Photovoltaic (PV) systems installed on LAWA property are subject to the requirements of the LAWA Design & Construction Handbook (DCH). This document is intended to provide clarity & guidance on LAWA's technical requirements for stand-alone and utility-interactive PV systems (with & without batteries). However, the local authority having jurisdiction (AHJ) or inspector has final say on what is or is not acceptable.

1.1 ELECTRICAL ENGINEERING REQUIREMENTS

A. PV Module interconnection cables

1. USE-2 or PV Cable.

B. Single conductor cable leaving PV array(s) shall be:

1. USE-2, RHW-2, PV-Wire, THHN/THWN-2, or XHHW-2.
2. Enclosed within raceway.

C. Color coding

1. Minimize use of colored insulation for exposed outdoor conductors.
2. Provide color scheme for DC conductors.
    a. Use "red is positive" and "black is negative" for ungrounded PV arrays associated with transformer-less inverters.

D. Inverters

1. The inverter ac disconnect should be "grouped" with the dc inverter disconnect and both should be "near" the inverter.
2. Provide external disconnect.
3. Inverters having internal dc disconnect may be used provided the inverter can be safely de-energized (PV source & output circuits) should the inverter require factory service or replacement. This requires review & approval prior to design.

E. Disconnects

1. Utility-Required AC Disconnect may be located within sight of the service-entrance meter.

F. Ground-Fault Protection

1. System shall have ground-fault protection device either built into inverter or charge controller (per equipment manual) or as a separate piece of equipment.

G. Rapid Shutdown of PV Systems on Buildings.

1. Provide initiation methods & associated labeling for review & approval prior to construction.
2. Remote disconnect readily accessible, clearly marked on the outside of the building and probably near the existing utility revenue meter.

H. Safety

1. Propose method for covering PV modules with an "OPAQUE" material for maintenance.

1.2 DESIGN REVIEW

A. Equipment Lists & Specifications

1. Provide an electronic & paper binder that, at minimum, contains:

    a. List of the equipment used.
        (1) (e.g.) PV modules, inverters, fuses, and circuit breakers.
        (2) Listing/certification, & rating information shall be included.
    b. Specifications for equipment.
        (1) The specifications of this equipment are necessary to determine if the conductors have been properly sized and that the fuses and circuit breakers used in the dc parts and ac parts of the system are properly rated.
        (2) Factory cut sheets or pages from instruction manuals shall be used to present this information.
    c. Include copies of the installation manuals & technical specifications for the inverter, module, and dc PV combiner.

B. The Diagram

1. Provide three-line diagram, in lieu of single-line diagram, indicating:

    a. The type & number of PV modules in each series string.
    b. The open circuit voltage (Voc) of each module.
    c. Cold temperature factor (additionally note the coldest expected ambient temperature).
        (1) Clarify source of info.
    d. Maximum direct current (dc) input voltage of the inverter.
    e. Voltage rating of direct current (dc) equipment (wires, overcurrent devices, disconnects).
    f. PV Module electrical parameters photo.
        (1) A label on the back of each module gives electrical parameters needed for code required calculations.
        (2) A photo of each label shall be included with design review package since label(s) may not be visible after installation.
        (3) These values shall additionally appear on the diagram.
    g. Indicate ampacity of module interconnection cables.

2. The three-line diagram shall indicate the following information for conduits.

    a. Conduit fill & conductor ampacity calculations that reflect temperature adjustment factors.
    b. Conductors leaving PV array shall be in conduit; additionally, indicate height above the roof for conduits exposed to sunlight.

3. The three-line diagram shall indicate the following information for module & string overcurrent protection & PV dc disconnect.

    a. The overcurrent protective devices (OCPD) voltage rating.

4. The three-line diagram shall indicate the following information for the inverter.

    a. Inverter maximum input voltage.
    b. Rated continuous output current of the inverter.

END OF SECTION