SUPPLEMENTAL CORRECTION SHEET FOR SOLAR PHOTOVOLTAIC SYSTEMS - ELECTRICAL

This is intended to provide uniform application of the codes by the plan check staff and to help the public apply the codes correctly.

Plan Check No. _____ **PCIS #:**_____-_____-_____

Checked by:_____ **Telephone:**_____

NOTE: Unless otherwise as noted, numbers in a parenthesis ( ) refer to Code sections of the 2014 Edition of the City of Los Angeles Electrical Code (LAEC).

PLAN DETAILS

A. General:

1. Provide the following information for the Photovoltaic (PV) System: (LAEC 93.0207, 690)
    a. Scope of the project, including system (based on inverter(s)) KW rating.
    b. Complete single line diagram of the PV System and utility interconnect.
    c. Site plan, including location of system components, (i.e. inverter, converter, batteries, modules, disconnects, etc.).
    d. Type of system (i.e. Alternating-Current Modules, Bipolar, Grounded, Ungrounded, Hybrid, Non-Isolated (i.e. Transformer-less), Isolated (i.e. with isolation transformer), interactive, stand-alone, etc.).
    e. Utility service operating voltage or class.
    f. Provide information on the size, type, and insulation ratings (voltage, temperature, etc.) of all conductors and associated wiring components on the Direct Current (DC) and Alternating Current (AC) side of the PV system.
    g. Indicate type, size and material of raceway(s).

2. Show the roof access and roof mounted equipment, on the roof plan. (LAEC 93.0207, 240.24)

3. Provide the following information (as applicable) for the Direct Current (DC) side of the PV System: (LAEC 93.0207, 690)
    a. Number of series connected modules in every PV source circuit.
    b. Number of parallel connected modules or panels PV source circuits in each array or PV power source.
    c. Number of combiner boxes, control boxes, or PV power centers for each array, sub-array or PV power source.
    d. Number of PV output circuits
    e. PV source circuit modules or panels connection arrangement
    f. Operating and open-circuit voltage of each module or panel.
    g. Operating voltage of each array or PV power source.
    h. Operating current of every PV source circuit.
    i. Operating current of each array.
    j. Maximum array, panel or module system voltage.
    k. Short circuit current of modules or panels.
    l. Short circuit current of array and subarrays.
    m. Short circuit current of battery system.
    n. Disconnecting means electrical ratings.
    o. Disconnecting means wiring diagram.
    p. Disconnecting means rated short-circuit current per pole.

4. Provide the manufacturer's specification sheets for the PV modules (or panels), including manufacturer's name catalog numbers, complete electrical information, required marked acceptable series backfeed fuse protection rating and installation instruction. (LAEC 93.0207)

5. Provide the inverters, converters, charge controllers, and AC modules manufacturer's specification sheets including the products model designation, listing requirements, installation instructions and the following minimum ratings: (LAEC 93.0207)

    a. Maximum Input AC and DC voltage and the range of operating voltage(s).
    b. Nominal AC output voltage.
    c. Nominal DC voltage and operating range for Utility Interactive or Stand-Alone systems with charge controller.
    d. Maximum Input AC and DC current and maximum input short circuit current.
    e. Maximum inverter output short circuit current and duration.
    f. Maximum backfeed current for utility interactive system with or without charge controller.
    g. Maximum continuous AC output current and power.
    h. Normal operation temperature range.

6. Provide information indicating if the inverter(s) or charge controller(s) contains current limiting devices that limits the output circuit current to the maximum inverter input DC current rating. (LAEC 93.0207)

7. Provide the manufacturer's wiring details for combiner boxes, control boxes, or PV power centers manufacturer's name, model designation, and listing requirements. (LAEC 93.0207)

8. Provide information on the size, type, and insulation ratings (voltage, temperature, etc.) of all conductors and associated wiring components on the DC and AC side of the PV System (LAEC 93.0207)

9. Provide battery specification sheet(s) indicating its type, nominal output voltage and the rated capacity in ampere-hours. (LAEC 93.0207, 690.71(B)(1))

10. The roof mounted photovoltaic modules or panel layout shall be approved by Fire Department (LAEC 93.0206)

11. Provide details for connectors indicating configuration, construction, type and required method of opening, grounding member and circuit current interruption capability and method. (LAEC 690.33)

