Plan Review Checklist for Solar Permits

Residential		
Item		**Description**
1.	☐	Provide a building permit application with a complete and accurate scope of work.
2.	☐	Provide the number of watts/kilowatts.
3.	☐	State the building codes and amendments on plans.
4.	☐	Provide structural notes indicating the design criteria used (wind, snow, etc.). See climatic and geographic design criteria.
5.	☐	For roof-mounted solar panels, provide a roof framing plan and solar supporting structure.
6.	☐	Provide connection details.
7.	☐	Provide fire setbacks
8.	☐	Provide calculations for snow load and wind uplift.
9.	☐	Review and provide information on the sample.
10.	☐	Provide footing layout and details for the ground solar panel.
11.	☐	Provide an electrical plan showing layout, wiring, disconnects, and signs.
12.	☐	Plans are signed and sealed by a Maryland Licensed Professional Engineer.
13.	☐	Apply for an electrical trade permit.

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Commercial		
Building/Structural		
Item		**Description**
1.	☐	Provide a building permit application with a complete and accurate scope of work.
2.	☐	Provide the number of watts/kilowatts.
3.	☐	Provide structural notes, current building codes and building amendments.
4.	☐	Provide structural notes indicating the design criteria used (wind, snow, etc.). See climatic and geographic design criteria.
5.	☐	Provide the existing roof plan, building dimension, roof slope, existing drain location, and specify parapet height.
6.	☐	Provide roof solar layout, solar supporting structure, height of solar panel from existing roof level, spacing between solar panels.
7.	☐	Provide plan showing roof structural elements. (Trusses, Beams, Posts…)
8.	☐	Provide plan showing alterations to roof framing plan.
9.	☐	Provide connection details.
10.	☐	Provide certification from a Maryland Licensed Professional Engineer stating that the existing roof can support the weight of the solar panel assembly, along with snow load and wind uplift.Provide calculations for snow load and wind uplift.
11.	☐	Provide footing layout and details for the ground solar panel.
12.	☐	Provide fire setbacks
13.	☐	Plans are signed and sealed by a Maryland Licensed Professional Engineer.

Electrical		
Item		**Description**
1.	☐	Compliance with the 2020 National Electrical Code (NEC), 2021 International Energy Conservation Code and Subtitle-9 Prince George's County Electrical Code
2.	☐	Plans are signed and sealed by a Maryland Licensed Professional Engineer.
3.	☐	Generating capacity ☐ Less than 5MW (5,000kW) ☐ 5MW (5,000kW) or more
4.	☐	**Type of Solar PV system** ☐ Rooftop ☐ Ground mount ☐ other
5.	☐	**Module information:** • System Kilowatt (kW) Rating (including the number of arrays) • Manufacturer's "cut sheets" for the specific model.

		• Listing. The module(s) should be listed to UL 1703. Explanation: All electrical devices and components must be listed to UL® (Underwriters Laboratories) North American Standards. • Open-circuit voltage • Maximum permissible system voltage per NEC article 690.7 • Short-circuit current rating • Maximum series fuse rating • Maximum power at Standard Test Conditions • Operating voltage • Operating current
6.	☐	**information on Alternating-Current Photovoltaic Modules:** • Alternating-current modules shall be marked with identification of terminals or leads and with identification of the following ratings: I. Nominal operating ac voltage. II. Nominal operating ac frequency III. Maximum ac power IV. Maximum ac current V. Maximum overcurrent device rating for ac module protection
7.	☐	**Array information:** • Number of modules in series, number of parallel source circuits, and total number of modules. • Operating voltage (sum of series modules operating voltage in source circuit). • Operating current (sum of parallel source circuit operating currents) [690.8]. • Maximum system voltage. [690.7] • Short-circuit current rating. [110.10]
8.	☐	**Battery information (if used):** • Manufacturer's "cut sheets" for the specific model. Note storage and venting requirements. • Nominal battery voltage for the system
9.	☐	**Inverter information:** • Model number and manufacturer's "cut sheets" for the specific model. • Listing. Is the inverter listed by a Nationally Recognized Testing Laboratory (NRTL) such as UL 1741 and labeled "Utility-Interactive"? If the utility interactive labeling is not provided, does the device comply with the requirements of IEEE Std. 929-2000 (ANSI) as verified by the instruction manual and validated by the listing agency? • Maximum continuous output power at 40º C • DC input voltage range

