Photovoltaic Check List

This checklist is intended only to function as a guideline. It does not cover all requirements. See Building Permit Plan Format Checklist. For any question please call 768-8220. (10/12/18)

**General Items:**

- Provide a plot plan showing the location of the project area and all existing building(s) on the property. This is in accordance with Section 18-4.3(a) of the Revised Ordinances of Honolulu. If the project area is located in a flood fringe zone, locate all flood boundaries on the parcel and identify all flood hazard and finish grade elevations.

- If the project area spans multiple buildings, provide additional details on the plan to distinguish between the separate structures.

- On the plan, provide the full name of the person or persons who is responsible for the electrical design and the drafting of the plans in accordance with Chapter 18, Section 18-4.3 of the Revised Ordinances of Honolulu. If required by Section 18-4.2 of the Revised Ordinances of Honolulu, plans shall be prepared by a State of Hawaii-licensed electrical engineer.

- Identify the type of battery that will be installed (i.e. vented lead-acid, sealed battery, lithium-ion etc). Be specific as possible in the description of the battery composition.

- Provide manufacturer’s specification sheets and installation instructions (if available) for all manufactured components. Ensure all components are listed by an OSHA Nationally Recognized Testing Laboratory per NEC 110.3(B).

- Locating new equipment on an array layout plan is not acceptable. Provide a floor plan with walls (interior and exterior) and openings (i.e. doors and windows) to locate all equipment shown on the one-line diagram. Note: The floor plan shall be drawn to scale and an industry-standard architectural scale shall be clearly indicated (i.e. 1/4" = 1'-0", 1/8" = 1'-0"). The use of all rooms/areas shall be identified.

- Show all existing PV systems at the project building(s).

**Building/Residential Items:**

- Identify the battery liquid electrolyte volume capacity; see [BldgCd, Sec. 508.2]. For lithium batteries, provide the weight of the battery in addition to the liquid electrolyte volume capacity.
Provide the following note on the plan and correct the sentence (choose either will or will not) to address the scope of work: "The installation of the photovoltaic system wiring will/will not penetrate a fire-resistant-rated wall, partition, floor, or ceiling." NOTE: All penetrations made to any fire-resistant-rated walls, partitions, floors, or ceilings should be identified on the plan.

Provide additional details to show the method on how the penetration(s) will be corrected to maintain the fire resistance rating. Refer to NEC Section 300.21, 725.3(B), and/or 800.26.

Provide the following note: "Penetrations of horizontal assemblies (listed in IBC 2006 Sec. 712.4) and fire-resistance-rated wall assemblies (listed in IBC 2006 Sec. 712.3) shall be protected by methods described in IBC 2006 Sec. 712. Penetrations of smoke partitions shall comply with 
comply with IBC 2006 Sec. 710.6. Penetrations shall not be made where prohibited by the Building Code."

If there will be penetrations of structural concrete, locate all such penetrations in the plans and furnish an architect or structural engineer’s approval letter; see [IBC, Sec. 1906.3] and the definitions for the different licensed design disciplines in [HRS, Sec. 464-1] & [HAR, Sec. 16-115-2]. Approval letter is subject to [HAR, Sec. 16-115-5, c].

Do not interfere with the means of egress; see [IBC, Ch. 10].

Provide a PV mounting system detail showing if the structural members the PV mounting system is embedded into is of wood, concrete, or metal. If the PV mounting system is embedded in a metal or concrete structural member, provide one of the following:
- Architect or structural engineer’s structural certification letter for the PV mounting system. The letter should indicate the wind load uplift requirements according to the projects location’s wind speed, 3 sec gust with exposure category.
- Architect or structural engineer’s seal and authentication as provided in [HAR, Sec. 16-115-7,c] on the sheet(s) containing the PV mounting detail(s).
- Provide in the plans the manufacturer’s specs for the PV mounting system. Spec sheet should show that the PV mounting system is appropriate for installation in whatever structure the system is to be embedded into.

Zoning Items:
- On provided site/floor plan, indicate the battery and panel array locations. If within the parking area, indicate the dimensions of parking stalls provided per LUO sec. 21-6.50.

