National Fire Protection Association

1 Batterymarch Park, Quincy, MA 02169-7471
Phone: 617-770-3000 • Fax: 617-770-0700 • www.nfpa.org

WORKING DRAFT OF NEC CODE-MAKING PANEL 4 MEETING OUTPUT

CONTENT NOT FINAL – SUBJECT TO REVISION PRIOR TO LETTER BALLOT AND PUBLICATION OF SECOND DRAFT REPORT

Document: National Electrical Code®

Revision Cycle: A2025

Meeting Date: October 2024

Panel Activity: Comment Stage

This is a working draft, prepared by NFPA staff, to record the output generated at the Code-Making Panel 4 Second Draft Meeting. It includes draft copies of the Second Revisions and any Global Revisions.

It is being made available to Panel members for the purpose of facilitating early review, particularly for those Panel members who may be seeking input from their respective organizations in preparation for the Second Draft Ballot.

Second Revision No. 7784-NFPA 70-2024 [Global Comment]

Global changes for 692 in attached Word file

Supplemental Information

File Name	Description	Approved
694_SR_7784_Global.docx		

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Wed Oct 16 13:46:01 EDT 2024

Committee Statement

Committee Statement: Changes were made to align references related to overcurrent protective devices with their defined terms and acronyms. This is related to the resolutions of PC 1644.

Response Message: SR-7784-NFPA 70-2024

694.7 Construction and Maintenance.

The construction and maintenance, associated wiring, and interconnections shall be performed only by qualified persons.

Informational Note: See Article 100 for the definition of *qualified person*.

(A) Wind Electric Systems.

A wind electric system(s) shall be permitted to supply a building or other structure in addition to other sources of supply. These requirements apply to both onshore and offshore installations.

(B) Diversion Load Controllers.

A wind electric system employing a diversion load controller as the primary means of regulating the speed of a wind turbine rotor shall be equipped with an additional, independent, reliable means to prevent over-speed operation. An interconnected utility service shall not be considered to be a reliable diversion load.

(C) Surge Protection.

Listed surge protective devices (SPDs) shall be installed between wind electric systems and any loads served by premises electrical systems. SPDs shall be permitted to be Type 3 SPDs on circuits serving wind electric systems or Type 2 SPDs located anywhere on the load side of service disconnects.

(D) Receptacles.

A receptacle shall be permitted to be supplied by a wind electric system branch or feeder circuit for maintenance or data acquisition use. Receptacles shall be protected with an OCPD~~overcurrent device~~ with a rating not to exceed the current rating of the receptacle. In addition to the requirements in 210.8, all 125-volt, single-phase, 15- and 20-ampere receptacles installed for maintenance of the wind turbine shall have ground-fault circuit-interrupter protection for personnel.

694.12 Circuit Sizing and Current.

(A) Calculation of Maximum Circuit Current.

The maximum current for a circuit shall be calculated in accordance with 694.12(A)(1) through 694.12(A)(3).

(1) Turbine Output Circuit Currents.

The maximum current shall be based on the circuit current of the wind turbine operating at maximum output power.

(2) Inverter Output Circuit Current.

The maximum output current shall be the inverter continuous output current rating.

(3) Stand-Alone Inverter Input Circuit Current.

The maximum input current shall be the stand-alone continuous inverter input current rating of the inverter producing rated power at the lowest input voltage.

(B) Ampacity and Overcurrent Protective Device Ratings.

(1) Continuous Current.

Wind turbine electric system currents shall be considered to be continuous.

(2) Sizing of Conductors and Overcurrent Protective Devices.

Circuit conductors and ~~overcurrent devices~~OCPDs shall be sized to carry not less than 125 percent of the maximum current as calculated in 694.12(A). The rating or setting of ~~overcurrent devices~~ OCPDs shall be permitted in accordance with 240.4(B) and 240.4(C).

Exception: Circuits containing an assembly, together with its~~-~~ OCPDs~~overcurrent devices~~, listed for continuous operation at 100 percent of its rating shall be permitted to be used at 100 percent of its rating.

694.15 Overcurrent Protection.

(A) Circuits and Equipment.

Turbine output circuits, inverter output circuits, and storage battery circuit conductors and equipment shall be protected in accordance with 240.4 and 240.5. Circuits connected to more than one electrical source shall have ~~overcurrent devices~~OCPDs located so as to provide overcurrent protection from all sources.

