HENDERSON

# Residential Photovoltaic

**City of Henderson**

**Development Services Center**

**Roof Mounted Solar Panels**

**Application Submittal Checklist**

Please use this checklist and the supporting detail to assure that your permit submittal includes all the information necessary for a timely review of your plans. All applications for permits **must** be submitted electronically through the DSC Online Portal (**dsconline.cityofhenderson.com**).

*Please apply using **Photovoltaic – Residential.***

## PDF Standards for Electronic Plan Submittals

**Submittal Package:**

The following documentation must be included when submitting the building permit application for review and all applicable building codes must be included on the plans.

_____ **Completed Building Permit Application**

_____ **Complete Plan Set**

_____ **A clear photo of the roof (satellite/aerial acceptable)**

- Photo shall show the roof prior to the installation of module and be unobstructed.

_____ **A clear photo of the main electrical service**

- Photo shall show the main electrical panel and all circuit breakers and the label inside the panel that is legible. (Disconnecting means, prior to any modifications).

_____ **Completed Residential Photovoltaic System Permit Authorization**

- This acknowledgement needs to be completed and signed by the legal property owner and acknowledges their approval for the photovoltaic **contractor** to apply for a building permit with the City of Henderson to install, or modify an existing, photovoltaic system.

_____ **Completed Owner Builder Affidavit of Exemption** [if applicable]

- Required for residential photovoltaic systems only if permit will be obtained by the property owner for their primary residence.

**Plan Review or In-Field Verification Criteria:**

_____ Plan Review by the Building Plan Examiners shall be required if **any** of the following conditions are included in this permit:

- If the Photovoltaic System meets or exceeds 15 KWh DC
- If the Photovoltaic System is free standing (not roof mounted)
- If the Photovoltaic System is located on a Mobile/Manufactured Home
- If the Photovoltaic System has a battery backup/Energy Storage System (ESS)
- If the main electrical panel is being upgraded or replaced
- If the main breaker is being de-rated
- If this is an addition to, or modification of, an existing Photovoltaic System

_____ In-Field Verification will be completed by the Building Inspection staff if **none** of the above conditions are included in this permit.

**Plan Contents – General Information**

Plans must contain the following minimum content requirements. This list is not intended to be inclusive of every detail required on a set of Photovoltaic plans. Rather, it is provided to give an overview of the basic plan contents required for plan review.

_____ **Cover Sheet**

Include general project information, such as: address, vicinity map, and DC KWh of the system. Also include information regarding battery backup system/ESS (size in KWh & location and type of battery), if the Main Electrical Panel will be upgraded, if the main electrical breaker will be de-rated, if this will be an addition or modification to an existing photovoltaic system and include a complete sheet index. Cover sheet must have a legend of symbols and abbreviations used throughout the plan set.

_____ **The plan set must be signed and sealed by the registered design professional.**

**Plan Contents - Structural**

_____ **Structural**

- Rooftop mounted photovoltaic panel systems installed on or above the roof covering shall be designed and installed in accordance with the following:
    a) Shall be designed to structurally support the system and withstand applicable gravity loads in accordance with IRC Chapter 3. The roof on which these systems are installed shall be designed and constructed to support the loads imposed by such systems per IRC Chapter 8.
    b) The portions of roof structures not covered with PV systems shall be designed for dead and live roof loads per IRC R301.4 and R301.6. The portions of roof that are covered with PV systems shall comply with the following:
        a. Dead load (including PV panel weight) per IRC Table R301.2(1).
    c) PV systems and their supports shall be designed and installed to resist the component and cladding loads specified in IRC Table R301.2(2)m adjusted for height and exposure per IRCB Table R301.2(3).

_____ **Structural plans shall be digitally stamped and signed on all pages**

_____ **Structural calculations for ballasted systems on flat rooftops (A complete structural analysis of the roof structure with supporting calculations shall be provided for any ballasted system)**

- The structural calculations and details must be signed and sealed by a Nevada civil or structural engineer and shall be digitally stamped and signed.

**Plan Contents – Site Plan**

_____ **Site plan must include:**

- Must be signed on all pages by the designer.
- Locations of all main system components including photovoltaic panels/modules, inverters, panels, disconnects, etc. shall be shown on the plans.
- Include plan location of all battery backup/Energy Storage Systems

