Adams County E-Permit Center for experiencing this user-friendly application.

b. An inspection can be scheduled through the E-Permit Center page found under 'schedule'.

c. To eliminate excessive inspections, we provide an integrated inspection of both electrical and structural components.

d. Before scheduling, we encourage you to utilize the following inspection checklist for a smooth and passing inspection.

Inspection Checklist

- ☐ Make sure all PV system ac/dc disconnects and circuit breakers are in the open position to start the inspection.
- ☐ All work is complete and in a workmanlike manner.
- ☐ No conductors hanging down attracting attention or debris.
- ☐ PV module number, quantity and locations are the same as when submitting application.
- ☐ Array mounting system and structural connections according to the approved plan.
- ☐ Roof penetrations flashed/sealed according to approved plan.
- ☐ Array exposed cables are properly secured, supported, and routed to prevent physical damage.
- ☐ Conduit correctly installed.
- ☐ Firefighter access according to approved plan.
- ☐ Roof- mounted PV systems have the required fire classification.
- ☐ Grounding/bonding of rack and modules according to the manufacturer's installation instructions.
- ☐ Equipment listed and installed according to the approved plans.
- ☐ Inverter is marked "utility interactive".
- ☐ Conductors, cables, and conduit types, sizes and markings according to approved plan.
- ☐ Overcurrent devices are the type and size according to plan.
- ☐ Disconnects according to the approved plan.
- ☐ Inverter output circuit breaker is located at opposite end of bus from utility supply.
- ☐ PV system markings, labels, and signs according to approved plans.
- ☐ Connection of the PV system to the grounding electrode system according to the approved plans.
- ☐ Access and working space for operation and maintenance of PV equipment is provided.

Appendix:

Simplified Residential Roof Photovoltaic Array Permit Guidelines

The information in this guideline is intended to provide a format whereby local jurisdictions and contractors can permit simple photovoltaic (PV) system installations where only a basic review is necessary. It is likely that most residential PV systems will comply with these simple criteria that address the requirements for PV systems in the building and electrical codes. Once you have filled out the following checklist, please submit this checklist along with the appropriate 'fill-in' diagrams depending on the technology, i.e., standard string, AC modules, etc. found at the following Solar ABCs links:

- Expedited Permit Process for Standard String System
- Expedited Permit Process for Micro-Inverter System

- Expedited Permit Process for AC Module System
- Expedited Permit Process for Supply Side System

Step 1: Structural PV Array Mounting Requirements Checklist
Both Member-Attached and Sheathing-Attached Provisions

A. General Site and Array Requirements *(all square boxes must be checked; where slanted check box sub-options occur, one sub-option must be checked):*

☐ 1. Wind Exposure and Design Wind Speed (as defined by ASCE 7-10, select one below):
- ☐ *a. Member-Attached System*: *Exposure B or C and design wind speed does not exceed 150 mph.*
- ☐ *b. Sheathing-Attached System (select one below):*
- ☐ i. *Exposure C (open terrain/fields) and design wind speed does not exceed 120 mph, or*
- ☐ ii. *Exposure B (urban, suburban and wooded areas more than 500 yards from open terrain) and design wind speed does not exceed 140 mph.*

☐ 2. The structure is not in Wind Exposure D (within 200 yards of a body water wider than a mile).

☐ 3. The structure is not on a hill with a grade steeper than 5%, where topographic effects can significantly increase wind loads.

☐ 4. Ground snow loads do not exceed 60 psf

☐ 5. Distributed weight of PV array is less than 4 lbs/ft^2 (less than 5 lbs/ft^2 for thermal systems).

B. Roof Information *(all must apply):*

☐ 1. The array is mounted on a permitted one- or two-family roof structure or similar structure. *If roof not permitted, show compliance with International Residential Code (IRC) span tables.*

☐ 2. The roof is framed with wood rafters or trusses at no greater than 48” on center. Roof framing members run upslope/downslope. (not horizontal purlins)

☐ 3. The roof structure appears to be structurally sound, without signs of alterations or significant structural deterioration or sagging.