		• AC output voltage range
10.	☐	Provide Single Line Diagram (SLD) as per the 2020 National Electrical Code Article 690.
11.	☐	Labelling as per the 2020 National Electrical Code Article 690
12.	☐	Grounding and bonding as per the latest applicable National Electrical Code Articles 250 and 690.
13.	☐	**Wire insulation Type:** • 90º C wet-rated conductors • USE-2 single conductor cable for exposed applications and single conductor cable listed and labeled for PV use • Type TC multiconductor cable for exposed applications with THWN-2 or XHHW-2 or RHW-2 or equivalent 90º C wet-rated conductors in the cable. • Type THWN-2 or XHHW-2 or RHW-2 or equivalent 90º C wet rated conductors in high temperature conduit (conduit rated for a minimum of 75º C wet conditions).
14.	☐	**Conductor Ampacity:** • Correct maximum current and ampacity calculations should be provided for each circuit. (Ampacity of conductors must be sufficient for application) [690.8] • The maximum PV source circuit current is the sum of parallel module rated short circuit currents multiplied by 125 percent [690.8(A)(1)]. • The minimum source circuit conductor ampacity is 125 percent of the maximum PV source circuit current [690.8(B)(1)]. • Minimum photovoltaic output circuit conductor ampacity is the sum of the maximum current of the parallel source circuits X1.25 [690.8(B)(1)]. Calculating ampacity of conductors used for the PV output circuit can be an involved process. • Minimum inverter output circuit conductor ampacity must be equal to or greater than the inverter continuous output current rating times 1.25. [690.8 (A)] Informational note: Where the requirements of [690.8(A)(1) & (B)(1)] are both applied.
15.	☐	**Overcurrent Protection:** • PV source circuit, PV output circuit, inverter output circuit, overcurrent protection must be sized so that both the PV module and the conductor from the module to the overcurrent devices are properly protected [690.9 (A), 240.15 (A)]. • PV modules must be protected so that the maximum series fuse rating, printed on the listing label, is not exceeded.

		• The module may be protected either by installing fuses or circuit breakers in a series string of modules or by the design of the PV system • Inverters listed with a Maximum utility back feed current that is well above 1 amp (typically equal to the maximum allowable output overcurrent protection) must be assumed to provide back feed current to the PV array. • Each source circuit must have overcurrent protection that is greater than or equal to the minimum PV Source Circuit current rating and less than or equal to the maximum series fuse rating. • For an inverter listed with a Maximum utility back feed current that is zero, two source circuits can be connected to the inverter without requiring overcurrent protection on either circuit. [690.9 (A) exceptions (1) & (2)].
16.		**Point of Connection:** ☐ Supply side ☐ Load side Informational note: For requirements of Point of Connection of a utility interactive PV inverter to the building electrical system see [Article 705.12].
17.	☐	**Rapid Shutdown of PV Systems on Buildings:** • PV system circuits installed on or in buildings shall include a rapid shutdown function that controls specific conductors in accordance with [Article 690.12].
18.	☐	**Disconnecting Means:** • The PV system disconnecting means readily accessible location • The PV system disconnecting means clearly marked, as per the article 690.13 • Disconnecting means listed as suitable of use, as per the article 690.13 • Comply with the maximum number of disconnects grouped in one location, as per the article 690.13 • Rating and type of disconnecting means as per the latest applicable National Electrical Code Article 690
19.	☐	Working space as per the 2020 National Electrical Code Article 110.26
20.	☐	Wiring methods as per 2020 National Electrical Code Article 690
21.	☐	Maximum Available Fault Current values at the service equipment obtained from the electric utility company as per the latest applicable National Electrical Code Articles 110 and 690
22.	☐	**Ground Fault Protection:** • Direct current ground-fault protection is required to be installed, per **690.41(B), to reduce fire hazards in PV arrays.**