12. Indicate if the PV system uses a diversion charge controller as the sole means of regulating the charging of a battery. (LAEC 690.72(B)(1))

13. Indicate method of access to the junction, pull or outlet boxes located behind the modules or panels. (LAEC 690.34)

B. Circuits:

1. The maximum system voltage of bipolar circuits shall be the highest voltage achieved between the ungrounded sides of each 2-wire circuits that are connected to bipolar source array when all of the following conditions are met: (LAEC 690.7(E))

    (1) One conductor of each 2-wire circuit is solidly grounded.
    (2) Each 2-wire circuit is connected to a separate subarray.
    (3) The equipment is clearly marked with a label as follows:

> **WARNING**
> BIPOLAR PHOTOVOLTAIC ARRAY.
> DISCONNECTION OF NEUTRAL OR GROUNDED CONDUCTORS MAY RESULT IN OVERVOLTAGE ON ARRAY OR INVERTER.

2. The maximum current for the specific circuit shall be calculated by the following: (LAEC 690.8(A))

    (1) The PV source circuit maximum current shall be the sum of parallel module rated short circuit currents multiplied by 125%.
    (2) The PV output circuit maximum current shall be the sum of parallel module rated short circuit currents multiplied by 125 %.
    (3) The inverter maximum current shall be the inverter continuous output current rating.

(4) The stand-alone inverter input circuit shall be sized based on the continuous inverter input current rating when the inverter is producing rated power at the lowest input voltage.

3. Overcurrent devices, where required shall be rated by the following: (LAEC 690.8(B)(1))
   (a) To carry not less than 125% of the maximum currents calculated in 690.8(A)
   (b) Terminal temperature limits shall be in accordance with 110.3(B) and 110.14(C).
   (c) Where operated at temperatures greater than 40°C (104°F), the manufacturer's temperature correction factors shall apply.
   (d) The rating or setting of overcurrent devices shall be permitted in accordance with 240.4(B), (C), and (D).
4. Circuit conductors shall be sized to carry not less than the larger of the following: (LAEC 690.8(B)(2))
   (a) 125% of the maximum currents calculated in 690.8(A) without any additional correction factors for conditions of use.
   (b) The maximum currents calculated in 690.8(A) after conditions of use have been applied.
   (c) The conductor selected, after application of conditions of use, shall be protected by the overcurrent protective device, where required.

5. The common-return conductor of systems with multiple voltages (i.e., multi-tap battery banks) shall not be smaller than the sum of the ampere ratings of the overcurrent devices of the individual output circuits. (LAEC 690.8(C))

6. Where a single overcurrent device is used to protect a set of two or more parallel-connected module circuits, the ampacity of each of the module interconnection conductors shall not be less than the sum of the (modules required marked acceptable series backfeed protection) fuse rating and 125% of the short-circuit from the other parallel-connected modules. (LAEC 690.8(D))

C. Overcurrent Protection:
1. PV source circuits, output circuits, inverter output circuits, and storage battery circuit conductors and equipment shall be protected in accordance with the requirements of Article 240. (LAEC 690.9(A))

2. The inverter output circuit conductor overcurrent protective device shall be located at the point where the conductor receive their supply but in no case shall be more than 10 feet away. (LAEC 240.21)

3. Circuits connected to more than one electrical source (i.e., parallel strings, inverters, storage-battery circuits, etc.) shall have overcurrent protective devices providing overcurrent protection from all sources (LAEC 690.9(A))

4. Overcurrent protective devices in the DC portion of the system shall be listed for use in DC circuits and shall have the appropriate voltage, current, and interrupting ratings. (LAEC 690.9(D))

5. PV systems with DC source circuits, DC output circuits, or both, on or penetrating a building operating at a PV system maximum system voltage of 80 volts or greater, shall be protected by a listed DC Arc-Fault Circuit Interrupter(AFCI), PV type, or other system components listed to provide equivalent protection. (LAEC 690.11)

6. Circuit breakers, if backfed, shall be suitable for such operation. (LAEC 705.12(D)(5))

D. Disconnecting Means:
1. Provide a disconnecting means to disconnect all conductors in a building or structure from the PV system conductors. This disconnecting means shall be installed at a readily accessible location either on the outside of the building or structure or inside nearest the point of entrance of the PV system conductors. (LAEC 690.14)

