

PHOTOVOLTAIC SYSTEM LABELING REQUIREMENTS

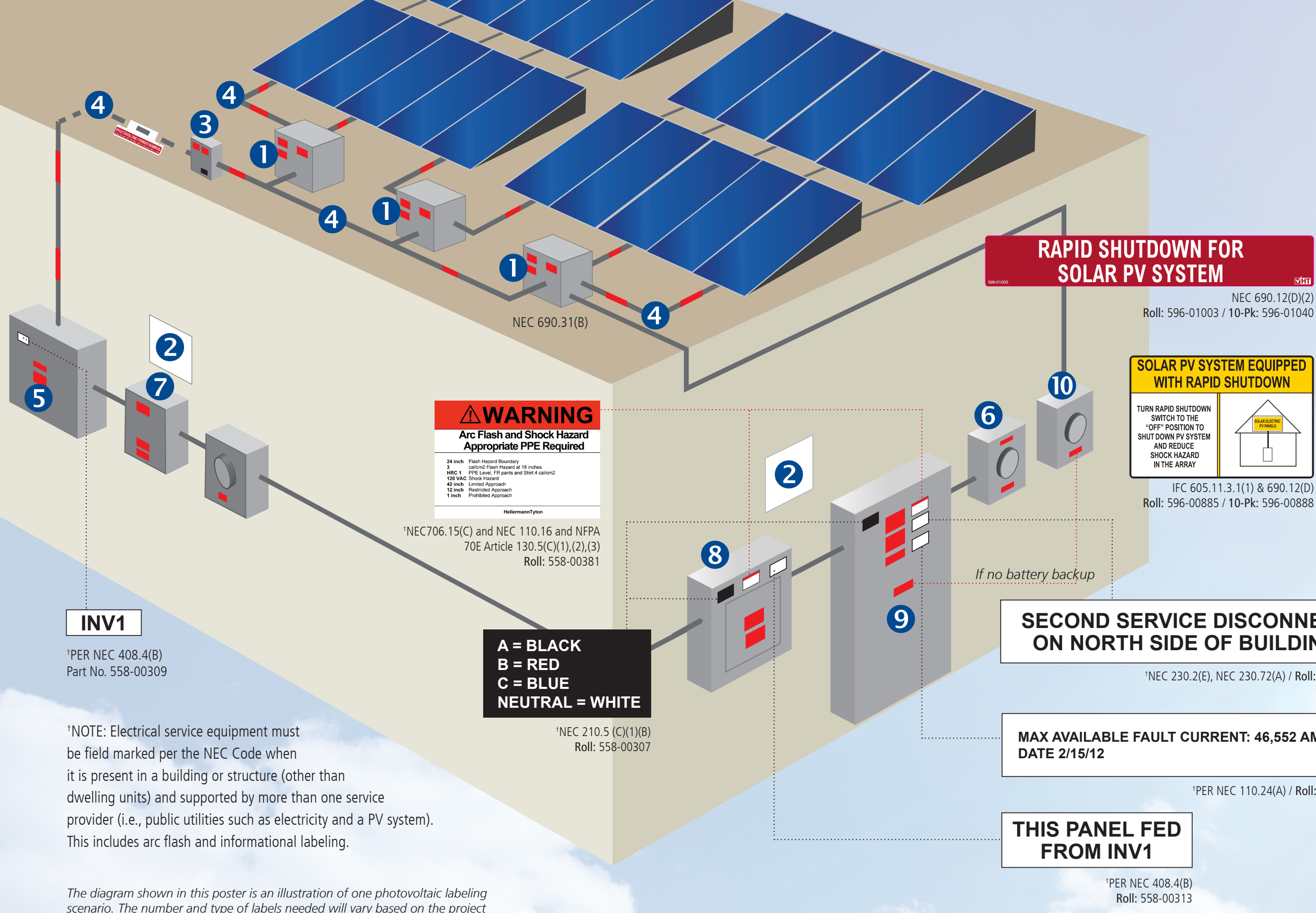
NEC 2023 Article 690

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 605.11.1.3



INV1
PER NEC 408.4(B)
Part No. 558-00309

*NOTE: Electrical service equipment must be field marked per the NEC Code when it is present in a building or structure (other than dwelling units) and supported by more than one service provider (i.e., public utilities such as electricity and a PV system). This includes arc flash and informational labeling.

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.

