

PHOTOVOLTAIC SYSTEM LABELING REQUIREMENTS

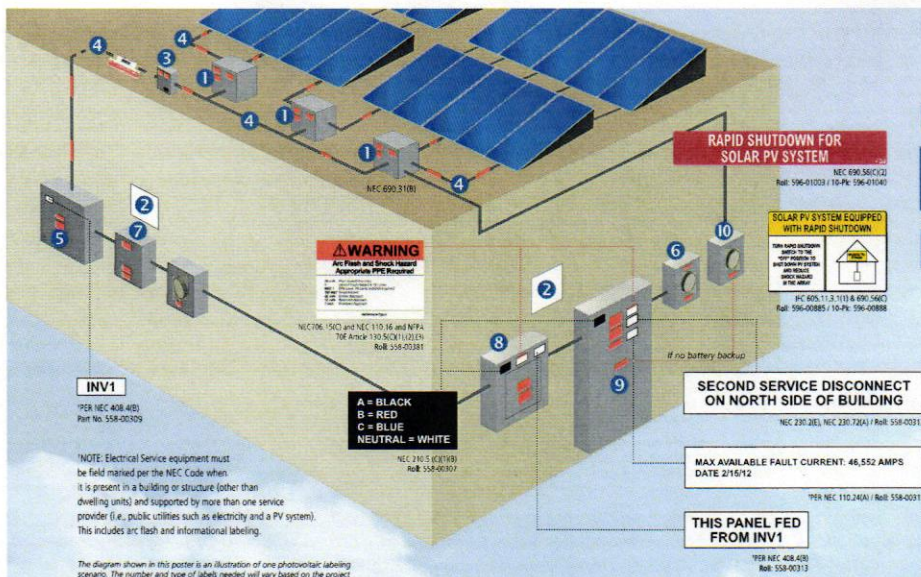
NEC 2020 Article 690

Adhesive Fastened Signs

ANSI Z535.4-2011 Product Safety Signs and Labels, provides guidelines for suitable font sizes, words, colors, symbols, and location requirements for labels. NEC 110.21(B)(1)

The label shall be of sufficient durability to withstand the environment involved. NEC 110.21(B)(3)

Adhesive fastened signs may be acceptable if properly adhered. Vinyl signs shall be weather resistant. IFC 605.11.3



The diagram shown in this poster is an illustration of one photovoltaic labeling scenario. The number and type of labels needed will vary based on the project scope and its related specifications. Check with AHJ for local requirements. UL1741 allows the use of either PV or Photovoltaic on the pre-printed label.

1 Combiner Box / Circuits / Conduit Combiner Box / Enclosures / EMT Enclosures

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

NEC 706.15(C)(4) & (5) / IFC 605.11.3(1) & (2) / NFPA 70E Article 110.2(C)(1) & (2) / Ral: 596-00381

WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

NEC 110.27(C) & (D) / IFC 605.11.3(4) & (5) / Ral: 596-00499 / 10-Pk: 596-00664 / Metal 5-Pk: 596-00631

2 Building / Structure

CAUTION
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKLINED

NEC 705.10 & 690.56(A)(1) / Ral: 596-00350

3 DC Disconnect / Breaker / Recombiner Box

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

DC VOLTAGE IS ALWAYS PRESENT WHEN SOLAR MODULES ARE EXPOSED TO SUNLIGHT

NEC 690.13(B) / Ral: 596-00919 / 10-Pk: 596-00284 / Metal 5-Pk: 596-00330

PHOTOVOLTAIC DC DISCONNECT

NEC 690.13(B) / Ral: 596-00919 / 10-Pk: 596-00284 / Metal 5-Pk: 596-00330

4 EMT / Conduit Raceways

SOLAR PV DC CIRCUIT
PHOTOVOLTAIC POWER SOURCE

NEC 690.13(D)(2) / Ral: 596-00999 / 10-Pk: 596-01006

5 Inverter

WARNING
THE DISCONNECTION OF THE OPEN-CIRCUIT CONDUCTORS MAY RESULT IN OVERVOLTAGE ON THE EQUIPMENT

NEC 690.51(B) / Ral: 596-00523 / 10-Pk: 596-00524 / Metal 5-Pk: 596-00524

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT / NORMAL OPERATING AC VOLTAGE

NEC 690.54 / Ral: 596-00882 / 10-Pk: 596-00882

6 Production / Net Meter (Bi-directional)

WARNING
DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

NEC 705.12(D)(2) & (3) / NEC 690.59 / Ral: 596-00919 / 10-Pk: 596-00965 / Metal 5-Pk: 596-00833

7 AC Disconnect / Breaker / Points of Connection

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT / NORMAL OPERATING AC VOLTAGE

NEC 690.54 / Ral: 596-00882 / 10-Pk: 596-00882

8 Breaker Panel / Pull Boxes

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

NEC 706.15(B) & (C) / NEC 690.13(B) / Ral: 596-00878 / 10-Pk: 596-00893 / Metal 5-Pk: 596-00921