2. Provide a disconnecting means for the following items: (LAEC 690.14, 690.15)
   (a) PV source circuit(s) (isolating switches),
   (b) Fuses,
   (c) Blocking diodes,
   (d) Inverters,
   (e) Batteries,
   (f) Charge controllers,
   (g) Combiner box,
   (h) _____

3. The PV system disconnecting means shall be grouped together and shall not exceed six. (LAEC 690.14(C)(4), 690.14(C)(5))

4. Disconnecting means shall be provided to disconnect a fuse from all sources of supply if the fuse is energized from both directions. (LAEC 690.16(A))

5. Fuse servicing disconnecting means shall be installed on PV output circuits where overcurrent devices (fuses) must be serviced that cannot be isolated from energized circuits. The disconnecting means shall be within sight of, and accessible to, the location of the fuse or integral with fuse holder and shall comply with 690.17. (LAEC 690.16(B))

6. The required disconnecting means may be a switch or a circuit breaker that is intended to disconnect ungrounded conductors of a PV system. These devices shall be readily accessible, have sufficient current interrupting rating at the nominal voltage at their line terminals and comply with all other applicable provision of 690.17. (LAEC 690.17)

7. Current carrying conductors of battery circuits, consisting of field serviceable batteries with more than twenty four 2-volts cells connected in series string (48 volts, nominal), shall have provisions to disconnect them into 24 cells (48 volts, nominal) or less segments for maintenance by qualified personnel. Non-load-break bolted or plug-in disconnects are permitted. (LAEC 690.71(E))

E. Wiring Method:
1. Wires used in PV system shall be of a type indicated in 690.31(B). Indicate the wires intended to be used in this installation. (LAEC 690.31, 93.0207)

2. DC PV source and output circuits of a utility-interactive inverter must be installed in approved metal raceways, Type MC metal-clad cable that complies with 250.118(10), or enclosures from the point of penetration of the surface of the building or structure to the first readily accessible disconnecting means. (LAEC 690.31(E))

3. Ungrounded source and output circuits shall be provided with disconnects, overcurrent protection(s), ground-fault protection(s) and listed inverter or charge controller for the purpose as required in 690.35. (LAEC 690.35)

4. The ungrounded source and circuit conductors shall consist of nonmetallic sheathed (jacketed) multiconductor cable, conductors installed in approved raceway, or conductors listed and identified as PV Wire installed as exposed, single conductor. PV wire used shall be approved by the Department, or by special permission, provided that the cable manufacturer has obtained a research report. (LAEC 690.35(D)), 110.2)

F. Grounding:
1. Indicate if the components of the system are negatively, positively grounded, or ungrounded. (LAEC 93.0207)

2. Provide a solidly grounded or other approved equivalent system grounding methods in accordance with LAEC section 250.4(A) for a grounded system. (LAEC 690.41)

3. The DC system circuit grounding connection shall be made at a single point on the PV output circuit, except for DC systems (i.e., inverters), with DC ground fault protection device that is incorporated as part of the DC system bond (ungrounded conductor-to-ground connection), the point of connection shall be made at any single point after this device. (LAEC 690.42)

4. Equipment grounding conductors and devices shall comply with the following: (LAEC 690.43)
   (a) Exposed non-current-carrying metal parts of module or panel frames, equipment and conductor enclosure shall be grounded in accordance with sections 250.134 or 250.136(A) regardless of voltage. Provide information on the equipment grounding method. (LAEC 690.43(A), 93.0207)
   (b) An equipment grounding conductor between a PV array and other equipment shall be required in accordance with 250.110. Provide information on the equipment grounding method. (LAEC 690.43(B), 93.0207)
   (c) Provide information on listed and identified devices for grounding the metallic frames of PV modules or other equipment bonded to the exposed metal surfaces or other equipment to mounting structures. (LAEC 690.43(C), 93.0207)