WARNING
Arc Flash and Shock Hazard
Appropriate PPE Required

A = BLACK
B = RED
C = BLUE
NEUTRAL = WHITE

RAPID SHUTDOWN FOR SOLAR PV SYSTEM
NEC 690.12(D)(2)
Roll: 596-01003 / 10-Pk: 596-01040

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY

SECOND SERVICE DISCONNECT ON NORTH SIDE OF BUILDING
NEC 230.2(E), NEC 230.72(A) / Roll: 558-00313

MAX AVAILABLE FAULT CURRENT: 46,552 AMPS DATE 2/15/12
PER NEC 110.24(A) / Roll: 558-00313

THIS PANEL FED FROM INV1
PER NEC 408.4(B)
Roll: 558-00313

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 705.20(7) and NEC 690.13(B)
Roll: 596-00878 / 10-Pk: 596-00893

WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL
NEC 110.27(C) & OSHA 1910.145(f)(7)
Roll: 596-00499 / 10-Pk: 596-00664

2 Building / Structure

THIS EQUIPMENT SUITABLE FOR ATTACHMENT TO FLOATING STRUCTURES, OR ATTACHED TO STRUCTURES FLOATING ON BODIES OF WATER.
NEC 690.4(G) / Roll: 558-00337

CAUTION
MULTIPLE SOURCES OF POWER
NEC 705.10 & NEC 710.10
Roll: 558-00358 OR 558-00346

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 705.20(7) & NEC 690.13(B) / Roll: 596-00879
10-Pk: 596-00894

PHOTOVOLTAIC DC DISCONNECT
NEC 690.13(B)
Roll: 596-00238 / 10-Pk: 596-00854

RATED AC OPERATING CURRENT
MAX RATED AC OPERATING CURRENT
RATED AC OPERATING VOLTAGE
MAX RATED AC OPERATING VOLTAGE
RATED SHORT CIRCUIT CURRENT
MAXIMUM SYSTEM VOLTAGE
FOR MARKING DC BACKUP SYSTEMS / Roll: 596-00240

MAXIMUM DC VOLTAGE OF PV SYSTEM
NEC 690.53 / Roll: 596-01001 / 10-Pk: 596-01009

4 EMT / Conduit Raceways

SOLAR PV DC CIRCUIT
NEC 690.31(D)(2) / Roll: 596-00998 / 10-Pk: 596-01006

PHOTOVOLTAIC POWER SOURCE
NEC 690.31(D)(2) / Roll: 596-00999 / 10-Pk: 596-01007

5 Inverter

WARNING
THE DISCONNECTION OF THE GROUNDED CONDUCTOR(S) MAY RESULT IN OVERVOLTAGE ON THE EQUIPMENT
NEC 690.31(E) / Roll: 596-09323
10-Pk: 596-09324

6 Production / Net Meter (Bi-directional)

WARNING DUAL POWER SOURCE SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
NEC 705.30(C) & NEC 690.59 / Roll: 596-00495
10-Pk: 596-09665

7 AC Disconnect / Breaker / Points of Connection

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION
NEC 705.20(7) & NEC 690.13(B)
Roll: 596-00878 / 10-Pk: 596-00893

WARNING
THIS EQUIPMENT FED BY MULTIPLE SOURCES: TOTAL RATING OF ALL OVERCURRENT DEVICES EXCLUDING MAIN POWER SUPPLY SHALL NOT EXCEED AMPACITY OF BUSBAR
NEC 705.12(B)(3) / Roll: 596-01000
10-Pk: 596-01008

8 Breaker Panel / Pull Boxes

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION
NEC 705.20(7) & NEC 690.13(B)
Roll: 596-00878 / 10-Pk: 596-00893

WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL
NEC 110.27(C) & OSHA 1910.145(f)(7)
Roll: 596-00499 / 10-Pk: 596-00664

9 Main Service Disconnect

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION
NEC 705.20(7) & NEC 690.13(B)
Roll: 596-00878 / 10-Pk: 596-00893

WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL
NEC 110.27(C) & OSHA 1910.145(f)(7)
Roll: 596-00499 / 10-Pk: 596-00664

WARNING
SINGLE 120-VOLT SUPPLY DO NOT CONNECT MULTIWIRE BRANCH CIRCUITS
NEC 705.82 & NEC 710.15(C) / Roll: 596-00591
10-Pk: 596-00699

DO NOT DISCONNECT UNDER LOAD
NEC 690.15(B) & NEC 690.33(D)(2)
Roll: 596-00244 / 10-Pk: 596-00671

CAUTION
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFEED
NEC 705.30(D) & NEC 690.59
Roll: 596-00887 / 10-Pk: 596-00666

WARNING DUAL POWER SOURCE SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
NEC 705.30(C) & NEC 690.59 / Roll: 596-00495
10-Pk: 596-00665

WARNING
POWER SOURCE OUTPUT CONNECTION, DO NOT RELOCATE THIS OVERCURRENT DEVICE.
NEC 705.12(B)(2) / Roll: 596-00883
10-Pk: 596-00884

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT
NEC 690.13(B) / Roll: 596-00243
10-Pk: 596-00675