☐ 4. Sheathing: At least 7/16” or thicker plywood, or 7/16” or thicker oriented strand board (OSB).

☐ 5. If a composition shingle roof, the roof has a single roof overlay (no multiple shingle layers). *If not, show compliance with IRC span tables.*

☐ 6. Roof height: Mean roof height is not greater than 40 feet.

☐ 7. In areas of significant seismic activity (Seismic Category C, D, E or F), PV array covers no greater than half the total area of the roof (all roofs included).

C. Array Mounting Equipment Information *(all must be defined):*

☐ 1. Mounting Equipment Manufacturer _____

☐ 2. Product Name and Model#_____

☐ 3. UL2703 fire rating for the PV modules used in the project. Fire rating Class____ (A, B, or C).

☐ 4. Specify anchor-to-roof sealing (e.g. flashing, or sealant compatible with roofing):

_____

If any structural item cannot be checked off, the building official may require the installer to provide structural calculations and/or details, stamped and signed by a design professional, addressing the unchecked item.

Member-Attached Additional Provisions

D. Member-Attached Array Requirements *(all square boxes must be checked; where slanted check box sub-options occur, one sub-option must be checked):*

☐ 1. Array is set back from all roof edges and ridge by at least twice the gap under the modules (or more, where fire access pathways are required).

☐ 2. Array does not cantilever over the perimeter anchors more than 19".

☐ 3. Gap under modules (roof surface to underside of module) is no greater than 10".

☐ 4. Gaps between modules are (select one below):

- ☐ *a. at least 0.25" on both short and long sides of modules, or*
- ☐ *b. 0" on short side, and at least 0.50" on long sides.*

☐ 5. Mounting rail orientation or rail-less module long edges (select one below):

- ☐ *a. run perpendicular to rafters or trusses, and attached to them, or*
- ☐ *b. run parallel to rafters and are spaced no more than 4'-0" apart, Ground Snow Load is no greater than 10 psf, and Design Wind Speed does not exceed 120 mph.*

☐ 6. The anchor/mount/stand-off spacing perpendicular to rafters or trusses (select one below):

- ☐ *a. does not exceed 4'-0", and anchors in adjacent rows are staggered where rafters or trusses are at 24" or less on center (see Figure), or*
- ☐ *b. does not exceed 4'-0", anchor layout is orthogonal, roof slope is 6:12 or less, Ground Snow Load is no greater than 10 psf, and Design Wind Speed does not exceed 120 mph, or*
- ☐ *c. does not exceed 6'-0", anchor layout is orthogonal, roof slope is 6:12 or less, Ground Snow Load is zero, and Design Wind Speed does not exceed 120 mph.*

☐ 7. Upslope/downslope anchor spacing follows manufacturer's instructions.

☐ 8. Anchor fastener is (select one below):

- ☐ *a. 5/16" diameter lag screw with 2.5" embedment into structural member, or*
- ☐ *b. fastener other than (a.) embedded in structural members in accordance with manufacturer's structural attachment details. Manufacturer's anchor layout requirements must not exceed the anchor spacing requirements shown in Items 5 and 6 above.*

If any structural item cannot be checked off, the building official may require the installer to provide structural calculations and/or details, stamped and signed by a design professional, addressing the unchecked item.