9 Main Service Disconnect

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

NEC 706.15(C)(4) & (5) / NEC 690.13(B) / Ral: 596-00919 / 10-Pk: 596-00999 / Metal 5-Pk: 596-00921

10 Main Service Disconnect / Utility Meter

WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

NEC 110.27(C) & (D) / IFC 605.11.3(4) & (5) / Ral: 596-00499 / 10-Pk: 596-00664 / Metal 5-Pk: 596-00631

11 Energy Storage Systems

NOMINAL ESS AC VOLTAGE
MAXIMUM ESS DC VOLTAGE
AVAILABLE FAULT CURRENT DERIVED FROM THE ESS
DATE CALCULATION PERFORMED

NEC 706.15(C) / Ral: 596-00999 / 10-Pk: 596-01005

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LABELING REQUIREMENTS FOR ARTICLE 690

- NEC 690.13(B)** Each PV system disconnecting means shall plainly indicate whether in the open (off) or closed (on) position and be permanently marked "PV SYSTEM DISCONNECT" or equivalent. Additional markings shall be permitted based upon the specific system configuration. For PV system disconnecting means where the line and load terminals may be energized in the open position, the device shall be marked with the following words or equivalent: "Terminals on the line and load sides may be energized in the open position."
- NEC 690.15(B)** An isolating device shall be rated to open the maximum circuit current under load or be marked "Do Not Disconnect Under Load" or "Not for Current Interrupting."
- NEC 690.31(B)(1)** PV system circuit conductors shall be identified at all termination, connection, and splice points by color coding, marking tape, tagging, or other approved means. Conductors relying on other than color coding for polarity identification shall be identified by an approved permanent marking means such as labeling, sleeving or shrink tubing that is suitable for the conductor size.
- NEC 690.31(C)(2)** Unless located and arranged so the purpose is evident, the following wiring methods and enclosures that contain PV system circuit conductors shall be marked with the wording PHOTOVOLTAIC POWER SOURCE or SOLAR PV DC CIRCUIT by means of permanently affixed labels or other approved permanent marking: (1) Exposed permanent marking; (2) Cable trays and other wiring methods; (3) Covers or enclosures of pull boxes and junction boxes; (4) Conduit bodies in which any of the available conduit openings are unused.
- NEC 690.31(C)(3)** Labels or markings shall be visible after installation. All letters shall be capitalized and shall be a minimum height of 9.5 mm (3/8 in.) in white on a red background. Labels shall appear on every section of the wiring system that is separated by enclosures, walls, partitions, ceilings, or floors. Spacing between labels or markings, or between a label and a marking, shall not be more than 3 m (10 ft). Labels required by this section shall be suitable for the environment where they are installed.
- NEC 690.31(E)** Solidly grounded bipolar PV systems shall be clearly marked with a permanent, legible warning notice indicating that the disconnection of the grounded conductor(s) may result in overvoltage on the equipment.
- NEC 690.33(D)(2)** Interruption of Circuit. Connectors shall be a type that requires the use of a tool to open and marked "Do Not Disconnect Under Load" or "Not for Current Interrupting."
- NEC 690.52** Alternating-current modules shall be marked with identification of terminals or leads and with identification of the following ratings:
- NEC 690.53** A permanent readily visible label indicating the highest maximum dc voltage in a PV system, calculated in accordance with 690.7, shall be provided by the installer at one of the following locations: (1) DC PV system disconnecting means; (2) PV system electronic power conversion equipment; (3) Distribution equipment associated with the PV system.
- NEC 690.54** All interconnect system(s) points of interconnection with other sources shall be marked as an accessible location at the disconnecting means as a power source and with the rated ac output current and the nominal operating ac voltage.
- NEC 690.55** The PV system output circuit conductors shall be marked to indicate polarity where connected to energy storage systems.
- NEC 692.56** A fuel cell system that stores electrical energy shall require the following warning sign, or equivalent, at the location of the service disconnecting means of the premises: **WARNING FUEL CELL POWER SYSTEM CONTAINS ELECTRICAL ENERGY STORAGE DEVICES.**
- NEC 690.56(B)** Plaque(s) or directory(s) shall be installed in accordance with 705.10 and 712.10.
- NEC 690.56(C)** The type of PV system is shown in figure 690.56(C).
- NEC 690.56(C)(2)** A rapid shutdown initiation device shall have a label located on or no more than 1 m (3 ft) from the initiation device that includes the following wording: **RAPID SHUTDOWN FOR SOLAR PV SYSTEM** The label shall be reflective, with all letters capitalized and having a minimum height of 9.5 mm (3/8 in.) in white on red background.
- NEC 690.59** PV systems connected to other sources shall be installed in accordance with Parts I and II of Article 705.
- NEC 705.12(B)(3)(3)** The sum of the ampere ratings of all overcurrent devices on panelboards, bus bars, and supply devices, including the rating of the overcurrent device protecting the busbar, shall not exceed the ampere rating of the busbar. The rating of the overcurrent device protecting the busbar shall not exceed the rating of the busbar. Permanent warning labels shall be applied to distribution equipment displaying the following or equivalent wording: **WARNING THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE SHALL NOT EXCEED AMPACITY OF BUSBAR.**
- NEC 705.12(C)** Each ESS disconnecting means shall plainly indicate whether it is in the open (off) or closed (on) position and be permanently marked "ENERGY STORAGE SYSTEM DISCONNECT." The disconnecting means shall be legibly marked in the field to indicate the following: **WARNING** ESS ac voltage and maximum ESS dc voltage. Available fault current derived from the ESS. An ac-Back label installed in accordance with acceptable industry practice. Data calculation was performed.
- NEC 705.12(B)(3)(3)** Permanent warning labels shall be applied to distribution equipment displaying the following or equivalent wording: **WARNING THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE SHALL NOT EXCEED AMPACITY OF BUSBAR.**
- NEC 705.12(B)(3)(2)** A permanent warning label shall be applied to the distribution equipment adjacent to the back-fed breaker from the inverter power source that displays the following or equivalent wording: **WARNING Power output connection. Do not re-locate this overcurrent device.**
- NEC 710.15(C)** Stand-alone systems shall be permitted to supply 120 volts to single-phase, 3-wire, 120/240-volt service equipment or distribution panels where there are no 240-volt outlets and where there are no nonwired branch circuits. In all installations, the sum of the ratings of the power sources shall be less than the rating of the neutral bus in the service equipment. This equipment shall be marked with the following words or equivalent: **WARNING Single 120-volt supply. Do not connect multiwire branch circuits.**
- NFPA 2012 130.5(C)** Same as NEC 110.16 but includes additional label information that is required after 9:30:2011. Check latest 2012 NFPA arc flash requirements.
- OSHA 1910.145(f)(7)** Warning tags are used to represent a hazard level between "Caution" and "Danger."