10 Main Service Disconnect / Utility Meter

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT
NEC 690.13(B) / Roll: 596-00243
10-Pk: 596-00675

11 Energy Storage Systems

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

WARNING
FUEL CELL POWER SYSTEM CONTAINS ELECTRICAL ENERGY STORAGE DEVICES
NEC 692.52 / Roll: 596-01002 / 10-Pk: 596-01010

ENERGY STORAGE SYSTEM DISCONNECT
NEC 706.15(C) / Roll: 596-01004 / 10-Pk: 596-01041

Labels are not to scale.
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LABELING REQUIREMENTS FOR ARTICLE 690

NEC 690.12(D) The type of PV system is shown in figure 690.12 (D).

NEC 690.12(D)(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 690.13(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)(2) 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(B)(2)(a) The PV system output circuit conductors shall be marked to indicate polarity where connected to energy storage systems.

NEC 690.31(D)(2) Unless located and arranged so the purpose is evident, the following wiring methods and enclosures that contain PV system dc 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 raceways, cable trays, and other wiring methods (2) Covers or enclosures of pull boxes and junction boxes (3) Conduit bodies in which any of the available conduit openings are unused.

The 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 690.4 (G) PV equipment floating on or attached to structures floating on bodies of water shall be identified as being suitable for the purpose and shall utilize wiring methods that allow for any expected movement of the equipment. Informational Note: PV equipment in these installations is often subject to increased levels of humidity, corrosion, and mechanical and structural stresses. Expected movement of floating PV arrays is often included in the structural design.

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 interactive system(s) points of interconnection with other sources shall be marked at 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 690.56 Plaques or directories shall be installed in accordance with 705.10.

NEC 690.59 PV systems connected to other sources shall be installed in accordance with Parts I and II of Article 705.

NEC 692.52 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 705.12(B)(3) The sum of the ampere ratings of all overcurrent devices on panelboards, both load and supply devices, excluding the rating of the overcurrent device protecting the busbar, shall not exceed the ampacity 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: EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE SHALL NOT EXCEED AMPACITY OF BUSBAR**.

NEC 705.30(C) Equipment containing overcurrent devices supplied from interconnected power sources shall be marked to indicate the presence of all sources.

NEC 705.30(D) Suitable for backfeed. Fused disconnects, unless otherwise marked, shall be considered suitable for backfeed.

NEC 706.15(C) Each ESS disconnecting means shall plainly indicate whether it is in the open (on) or closed (off) position and be permanently marked "ENERGY STORAGE SYSTEM DISCONNECT". The disconnecting means shall be legibly marked in the field to indicate the following:

Nominal ESS ac voltage and maximum ESS dc voltage
Available fault current derived from the ESS
An arc-flash label applied in accordance with acceptable industry practice
Data calculation was performed

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:

- Nominal system voltage
- Available fault current at the service overcurrent protective devices
- The clearing time of service overcurrent protective devices based on the available fault current at the service equipment
- 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 210.5(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 branch circuits, feeders, and 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 or 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 Permanent plaques, labels, or directories shall be installed at each service equipment location, or at an approved readily visible location in accordance with (1), (2), and (3). 1. Denote the location of each power source disconnecting means for the building or structure. Exception: Installations with multiple co-located power production sources shall be permitted to be identified as a group(s). The plaque or directory shall not be required to identify each power source individually. 2. Indicate the emergency telephone numbers of any off-site entities servicing the power source systems. Informational Note: See NFPA 1, 11.2.2.1.5 Installer information. 3. Be marked with the wording "CAUTION: MULTIPLE SOURCES OF POWER." The marking shall comply with 110.21(B).

NEC 705.20(7) Where the line and load terminals are capable of being energized in the open position, be marked with the following words or equivalent: **WARNING – ELECTRIC SHOCK HAZARD TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION**. Informational Note: with interconnected power sources, some equipment, including switches and fuses, is capable of being energized from both directions.

NEC 705.12(B)(3) Permanent warning labels shall be applied to distribution equipment displaying the following or equivalent wording: **THIS EQUIPMENT FED BY MULTIPLE SOURCES: TOTAL RATING OF ALL OVERCURRENT DEVICES EXCLUDING MAIN POWER SUPPLY SHALL NOT EXCEED AMPACITY OF BUSBAR**.

NEC 705.12(B)(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 relocate this overcurrent drive."

NEC 710.10 A permanent plaque, label, or directory shall be installed at a building supplied by a stand-alone system at the power source disconnecting means location, or at an approved readily visible location. The plaque, label, or directory shall denote the location of each power source disconnecting means for the building or be grouped with other plaques or directories for other on-site sources. Where multiple sources supply the building, markings shall comply with 705.10.

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 multiwire 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."