Sheathing-Attached Additional Provisions

E. Sheathing-Attached Array Requirements (all square boxes must be checked; where slanted check box sub-options occur, at least one sub-option must be checked):

- ☐ 1. Array is set back from all roof edges and ridge by at least twice the gap under the modules (or more, where fire access pathways are required).
- ☐ 2. Array does not cantilever over the perimeter anchors more than 19".
- ☐ 3. Gap under modules (roof surface to underside of module) is no greater than 5".
- ☐ 4. Gap between modules is at least 0.75" on both short and long sides of modules.
- ☐ 5. Roof framing and sheathing nailing options (select a, b, or c below):
  - ☐ a. *Manufactured Wood Trusses, or*
  - ☐ *b. Initially Dry Wood Rafters (lumber grade stamps are visible and state "S-DRY" (Surfaced Dry) or "KD" (Kiln-Dried), or*
  - ☐ *c. Initially Wet Wood Rafters meeting one of the field-verified sheathing nail options listed below. Note: If lumber stamps are not visible, or if lumber stamps state "S-GRN" (Surfaced Green), the lumber shall be assumed to have been initially "wet" (MC > 19%) at time of sheathing installation. (select I, ii, or iii below):*
    - ☐ *i. Deformed shank nails, 6d or greater, or*
    - *ii. 8d smooth shank common or box nails, or*
    - ☐ *iii. 6d smooth shank common or box nails, nailed into dense lumber, either Douglas Fir (stamp: DF or DF-L) or Southern Pine (stamp: SPIB).*

      *(**NOTE:** sheathing attached not allowed with Lower density lumber such as Spruce-Pine-Fir (stamp: S-P-F) and Hem-Fir (stamp: HF) and 6d smooth shank nails.)*
- ☐ 6. Anchor location restrictions—all anchors must comply with at least one of the options below. Anchors verified to be in "Bands of Strength" are attached in the middle 16" wide strip centered between the long edges of sheathing panels (at least 16" from sheathing long edge). Check all boxes that apply to anchors in the array:
  - ☐ *a. Anchor is not in bands of strength (i) tributary region is more than 3 feet from any roof edge (wind Zone 1), (ii) tributary area is 9 square feet or less (up to half the area of a 60 cell PV module), and (iii) If initially wet lumber as defined by item 5c: Exposure B only, 120 mph max wind speed.*
  - ☐ *b. Anchor is in bands of strength (i) tributary region is more than 3 feet from any roof edge (wind Zone 1), and (ii) tributary area is 18 square feet or less (up to the full area of a 60 cell PV module).*
  - ☐ *c. Anchor is in bands of strength (i) tributary region is less than 3 feet from a roof edge (wind Zone 2), and (ii) tributary area is 9 square feet or less (up to half the area of a 60 cell PV module).*

☐ *d. Anchor is in bands of strength (i) tributary region is within 3 feet of a roof corner (wind Zone 3), and (ii) tributary area is 4.5 square feet or less (up to ¼ of a 60 cell PV module).*

If any structural item cannot be checked off, the building official may require the installer to provide structural calculations and/or details, stamped and signed by a design professional, addressing the unchecked item.

Step 2: Electrical PV System Requirements Checklist

- ☐ 1. Major electrical components including PV modules, dc-to-dc converters, and inverters, are identified for use in PV systems.
- ☐ 2. Array mounting system UL2703 certified for bonding and grounding. Alternatively, the array mounting system may incorporate UL2703 grounding devices to bond separate exposed metal parts together or to the equipment grounding conductor.
- ☐ 3. The PV array consists of no more than 2 series strings per inverter input and no more than 4 series strings in total per inverter.
- ☐ 4. Field Installed PV array wiring meets the following requirements:
  - ☐ a. All exposed PV source circuit wiring is 10 AWG PV Wire.
  - ☐ b. All PV source circuit wiring in raceway is 10 AWG THWN-2, XHHW-2, or RHW-2.
  - ☐ c. Any field-installed PV output circuit wiring is 6 AWG THWN-2, XHHW-2, or RHW-2.
  - ☐ d. PV system circuits on buildings meet requirements for controlled conductors in 690.12.
- ☐ 5. The total inverter capacity has a continuous ac power output 15,360 Watts or less and meets the requirements of 705.12(D) where installed on the load side of the service disconnecting means (complies with Table 705.12(D) in Technical Appendix). (choose one below)
  - ☐ Load-side connection complying with Table 705.12(D)
  - ☐ Supply-side connection complying with 705.12(A)
- ☐ 6. Equipment is rated for the maximum dc voltage applied to the equipment (put N/A in all blanks that do not apply to the specific installation):
  - ☐ a. ASHRAE Extreme Annual Mean Minimum Design Dry Bulb Temperature (one source is www.solarabcs.org/permitting) =__1°C__; Table 690.7 (NEC) value___1.20_____
  - ☐ b. Max (temp adjusted) module Voc:
    Rated Voc __39.7_V x Table 690.7 value_1.10__ =__43.7__V
  - ☐ c. Dc-to-dc converter(s) or microinverter rated maximum input voltage:___N/A__V
    (must be greater than Max module Voc in (B.))
  - ☐ d. Maximum number of dc-to-dc converters allowed in series (up to 600Vdc): __N/A__
  - ☐ e. Maximum voltage of dc-to-dc converter circuit with maximum number in (C.): __N/A_V
  - ☐ f. Inverter(s) rated maximum input voltage: _60_V (must be greater than i to iv below)
  - ☐ i) Inverter 1 input 1: Max module Voc (B.) __43.7_V x # in series__1__ = __43.7__V