REQUIREMENTS FOR ELECTRICAL INSTALLATIONS (FIELD MARKING)

- NEC 110.16** Electrical equipment that is in other than dwelling units shall be field marked to warn qualified persons of a potential arc flash hazard.
- NEC 110.16(A) Arc Flash:** Electrical equipment, such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that is in other than dwelling units, and is likely to require examination, adjustment, servicing, or maintenance while energized, shall be field or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.
- NEC 110.16(B)** In other than dwelling units, in addition to the requirements in (A), a permanent label shall be field or factory applied to service equipment rated 1200 amps or more. The label shall meet the requirements of 110.21(B) and contain the following information:
 1. Nominal system voltage.
 2. Available fault current at the service overcurrent protective device.
 3. The clearing time of the service overcurrent protective devices based on the available fault current at the service equipment.
 4. The date the label was applied.

Exception: Service equipment labeling shall not be required if an arc flash label is applied in accordance with acceptable industry practice.
- NEC 110.21(B)(1) Field Applied Hazard Markings:** The marking shall warn of the hazards using effective words, colors, symbols, or any combination thereof.
- NEC 110.21(B)(3)** The label shall be of sufficient durability to withstand the environment involved.
- NEC 110.22(B) Engineered Series Combination Systems:** Equipment enclosures for circuit breakers or fuses applied in compliance with series combination ratings selected under engineering supervision in accordance with 250.86(A) shall be legibly marked in the field as directed by the engineer to indicate the equipment has been applied with a series combination rating. The marking shall meet the requirements in 110.21(B).
- NEC 110.24(A) Field Marking:** Service equipment at other than dwelling units shall be legibly marked in the field with the maximum available fault current. The field marking(s) shall include the date the fault-current calculation was performed and be of sufficient durability to withstand the environment involved. The calculation shall be documented and made available to those authorized to design, install, inspect, maintain, or operate the system.
- NEC 110.27(C)** Entrances to rooms or other guarded locations that contain exposed live parts shall be marked with conspicuous warning signs forbidding unqualified persons to enter.
- NEC 250.21(C)(1)(b) Posting of Identification Means:** The method utilized for conductors originating within each branch-circuit panelboard or similar branch-circuit distribution equipment shall be documented in a manner that is readily available and shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. The label shall be of sufficient durability to withstand the environment involved and shall not be handwritten.
- NEC 230.2(E) Identification:** Where a building or structure is supplied by more than one service, or any combination of services, a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each.
- NEC 408.4(B) Source of supply:** All switchboards, switchgear, and panelboards supplied by feeder(s) in other than one- or two-family dwellings shall be permanently marked to indicate each device of equipment where the power originates. The label shall be permanently affixed of sufficient durability to withstand the environment involved and not be handwritten.
- NEC 705.10** A permanent plaque or directory shall be installed at a building supplied by a stand-alone system at each service equipment location, or at an approved readily visible location. The plaque or directory shall denote the location of each power source disconnecting means for the premises or be grouped with other plaques or directories for other on-site sources. The marking shall comply with 110.21(B).
- NEC 705.12(C)** Equipment containing overcurrent devices in circuits supplying power to a busbar or conductor supplied from multiple sources shall be marked to indicate the presence of all sources.