Exception: An OCPD ~~overcurrent device~~ shall not be required for circuit conductors sized in accordance with 694.12(B) where the maximum current from all sources does not exceed the ampacity of the conductors.

Informational Note: Possible backfeed of current from any source of supply, including a supply through an inverter to the wind turbine output circuit, is a consideration in determining whether overcurrent protection from all sources is provided. Some wind electric systems rely on the turbine output circuit to regulate turbine speed. Inverters may also operate in reverse for turbine startup or speed control.

(B) Transformers.

The following shall apply to transformer installations:

(1) For the purpose of overcurrent protection, the primary side of transformers with sources on each side shall be connected to the largest source of available fault current.

(2) Transformer secondary conductors shall be protected in accordance with 240.21(C).

(C) Direct-Current Rating.

OCPDs~~Overcurrent devices~~, either fuses or circuit breakers, used in any dc portion of a wind electric system shall be listed for use in dc circuits and shall have appropriate voltage, current, and interrupting ratings.

Second Revision No. 7647-NFPA 70-2024 [Detail]

Revise 705.20(G) heading to be:

(G) Dc Power Source Connections.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 13:39:56 EDT 2024

Committee Statement

Committee Statement: The correct spelling of Dc is with a capital D and it is being corrected here. This is a detail SR to be balloted separately from SR 7642 which is also on 705.20(G).

Response Message: SR-7647-NFPA 70-2024

Public Comment No. 1787-NFPA 70-2024 [Section No. 705.20(G)]

Second Revision No. 7681-NFPA 70-2024 [Detail]

See attached Word file for changes in 705.11(A)

Supplemental Information

File Name	Description	Approved
705.11_A_SR_7681.docx		

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 16:39:42 EDT 2024

Committee Statement

Committee Statement: PC 1921 requested the return of the language from the 2023 NEC related to disconnecting means. Rather than using that approach, this second revision places the requirement for a power source service disconnecting means in 705.11(A) ahead of the first draft first uses of the term in 705.11(B). Clarifying language is added to 705.20 to show that the power source service disconnecting means required in 705.11(A) is permitted to meet the requirements of 705.20 so additional disconnects are not required. See SR 7685.

This SR is being balloted separately from SR 7614 which is also on 705.11(A).

Response Message: SR-7681-NFPA 70-2024

Public Comment No. 1921-NFPA 70-2024 [Section No. 705.11]

705.11 Source Connections to a Service.

(A) Service Connections.

An electric power production source shall be permitted to be connected to a service at a power source service disconnecting means by one of the following methods:

1. To a new service in accordance with 230.4(A)
2. To the supply side of the service disconnecting means in accordance with 230.82(6)
3. To an additional set of service entrance conductors in accordance with 230.40, Exception No. 5

These connections shall comply with 705.11(B) ~~through~~ and 705.11(C).

Formatted: Font: (Default) +Body (Aptos), 11 pt, Font color: Auto

Second Revision No. 7794-NFPA 70-2024 [Detail]

Revisions to 705.30(D)(3):

(D) Suitable for Backfeed.

Suitability for backfeeding shall be determined as follows:

(1) Fused disconnects, unless otherwise marked, shall be considered suitable for backfeed.

(2) Circuit breakers not marked "line" and "load" shall be considered suitable for backfeed.

(3) Circuit breakers marked "line" and "load" shall not be ~~used to satisfy the requirements in 705.30(A).~~ considered suitable for backfeed.

Informational Note: The markings referred to in this section relate to markings on the disconnecting means or circuit breaker itself and not the equipment on which it is mounted.

Supplemental Information

File Name	Description	Approved
705.30_D_3_SR_7794.docx		

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Wed Oct 16 14:05:38 EDT 2024

Committee Statement

Committee Statement: Circuit breakers that have been listed and marked with "line" and "load" have not been specifically tested to perform in a backfeed protection. UL 489 sets the requirement for circuit breakers used in backfeed applications including marking requirements, and the NEC language is changing to align with that standard.

Response Message: SR-7794-NFPA 70-2024

Revisions to 705.30(D)(3):

(D) Suitable for Backfeed.