- ☐ ii) Inverter 1 input 2: Max module Voc (B.) __N/A_V x # in series__N/A = _N/A_V
- ☐ iii) Inverter 2 input 1: Max module Voc (B.) __N/A_V x # in series__N/A = __N/A_V
- ☐ iv) Inverter 2 input 2: Max module Voc (B.) __N/A_V x # in series__N/A_ = __N/A__V

☐ 7. One of the standard electrical diagrams (E1.1a, E1.1b, E1.1c, E1.1d, or E1.1e) can be used to accurately represent the PV system.

Fill out the standard electrical diagram completely. If the electrical system is more complex than the standard electrical diagram can effectively communicate, the project does not meet the requirements for a simplified permit application and additional information may be necessary for the jurisdiction to process the permit application.

Standard Permit Guidelines Checklist

If your project did not qualify for the 'simplified permit' process, use the following checklist for submitting documents through the E-Permit Center. The E – Permit Center allows applicants to apply for permits, pay fees, upload documents for review and receive/answer comments online for all solar permits. Permits can be applied for and obtained without ever coming to the Government Center. Follow the 'Submittal Instructions' for solar on the E-Permit website at Adams County E-Permit Center .

General Submittal Documents

- ❑ All files shall be in PDF format
- ❑ Size
  - PDF files shall not exceed 30MB each and must be reduced to the smallest size available to provide quick access to the files.
  - Example: Within Acrobat 11 Pro, select "Save As Other" then "Optimized PDF", settings "Mobile" with a "Make compatible with: **Acrobat 10.0 or later**."
  - If any file should exceed the 30MB maximum, please contact the Development Services Team at 720-523-6800 or email epermitcenter@adcogov.org for assistance **prior** to submittal or re-submittal
- ❑ Site plan showing the location of all equipment – interior and exterior show any plumbing, mechanical, or building vents that must be relocated
  NOTE: Attic vents, plumbing vents, dryer vents, bathroom exhaust vents, and similar terminations on the rooftop cannot be covered by solar equipment.
- ❑ Indicate setbacks for ground-mounted equipment
- ❑ Floor plan
  - Locate all equipment within the structure (if applicable) and indicate clearances

- ❑ Pipe plan
  - Provide schematics of all system components of piping – include sizes and materials (solar thermal system installation)
- ❑ Product literature and equipment listing – include mounting systems, racking, standoffs, and flashing
- ❑ Foundation design (if roof mounted)
- ❑ Engineer's letters and designs, as applicable
- ❑ Structural analysis from a P.E. for additional loads

NOTE: Installations on roofs with two or more layers of asphalt shingles or with any stone, slate, or clay tile shingles require an engineer's analysis of the roof structure's ability to support the new system.