- For ground and structure mounted PV: Indicate setbacks from the property lines per LUO sec. 21-4.30. Provide elevation drawings with the height dimensioned from grade to its highest point.
Fire Items:

- Address the following on the plan (for buildings other than one- and two-family dwellings and townhouses):
  - Provide an access perimeter around the roof edges per 11.12.2.2.3.1 of NFPA 1.
  - Provide centerline access pathways on both axes of the roof per 11.12.2.2.3.2 of NFPA 1.
  - Provide 4ft wide pathways to skylights, hatches, and standpipes per 11.12.2.2.3.2 of NFPA 1.
  - Provide 4ft clear around hatches and a clear path to roof edge per 11.12.2.2.3.2 of NFPA 1.
  - Provide ventilation options per 11.12.2.2.3.3.2 of NFPA 1.

- For ground-mounted photovoltaic systems, address the following on the plan:
  - Provide a clear area of 10 ft around the ground-mounted photovoltaic installation per 11.12.3.1 of NFPA 1.
  - Provide a gravel base or other non-combustible base acceptable to the AHJ under and around the installation per 11.12.3.2 of NFPA 1.
  - Provide fencing, skirting or other suitable security barriers per 11.12.3.3 of NFPA 1 and NEC Section 690.31(A).

- Add the following notes to the plan (as applicable):
  “Fire Safety Note 11.12.1 New photovoltaic systems shall be installed in accordance with Section 11.10, Section 11.12 and NFPA 70.
  52.1 General. Stationary storage battery systems having an electrolyte capacity of more than 100 gal (378.5L) in sprinklered buildings or 50 gal (189.3L) in unsprinklered buildings for flooded lead-acid, nickel-cadmium, and valve-regulated lead acid (VRLA) batteries or 1000lb (454 kg) for lithium-ion and lithium metal polymer batteries used for facility standby power, emergency power, or uninterruptable power supplies shall be in accordance with Chapter 52 and Table 52.1.”

- On the plan, provide details of markings, signage, and information required per 11.12.2 of NFPA 1.

Electrical Items:

- State on the plan if the utility will ever charge the battery. If utility charges the battery, provide a service load calculation on the plan to show that the existing service entrance conductors are adequately sized due to the additional battery charging loads.

- Provide a detailed explanation on the operation of the photovoltaic with battery energy storage system specific to this project in accordance with NEC Section 110.3(A). Address the following on the plan:
- describe what happens with the photovoltaic with battery energy storage system during the day
- describe what happens with the photovoltaic with battery energy storage system during the evening
- what energy sources (utility, PV, battery) support the branch circuits in the critical loads panelboard? Identify the conditions under which each source will supply power to the critical loads panelboard. Identify the priority scheme when each energy source is used.
- what energy sources (utility, PV, battery) support the dwelling branch circuit loads? Identify the conditions under which each source will supply power to support dwelling loads. Clarify if there is a priority scheme for when each energy source is used.
- describe what happens if PV production exceeds dwelling consumption when the battery is full
- describe what happens if dwelling consumption exceeds PV production. Describe what happens if dwelling consumption exceeds both PV production and battery discharge.
- describe if the photovoltaic with battery energy storage system ever feeds AC power back to the utility grid
- describe what happens when the utility power goes offline and what happens when it comes online. Describe the operation of the photovoltaic with battery energy storage system in detail during utility outage during the day and evening. Identify the dwelling loads that will be operational during utility outage.
- describe the conditions under which the batteries will be charged and discharged and define the specific demand set-points.
- what energy sources (utility, PV) will charge the battery? Identify the condition priority scheme under which each source will charge the battery.
- describe what happens if the battery system starts to drain and voltage level drops. Describe if/and how the battery system is cutoff. At what level does this occur?

- Provide the existing electrical one-line diagram prior to any alteration. The existing one-line diagram should show all electrical equipment from the service connection to all electrical distribution equipment (i.e. panelboards). Provide electrical and NEMA ratings of equipment, wire identification and sizing, and grounding. Show all demolition work on the existing one-line diagram.