(d) Devices and systems used for mounting PV modules that are also used to provide grounding of the module frames shall be identified for the purpose of grounding PV modules. (LAEC 690.43(D))
(e) Identify the listed devices for bonding the metallic frames of PV modules to bond the exposed metallic frames of PV modules to the metallic frames of adjacent PV modules. (LAEC 690.43(E))
(f) Equipment grounding conductors for the PV array and structure (where installed) shall be contained within the same raceway or cable or otherwise run with the PV array circuit conductors when those circuit conductors leave the vicinity of the PV array. (LAEC 690.43(F))
(g) Indicate if the components of the system are negatively, positively grounded, or ungrounded. (LAEC 93.0207)

5. The equipment-grounding conductor for the PV source and PV output circuits shall per LAEC Table 250.122. If no overcurrent protective device (OCPD) is used in the circuit, an assumed OCPD rated at the PV rated short-circuit current of circuits shall be used in LAEC Table 250.122 to size the equipment-grounding conductor. (LAEC 690.45(A))

6. The equipment-grounding conductor for other than dwelling units, where no ground fault protection is provided per LAEC sections 690.5(A) through (C), shall have an ampacity of not less than two (2) times the temperature and conduit fill corrected circuit conductors. (LAEC 690.45(B))

7. The array equipment-grounding conductor smaller than 6 AWG, or the equipment bonding jumpers (if used) shall be protected from physical damage by raceway or cable armor or other methods as permitted in LAEC section 250.120(C). (LAEC 690.46)

8. Indicate grounding electrode system used for the AC, DC or combined AC/DC systems. (LAEC 690.47)

9. PV Systems having DC circuits and AC circuits with no direct connection between the DC grounded conductor and AC grounded conductor shall have a DC grounding system. Indicate the method for DC grounding system bonding to the AC grounding system. (LAEC 690.47(C)
   (1) Separate Direct-Current Grounding Electrode System Bonded to the Alternating-Current Grounding Electrode System
   (2) Common Direct-Current and Alternating-Current Grounding Electrode
   (3) Combined Direct-Current Grounding Electrode Conductor and Alternating-Current Equipment Grounding Conductor.

10. Provide detail drawing or indicate the method used to insure that removal of an equipment from the system it does not disconnect the (equipment grounding) bonding connection between the grounding electrode conductor and exposed conducting surfaces. (LAEC 690.48, 93.0207)

11. Provide detail drawing or indicate the method used to insure the removal of a utility-interactive inverter or other equipment that does not disconnect (remove) the bonding connection between the grounding electrode conductor and the PV source and/or output circuit grounded conductor. (LAEC 690.49, 93.0207)

G. Ground Fault Protection:
1. Grounded DC PV arrays shall be provided with DC ground-fault protection to reduce fire hazards. Ungrounded photovoltaic arrays shall comply with 690.35. A warning label shall appear on the utility-interactive inverter or be applied by the installer near the ground-fault indicator at a visible location, stating the following: (LAEC 690.5)

WARNING
ELECTRIC SHOCK HAZARD
IF A GROUND FAULT IS INDICATED,
NORMALLY GROUNDED CONDUCTORS MAY
BE UNGROUNDED AND ENERGIZED

2. The AC side of PV inverter connected to the load side of a service or feeder disconnecting means containing Ground-Fault Relaying and Sensing Equipment (GFRSE) protection shall be protected by a listed “Equipment Ground-Fault Protective Device (EGFPD)”, located immediately on the AC output side of the inverter. (LAEC 705.12 (3) Exception)

3. All GFRSE and ground fault circuit interrupters must be listed for the back feed current when the AC side of an inverter(s) are connected to their load side. (LAEC 110.3(B))

4. The EGFPD shall not be installed in service equipment unless listed for such an installation (LAEC 110.3(B))

H. Connection to Other Sources:

1. A load disconnect that has multiple sources of power shall disconnect all sources when in the off position. (LAEC 690.57)

2. Only inverters and AC modules listed and identified as interactive shall be permitted in interactive systems. (LAEC 690.60)

3. Provide information indicating compliance with the LAEC 690.61 requirement, Loss of Interactive System Power (LAEC 93.0207, 690.61)

4. The sum of the ratings of all overcurrent devices connected to power production sources shall not exceed the rating of the service when connecting to the supply side of the service disconnecting mean. (LAEC 705.12(A))