- ❑ Bookmarks
  - Make sure to be in the "fit on full page to window view" prior to bookmark creation.
  - All plan sets, including soils reports and correspondence, should be uploaded as 1 file.
  - Individual pages do not need to be bookmarked; only the sections need to be bookmarked.
  - Supporting documents such as Structural Calculations, Energy Compliance Certifications, etc. shall be submitted as a single combined multipage, bookmarked file
  - Naming convention for bookmarks.

  For initial submittals, see below
    - 123 Main Street – BDP 1 – Site/Landscape Plan
    - 123 Main Street – BDP 1 – Structural/Foundation Plans
    - 123 Main Street – BDP 1 – Electrical Plans
    - 123 Main Street – BDP 1 – Correspondence (Permits/approvals from other entities)

  Subsequent submittals should be named the same with the next higher submittal number
    - 123 Main Street – BDP 2 – Site/Landscape Plan
    - 123 Main Street – BDP 2 – Structural/Foundation Plans
    - 123 Main Street – BDP 2 – Electrical Plans
    - 123 Main Street – BDP 2 – Correspondence (Permits/approvals from other entities)

- ❑ Page Orientation/Scale
  - Plans shall be set to landscape view, oriented so that North is always at the top of the monitor
  - Document files may be oriented either landscape or portrait view so that the top of the page is always at the top of the monitor

- Plans shall be generated to scale (e.g. ¼”=1’, 1/8”=1’ or 1:10)

❑ Security
- PDF files shall have permissions to allow Annotations, Form Fill and Signing or Stamping by County staff

❑ Signatures
- Plans prepared by Design Professionals shall contain an information block with name, license number, signature and contact information
- Plans and documents prepared by Design Professionals may be signed electronically
- Electronic signatures (including Adobe self-certified signatures) or an image containing the electronic stamp and wet signature **must be applied** to every sheet on the plans and, where appropriate, on associated documents. Documents that are not correctly signed/stamped will not be accepted.

Electrical Requirements (For PV Systems)

- ❑ One-line diagram that includes the following information:
  - ❑ conductor size and insulation types
  - ❑ conductor material, (i.e., copper, aluminum)
  - ❑ series and parallel configuration of the module connections
  - ❑ main over current device ratings
  - ❑ existing and new panel busbar amperage ratings
- ❑ Schematic drawing that includes the following:
  - ❑ location of all modules, inverters, disconnects, and service equipment
  - ❑ location of all batteries
  - ❑ location and connection of all grounding electrode conductors
  - ❑ clearances around all equipment noted above
- ❑ Conduit or cable type & size, (i.e., nonmetallic, EMT, direct burial cable etc)
- ❑ All calculations from modules to inverter and inverter to point of connection
- ❑ All applicable warning and marking labels for AC and DC disconnects as required per the current adopted code

Equipment Requirements

- ❑ Provide the following equipment information:
  - ❑ Module short circuit current ratings
  - ❑ Module open circuit voltage ratings
  - ❑ Module series fuse ratings
  - ❑ Inverter maximum output current rating
  - ❑ Inverter maximum over current protection – output/input per manufacturer
  - ❑ Inverter U.L. File number, listings and remaining specifications

- ❑ All associated documentation/cut sheets and installation instructions on equipment, (i.e., inverters, disconnects, modules, charge controllers, over current devices, etc.), as required per the current adopted code

Fire Department Requirements

- ❑ Per the 2012 International Fire Code, PV solar systems must meet the following requirements:
  - ❑ Roof clearances for installations
- ❑ Direct current (DC) wiring
  - ❑ Direct current (DC) conduit, wiring, and raceways shall be located below the solar array or a minimum of 24” below the roof sheathing
- ❑ Labeling
  - ❑ For residential applications, a label stating “CAUTION, SOLAR PHOTOVOLTAIC SYSTEM ON PREMISES” shall be placed at or within the main electrical service disconnect