- Provide a new one-line diagram showing all alterations. The one-line diagram should show all electrical equipment from the service connection to all electrical distribution equipment (i.e. panelboards). Provide electrical and NEMA ratings of equipment, wire identification and sizing, and grounding. Clearly differentiate between new and existing electrical items.

- On the one-line diagram, show and identify all new communications and signal wiring.

- Prepare an array layout plan and address the following:
  - Locate all roof junction boxes and conduit
  - Identify which PV modules make up each string
- For microinverters, locate all manufacturer interconnection cable. Note: The roof plan should only show equipment installed on the roof.

- Prepare an industry-standard panel schedule that includes the following information:
  - Panel ratings (i.e., voltage, full load current, short circuit current, phases, # wires).
  - Panel name and location.
  - Rating of main breaker, or statement that panel is MLO.
  - For each circuit number, the number of phases and current rating of the breaker.
  - For each circuit number, the load (in KVA) on each phase.
  - For each circuit number, the type of load (e.g., lighting, receptacle, motor).
  - The sum of the KVA loads on each phase, and the total KVA (connected load) on the panel.
  - Where appropriate, the application of a demand factor to the KVA load of any specific item (i.e., 125% for the largest motor, or 50% of receptacle loads over 10KVA).
  - The total demand load of the panel, in KVA.
  - The equivalent of the demand load, in amps.

- Provide additional details on the floor plan to show that the battery area is compliant with NEC Section 110.26(D) or 210.70(A)(3). Note: If the light fixture(s) exists, locate the luminaire(s) and designate it as existing.

- If new electrical equipment will be exposed to vehicular traffic, provide additional details on the plan regarding compliance with NEC Section 110.27(B) or 110.26(F)(2).

- Provide elevation details of all new electrical equipment and define the mounting heights in accordance with NEC Sections 240.24(A) and 404.8.

- Provide additional details on the plan that show that underground installations are in compliance with NEC Section 300.5(A).

- If PVC conduit will be used, state on the plan that PVC conduit will be schedule 80 in areas exposed to physical damage in accordance with NEC Section 352.10(F). State on the plan that the standoff height of PVC conduit above the roof is greater than 3-1/2". PVC is not allowed where subject to ambient temperatures in excess of 50 deg C (122 deg F) unless listed otherwise. Refer to NEC Section 352.12(D) and NEC Table 310.15(B)(2)(c).

- Provide fill calculations on the plan to show that all CT enclosures are in compliance with NEC Section 312.8.

- Provide a disconnecting means for the battery in accordance with NEC Section 480.5. Locate the disconnecting means on the floor plan.
o Provide a statement on the plan that the ventilation at the battery area is in accordance with NEC Section 480.9(A). If the battery technology does not require ventilation, state on the plan that "The chemistry of the battery is such that NEC Section 480.9(A) does not apply".

o Provide additional details to show that the battery terminals will be compliant with NEC Section 480.9(B).

o Show working space clearances around the battery equipment in accordance with NEC 480.9(C). Provide manufacturer’s documentation that identify the service points of the battery. Note: Battery stacks should be positioned such that access to each stack does not require reaching over other battery stacks.

o Show all labels required by NEC Articles 690 and 705 on the plan. Do not abbreviate labels. Provide all numerical values when required. It is not sufficient to cover labels with general notes. Identify the location for each label on the plan.

o Provide an interior wireway detail to show compliance with NEC Section 690.4(B). On the plan, identify the manufacturer and model number of the wireway with the partitions installed.

o Provide overcurrent protection for PV and battery circuits per NEC 690.9(A).

o For stand alone systems, provide additional details on the plan regarding compliance with NEC Section 690.10.

o Provide PV circuit and equipment disconnects per NEC Sections 690.13 and 690.15.

o Clarify on the plans if the DC circuit of the inverter is a grounded or ungrounded. If grounded, provide a DC grounding electrode and continuous grounding electrode conductor in accordance with NEC Sections 690.47(B) & (C). If ungrounded, all exposed PV source conductors shall be listed PV wire, including the output conductors from the PV modules in accordance with NEC Section 690.35(D). Provide manufacturer’s spec sheet or official manufacturer documentation (i.e. signed letter) for PV module that states that the interconnection wiring for the PV module is listed PV wire. State on the plan that the DC circuit of the inverter meets the requirements for ungrounded photovoltaic arrays in NEC Section 690.35.