		• Ground-fault protection is permitted to take the form of onboard circuitry in an inverter or combiner box that is listed as providing ground-fault protection and it is also permitted to be installed as a device or system that is separate from the inverter or combiner box. • When isolating inverters were installed, the grounded dc conductor was brought to ground potential by being connected to the grounding system through a fuse. • **Ground-fault protective devices (GFPDs) must meet four requirements:** I. Detect ground-faults in the dc conductors of a PV system, including functionally grounded conductors. II. Isolate faulted circuits from ground reference. III. Indicate the occurrence of ground-faults IV. Be listed for providing PV ground fault protection
23.		**Grounding:** ☐ **A two-wire PV array** with one functionally grounded conductor, as permitted, per 690.41(A)(1), is where one of the dc conductors from the array is grounded while the other is left ungrounded. In this configuration, the grounded conductor references ground through the inverter's electronic circuitry, which also provides the ground-fault protection. ☐ **A bi-polar PV array** with a functionally grounded reference (center-tapped conductor), as permitted, per 690.41(A)(2), is where one conductor, that is common to each of the array's monopole sub-arrays, is grounded while the other conductors, one from each of the array's monopole sub-arrays, are left ungrounded. In this configuration, the grounded conductor, being functionally grounded, references ground through the inverter's electronic circuitry. In this case, as above, the inverter's electronic circuitry provides the ground-fault protection. ☐ **A PV array that is not isolated** from the grounded inverter output, as permitted, per 690.41(A)(3), is where the grounded dc conductor from the PV array is directly coupled to the inverter's grounded ac conductor. In this configuration, ground-fault protection is provided through a device or system installed outboard of the inverter, which may be accomplished by installing the GFPD in its own enclosure or installing a combiner box that features an onboard GFPD.

		☐ **An ungrounded PV array**, as permitted, per 690.41(A)(4), where neither of the dc conductors from the array is grounded, which is the most popular of all the array configurations in the U.S. today. In such a configuration, it is especially important to provide ground-fault protection because there would, otherwise, be no way of detecting a ground-fault in the array, which underscores the importance of the GFPD's functions in a solar PV system. ☐ **A solidly grounded PV array**, as permitted, in 690.41(B), as permitted, per 690.41(A)(5), is a special case where the PV array contains no more than two source circuits, i.e., two strings of modules, the PV system circuitry is not located in or on a building, and the system is solidly grounded. These types of systems are often used to supply power to traffic signs and in small, remote water pumping stations for livestock. In such a configuration, one of the dc conductors from the array is grounded while the other is left ungrounded; and the grounded conductor is solidly connected to a grounding electrode system. ☐ **If ground-fault protection is installed outboard of the inverter or combiner box**, it is permitted to be installed in its own enclosure, and the standard requirements of grounding and bonding the enclosure are enforced. Many GFPDs are designed to be mounted on DIN-rail, and they take-on the general appearance of a circuit breaker. Even those that are designed as part of a combiner boxes take this form. Those GFPDs that are integral to an inverter, on the other hand, may not be recognizable as such, where the only way one would know of its inclusion in the inverter's circuitry is a label or mark on the inverter itself or by a ground-fault indicator that appears on the inverter's user display. As with GFCIs, GFPDs have separate, supply-side- and load-side terminations; and care must be taken to see that the device is installed correctly. If a GFPD is installed in a utility-interactive PV system, the system's output conductors are required to be terminated to the device's supply-side terminals per 705.32. Where a GFPD is installed in a combiner box, the combiner box's finger bus carries the combined input current of the array. The finger bus would then be required to terminate to the supply-side of the device.
24.	☐	Review **DPIE-Guidelines-for-Permitting-Rooftop-PV-Solar-Array-Systems-PDF.pdf**
25.	☐	Apply for an electrical trade permit.