5. Utility interactive inverter interconnection to the load side of the service disconnecting means shall be made at a dedicated circuit breaker or fusible disconnecting means. (LAEC 705.12(D)(1))

6. The sum of the ampere ratings of overcurrent devices in circuits supplying power to a busbar or conductor shall not exceed 120% of the rating of the busbar or conductor. (LAEC 705.12(D)(2))

7. Unless the panelboard is rated not less than the sum of the ampere ratings of all overcurrent devices supplying it, a connection in a panelboard shall be positioned at the opposite (load) end from the input feeder location or main circuit location. A permanent warning label shall be applied to the distribution equipment with the following or equivalent wording: (LAEC 705.12(D)(7))

> WARNING
> INVERTER OUTPUT CONNECTION
> DO NOT RELOCATE THIS OVERCURRENT DEVICE

8. Utility interactive inverters and AC modules shall not be connected to 3-phase power systems unless the interconnected system is designed so that significant unbalanced voltages cannot result. (LAEC 705.100(A))

9. Three-phase inverters and 3-phase AC modules in interactive systems shall have all phases automatically de-energized upon loss of, or unbalanced, voltage in one or more phases unless the interconnected system is designed so that significant unbalanced voltages will not result. (LAEC 705.100(B))

J. Storage Batteries:

1. The storage batteries shall be installed in accordance with provisions of Article 480. (LAEC 690.71)

2. In dwellings, provide information on how are the battery cells interconnected and what is their nominal operating voltage. (LAEC 690.71(B)(1))

3. Provide a listed current limiting overcurrent device at the output of each battery circuit. This device must have adequate short circuit interrupting rating and be able to reduce the available short circuit below the withstand rating of other equipment in that circuit. (LAEC 690.71(C))

4. Battery systems consisting of more than twenty-four 2-volts cells connected in series (more than 48 volts, nominal) are permitted to operate with ungrounded conductors, provided the comply with the following: (LAEC 690.71(G))
   (1) The PV array source and output circuits are solidly grounded according to provisions of section 690.41.
   (2) The DC and AC load circuits are solidly grounded.
   (3) All main ungrounded battery input/output circuit conductors are provided with switched disconnects and overcurrent protection.

(4) A ground-fault detector and indicator installed to monitor for ground faults in the battery bank.

5. Flexible cables used from battery terminals to a nearby approved junction box shall be sized 2/0 AWG or larger. (LAEC 690.74)

6. Provide either a battery charge control OR show that the PV source circuit is matched to the voltage rating and charge requirements of the interconnected battery cells. (LAEC 690.72(A))

7. Provide a second independent means to prevent overcharging of a battery when the sole means of regulating the battery charge is through a diversion charge controller. (LAEC 690.72(B)(1))

8. PV systems using utility-interactive inverters to control battery state-of-charge by diverting the excess power into the utility system through a diversion charge controller, shall have a second independent means of controlling the battery charging process when the utility is not present or when the primary charge controller fails or disabled. The charge regulation circuits in these systems shall comply with the requirements 690.8. (LAEC 690.72(B)(3))

K. Systems Over 600 Volts:
1. The PV system with maximum system voltage of over 600 volts DC shall comply with 490 and other requirements applicable installations rated over 600 volts. (LAEC 690.80)

2. The voltage rating of battery circuit cable or equipment shall not be smaller than the charging or equalizing condition of the battery circuit. (LAEC 690.85)

3. The voltage rating of equipment or cable in the DC source and output circuits shall not be smaller than the expected maximum system voltage. (LAEC 690.85)

CALCULATIONS

A. Circuit Voltage:
1. Provide maximum system voltage calculation based on either the City of Los Angeles lowest expected ambient temperature of -7℃ (20℉) or use the manufacturer supplied open-circuit voltage temperature coefficients supplied in the instructions for listed modules that are crystalline and multi-crystalline silicon modules. (LAEC 690.7(A), 110.3(B), 93.0600)

2. Provide maximum system open-voltage calculation based on manufacturer's instructions for PV power source modules made of materials other than crystalline or multi-crystalline silicon. (LAEC 690.7(A), 93.0207, 93.0402)