o For unbalanced PV loads, state the following on the plan: "The PV system will comply with NEC 690.63(A) and the electrical contractor will balance electrical system per NEC 690.63(A). The installation of the PV system must also be approved by HECO regarding the compliance with NEC 690.63(A)."

o State on the plan that circuit breakers are suitable for backfeed in accordance with NEC Section 705.12(D)(5).
*** REFERENCES/LEGEND ***
1. Building Code: [ROH, Ch. 16],
a. IBC: INTERNATIONAL BUILDING CODE 2006 as amended by [ROH, Sec. 16-1.1].
b. IRC: International Residential Code 2006 as amended by [ROH, Sec. 16-1.2].
c. IEBC: International Existing Building Code 2006 as amended by [ROH, Sec. 16-9.1]
2. Electrical Code: [ROH, Ch. 17]
a. NEC: National Electrical Code 2008
3. Fire Code: [ROH, Ch. 20]
a. NFPA 1 2012 as amended by [ROH, Sec. 20-1.1]
5. HAR: HAWAII ADMINISTRATIVE RULES, "http://cca.hawaii.gov/hawaii-administrative-rules/".
Building Permit Plan Format Checklist

The purpose of this checklist is to provide plan preparers with the proper formatting and preparation for plans submitted as either hardcopy paper or electronic files via ePlans. Adherence to this checklist ensures that plans meet pre-screening requirements which will facilitate a quicker review process. In addition, the use of the Building Permit Application Checklist, which enumerates the minimum information required for plans review for either a Residential or Commercial project (also available on the DPP website), is required.

1. **Complete Plot Plan Showing:**
   a. Entire property
   b. All lot dimensions
   c. All driveway aprons (new & existing)
   d. Offsite utilities (utility poles, hydrants, etc.), Sidewalk infrastructure (catch basins, manholes)
   e. Location of work
   f. All existing structures with addresses
   g. Building setbacks
   h. Required yard setbacks
   i. Easements labeled
   j. All streets with names

2. **Address:**
   a. Provide legal registered address, as on record with the Dept. of Planning & Permitting

3. **Color:**
   a. Plans are black and white drawings
   b. Photos may be used for reference only
   c. Renderings and Logos are acceptable

4. **Stamp Space:**
   a. The top right corner is clear - 3.75”H x 5.75”W from edge of each sheet

5. **File Naming Standard**:*
   a. Format: Sheet number followed by a short description of drawing (ex. A001 – First Floor Plan)
   b. Are less than 40 characters
   c. Consistent with sheet index
   d. Contain no special characters such as ! @#$%^&*()”\|/\=-+[
   e. Acceptable special characters: Hyphen and underscore

6. **Scale:**
   a. All applicable drawings and details are drawn to scale
   b. All applicable sheets have a typical graphic scale bar
   c. Scale provided matches drawing
   d. Minimum 1/8” height text and symbols
   e. Standard Architectural and Engineering scales must be used

7. **Files/Sheets:**
   a. Each sheet is its own file*
   b. All sheets are same size
   c. All sheets in the same correct orientation (portrait or landscape)
   d. No sticky back, taping, gluing or stapling onto plans**
   e. Print on one side only**
   f. Minimum page size/sheet size of 24” x 36”

8. **Index:**
   a. Index list matches sheets submitted
   b. Cross-referencing is consistent between – file name, sheet number, details, index, etc.

9. **Title Block:**
   a. On each sheet
   b. Includes – owner/project name, project address, TMK(s), brief project description

10. **Numbering Standard:**
    a. One alphabetical character that designates discipline followed by 3 numerical characters. (ex. A001 or S-101)
    b. Title sheet does not include an alphabetical character (ex. 000, 100)
    c. The numerical format can be sequential or in a series format

11. **Drawing Revisions:**
    a. Cloud all changes
    b. Use black ink for handwritten changes**
    c. Validate handwritten changes with printed full name, signature, and date**

* Does not apply to paper submittals.
** Applies to paper submittals only.

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