_____ **Additional Documentation or Information**

- Provide documents from each manufacturer showing listings and installation instruction of all panels/modules, disconnects, inverters, disconnects, meters and other equipment and devices for review
- Provide a directory or plaque at the service equipment location. (NEC 705.10)
- Provide plaques with raised letters, or embossed, to meet all requirements of Article 706
- Rooftop mounted PV systems shall have the same fire classification as the roof assembly required in IRC section R902.
- Roof penetrations shall be flashed and sealed per IRC Chapter 9.
- Photovoltaic shingles shall comply with IRC section R905.16.
- Building integrated PV systems shall have a fire classification in accordance with IRC section R902.3.
- Roof access, pathways and setback requirements shall be provided in accordance with IRC sections R324.6.1 through R324.6.2.1. Access and minimum spacing shall be required to provide emergency access to the roof, to provide pathways to specific areas of the roof, provide smoke ventilation opportunity areas and to provide emergency egress from the roof. Refer to the aforementioned sections for exceptions.
- Not fewer than two pathways, on separate roof planes from the lowest roof edge to the ridge and not less than 36 inches 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 PV array, a pathway not less than 36 inches wide shall be provided from the lowest roof edge to the ridge on the same roof plane as the PV 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.
- For PV arrays occupying not more than 33 percent of the plan view total roof area, not less than an 18-inch clear setback is required on both sides of a horizontal ridge. For PV arrays occupying more than 33 percent of the plan view total roof area, not less than a 36-inch clear setback is required on both sides of a horizontal ridge.
- Where an automatic sprinkler system is installed within the dwelling in accordance with NFPA 13D or section P2904, setbacks at ridges shall comply with one of the following:
    a) PV arrays occupying not more than 66 percent of the plan view total roof area, not less than an 18-inch clear setback is required on both sides of a horizontal ridge.
    b) PV arrays occupying more than 66 percent of the plan view total roof area, not less than a 36-inch clear setback is required on both sides of a horizontal ridge.
- Panels and modules installed on dwellings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway not less than 36 inches wide shall be provided to the emergency escape and rescue opening.
- If energy storage systems are installed in a vehicular path, physical protection (Bollards) is/are required. (NEC 110).
- Provide mounting requirements for all energy storage systems

**Plan Contents - Electrical**

_____ Electrical drawings if completed by a Nevada Licensed Engineer shall be digitally stamped and signed on all pages

- Provide a three-line-diagram that includes:
    a) All raceway sizes and types
    b) Conductor sizes and types
    c) Equipment and device information
    d) AC and DC grounding
    e) Required AC and DC disconnecting means. Disconnecting means shall comply with Article 690.13
    f) Indicate whether disconnect is utility interactive
    g) Show main load center and point of connection
- Show type and number of photovoltaic modules in each string
- The AC and DC sides of the photovoltaic system shall be grounded in accordance with Article 690
- Provide non- automatic illumination at energy storage systems (NEC 706.10 (E)).
- Provide ground fault protection for roof mounted photovoltaic systems located on dwelling roofs. (NEC 690.41)
- Marking is required on interior and exterior direct-current (DC) conduit, enclosures, raceways, cable assemblies, junction boxes, combiner boxes and disconnects.
    a) The materials used for marking shall be reflective, weather resistant and suitable for the environment.
    b) Markings shall have all letters capitalized with a minimum height of 3/8-inch white on red background.
    c) The marking shall contain the words "WARNING: PHOTOVOLTAIC POWER SOURCE."
    d) The marking shall be placed adjacent to the main service disconnect in a location clearly visible from the location where the disconnect is operated.
    e) Marking shall be placed on interior and exterior DC conduit, raceways, enclosures, and cable assemblies every 10-feet, within 1-foot of turns or bends and within 1-foot above and below penetrations of roof/ceiling assemblies, walls, or barriers.

- Conduit, wiring systems, and raceways for photovoltaic circuits shall be located to reduce trip hazards and maximize fire-fighting operations including ventilation opportunities, as follows:
    a) As close as possible to the ridge or hip or valley
    b) As directly as possible from the hip or valley to an outside wall
    c) Conduit runs between sub arrays and to DC combiner boxes shall be installed in a manner that minimizes the total amount of conduit on the roof by taking the shortest path from the array to the DC combiner box.
    d) The DC combiner boxes shall be located such that conduit runs are minimized in the pathways between arrays.
- DC wiring shall be installed in metallic conduit or raceways when located within enclosed spaces in a building. Conduit shall run along the bottom of load bearing members
- Show the location of the main breaker and its location in the panel on the plans. (Indicate end fed, center fed, bottom fed, etc.)
    a) Show if the panel is new or existing on the plans.
    b) Show the bus bar rating on the plans. (200, 225, etc.)
    c) Show the main breaker size on the plans. If the breaker will be de-rated, show the existing breaker size and then show the new de-rated breaker size.

d) Provide a panel schedule and load calculations for all panels. If there is a sub-panel, provide a combination load calculation for the main and sub-panels.

- The photovoltaic disconnecting means and overcurrent device shall be installed at an accessible location on the outside of a building or structure before any system conductors enter the building or structure. (NEC 690.13).
- Provide a utility interactive inverter in a readily accessible location, or the installation shall comply with NEC Articles 690, and 706.
- If more than one battery backup/Energy Storage System is stacked in the same stud bay structural calculations are required
- Show the size and location of the main electrical service equipment and all sub-panels. Show the location of all outlets, switches, light fixtures (exterior and site), and special outlets. Identify the locations of all required GFCI and AFCI protected outlets and light fixtures. This should be shown on the plans if applicable.

_____ **Electrical Load Calculations**

- Must be signed by preparer and may use the City of Henderson electrical load calculations form in lieu of the designer's own form.