B. Circuit Current:
1. Provide maximum DC circuit current calculation for each PV source circuit. The PV source circuit current shall be based on sum of parallel module rated short circuit currents multiplied by 125% and any inverter back feed current. (LAEC 690.8(A)(1), 93.0207)

2. Provide the maximum DC current calculation for each PV output circuit. The output circuit current shall be based on sum of parallel source circuits maximum currents as determined in LAEC section 690.8(A)(1) and addition of any inverter back feed current. (LAEC 690.8(A)(2), 93.0207)

3. The inverter maximum output circuit current shall be the inverter continuous output current rating. (LAEC 690.8(A)(3))

4. The Stand-Alone inverter input circuit maximum current shall be based on inverter rated power divided by the lowest input voltage. (LAEC 690.8(A)(4))

C. General:
1. Provide calculation to determine the minimum overcurrent device rating for the DC side. The overcurrent devices, where required to carry not less than 125% of the maximum currents. (LAEC 690.8(B)(1)(a))

2. Provide calculation using the manufacturer's temperature correction factors where the overcurrent devices operating at temperatures greater than 40°C (104°F) (LAEC 690.8(B)(1)(c))

3. Provide two calculations to determine the minimum conductor ampacity. The conductors shall be sized to carry not less than the larger of the 125% of the maximum currents calculated in 690.8(A) without any additional correction factors for conditions of use or the maximum currents calculated in 690.8(A) after conditions of use have been applied (LAEC 690.8(B)(2))

4. For conductors exposed to direct sunlight the ampacities shall be derated by the correction factors given in Table 310.16 for an ambient temperature of 39℃ (102℉). (LAEC 310.15(A)(2), 93.0600)

5. For circular raceways (conduits) exposed to sunlight on rooftop exposed to direct sunlight the adjustments shown in Table 310.15(B)(3)(c) shall be added to the outdoor temperature to determine the applicable ambient temperature for application of the correction factors in Table 310.15(B)(2)(a) or Table 310.15(B)(2)(b). Indicate the height of the circular raceways (conduits) installed above rooftop. (LAEC 310.15(A)(2), 93.0207)

6. For flexible cords and cables in outdoor location exposed to direct sunlight the ampacities shall be derated by the correction factors given in Table 690.31(C) for an ambient temperature of 39℃. (LAEC 690.31(C), 93.0600)

7. Provide calculation showing the required maximum charging current of the interconnected battery cells. (LAEC 690.72(A))

8. Provide calculation for ampacity of the neutral conductor of a 2-wire inverter output connected to the ungrounded conductors of a 3-wire or a 3-phase, 4 wire systems. (LAEC 705.95(A))

9. Provide the sum of the ratings of all overcurrent devices connected to power production sources for supply side connection. The sum shall not exceed the rating of the service. (LAEC 705.12(A))

10. Provide the sum of the ampere ratings of overcurrent devices in circuits, connected on the load side of service disconnecting means, supplying power to a busbar or conductor. The sum shall not exceed 120% of the rating of the busbar or conductor. (LAEC 705.95(D)(2))

11. Provide calculation showing the total DC leakage current in the DC ground or DC grounded circuits in non-isolated PV systems does not exceed the EGFPD leakage current trip setting. (LAEC 110.3(A), 93.0207)

12. Provide calculation showing the required current and voltage ratings of DC diversion charge controller and diversion load in a circuit. (LAEC 690.72(B)(1))

13. Provide calculation showing the required conductor ampacity and overcurrent protective device rating for circuits containing DC diversion charge controller and diversion load. (LAEC 690.72(B)(2))

14. Provide calculation showing if expansion fittings are not required for the roof mounted raceways due to thermal expansion or building expansion joints if the raceway is used as equipment grounding conductor. (LAEC 300.7(B) and 352.44)

15. Provide unbalanced voltage calculation for single phase or three phase inverter interconnection. (LAEC 705.100, 93.0207)

16. Provide fault current calculation from utility company side to the AC disconnect(s) and inverter(s). (LAEC 110.9, 110.10, 93.0207)

NOTES ON PLANS

1. Indicate the PV Electrical System Type, KW rating and list all associated components (LAEC 93.0207)

2. Indicate the number of PV cells and modules in each PV Array. (LAEC 93.0207)

3. Indicate the PV modules manufacturer's name, model or catalog number, physical size, weight and supporting means.

4. Indicate the following information on the DC side of the inverter in PV system: (LAEC 93.0207)
   (a) Input Voltage,
   (b) Maximum Open circuit Voltage,
   (c) Maximum Input Current,

(d) Maximum DC power,
(e) Maximum Short Circuit Current,
(f) Maximum Permitted system Voltage,

5. Indicate the manufacturer's name, model designation, complete electrical ratings (AC and DC), fault current withstanding and recognized listing agency name for each inverter unit. (LAEC 93.0207)

6. Indicate the following AC output values of the PV system: (LAEC 93.0207)
   (a) Maximum Output Power,
   (b) Nominal Output Power,
   (c) Operating range, utility voltage,
   (d) Maximum continuous Output Current,
   (e) Frequency Operating range,
   (f) Total Harmonic Distortion,
   (g) Maximum Efficiency,
   (h) Maximum allowable overcurrent protection.

7. Indicate the operating temperature range of the system. (LAEC 93.0207)

8. Indicate on the plans that all PV system components shall be listed by a recognized testing agency (i.e., UL 1741, etc). (LAEC 93.0207)

9. Indicate on the plans that the wiring material shall be suitable for the sun exposure and wet locations. Field applied protective coatings are not acceptable. (LAEC 93.0207)

10. Indicate the maximum series fuse type and rating for each array. (LAEC 93.0207)

11. Indicate on the plans that where the terminal of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and have the following words or equivalent: (LAEC 690.17)

> WARNING
> ELECTRIC SHOCK HAZARD.
> DO NOT TOUCH TERMINALS.
> TERMINALS ON THE BOTH THE LINE AND LOAD SIDES
> MAY BE ENERGIZED IN THE OPEN POSITION.

12. Indicate on the plans the installation of one or more electrical power production sources operating in parallel with a primary source(s) of electricity shall be installed only by qualified persons. (LAEC 705.6)

13. Indicate on the plans that signs shall be posted adjacent to each PV disconnect and inverter to indicate: (LAEC 93.0207)

> PHOTOVOLTAIC SYSTEM

14. Indicate on the plans that all PV modules and associated equipment and wiring material shall be protected from any physical damage. (LAEC 93.0207)

15. Indicate on the plans, that in one- and two-family dwelling, live parts in PV source circuits and PV output circuits over 150 Volts to ground shall not be accessible to other than qualified persons while energized. (LAEC 690.7(D))

16. Indicate on the plans that all field installed junction, pull and outlet boxes located behind modules or panels shall be accessible directly or by displacement of a module(s) or panel(s) secured by removable fasteners. (LAEC 690.34)

17. Indicate on the plans that in an Ungrounded PV system, the power source shall be labeled with the following warning at each junction box, combiner box, disconnect and device where the ungrounded circuits may be exposed during service: (LAEC 690.35(F))

> WARNING
> ELECTRIC SHOCK HAZARD.THE DC CIRCUIT CONDUCTORS
> OF THIS PHOTOVOLTAIC SYSTEM ARE
> UNGROUNDED BUT MAY BE ENERGIZED

18. Each side of a power transformer shall be considered as primary and protected in accordance with LAEC 450.3 (LAEC 690.9(B))

19. The grounded conductors of battery circuits consisting of more than twenty four 2-volts cells connected in series string (48 volts, nominal) shall have provisions to disconnect them into 24 cells (48 volts, nominal) or less segments for maintenance by qualified personnel. The disconnects shall only be accessible to qualified personnel. A non-load-break-rated switch is permitted. (LAEC 690.71(F)

20. Single-conductor cable type USE-2, and PV wires that are approved by the City of Los Angeles Electrical Testing Laboratory are permitted to be used in the source circuits. (LAEC 690.31(B), 93.0402)

21. Removal of a utility-interactive inverter or other equipment shall not disconnect the bonding connection between the grounding electrode conductor and the PV source and/or output circuit grounded conductor. (LAEC 690.49)

22. The roof mounted PV modules, panels or solar voltaic roll roofing material shall have the same or better listed fire-resistance rating than the building roof-covering material. (LAEC 110.3(B))

ADDITIONAL CORRECTIONS	**Code Sec. No**