Suitability for backfeeding shall be determined as follows:

1. Fused disconnects, unless otherwise marked, shall be considered suitable for backfeed.
2. Circuit breakers not marked "line" and "load" shall be considered suitable for backfeed.
3. ~~—~~Circuit breakers marked "line" and "load" shall not be considered suitable for backfeed. ~~used to satisfy the requirements in 705.30(A).~~

Informational Note: The markings referred to in this section relate to markings on the disconnecting means or circuit breaker itself and not the equipment on which it is mounted.

Second Revision No. 7504-NFPA 70-2024 [Definition: PV Module (Module) (Solar PV Module).]

PV Module (Module) (Solar PV Module).

A complete ~~, environmentally protected~~ unit consisting of solar cells and other components designed to produce dc power. (CMP-4)

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 12:03:33 EDT 2024

Committee Statement

Committee Statement: The phrase “environmentally protected” has been deleted as unnecessarily vague language. PV modules are tested and listed for specific environmental conditions.

Response Message: SR-7504-NFPA 70-2024

Public Comment No. 501-NFPA 70-2024 [Definition: PV Module (Module) (Solar PV Module).]

Second Revision No. 7510-NFPA 70-2024 [Section No. 690.1]

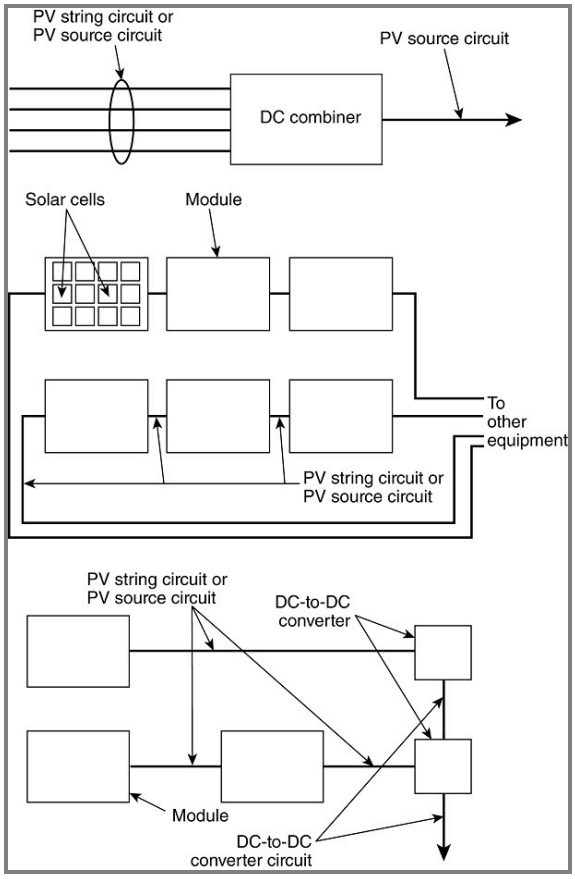
690.1 Scope.

This article applies to solar PV systems, other ~~than those described in 691.4~~ . than Large-Scale Photovoltaic (PV) Electric Supply Stations. The systems covered by this article include those interactive with other electric power production sources or stand-alone, or both. These PV systems could have ac or dc output for utilization.

Informational Note No. 1: See Figure Informational Note 690.1.

Informational Note No. 2: Article 691 covers the installation of large-scale PV electric supply stations.

Figure Informational Note 690.1 Illustration of PV System DC Circuits and PV System Components in a Typical PV Installation.



Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 12:26:39 EDT 2024

Committee Statement

Committee Statement:	The scope reference to 691.4 is revised to the title of Article 691, Large-Scale Photovoltaic (PV) Electric Supply Stations, to increase clarity and useability.
Response Message:	SR-7510-NFPA 70-2024

Public Comment No. 507-NFPA 70-2024 [Section No. 690.1]

Second Revision No. 7576-NFPA 70-2024 [Section No. 690.2]

[SEE WORD FILE ATTACHED]

690.2 ~~Equipment~~ 2 Listing Requirements .

The following equipment, and any associated retrofit kits, shall be listed or be ~~evaluated for the application and have a field label applied~~ field evaluated :

(1) Electronic power converters

(2) ~~Motor generators~~

(3) PV modules

(4) ac modules

(5) ac module systems

(6) OCPDs used in PV system dc ~~overcurrent protective devices~~

(7) circuits

(8) dc combiners containing OCPDs

(9) PV rapid shutdown equipment (PVRSE)

(10) PV hazard control equipment (PVHCE)

(11) PV hazard control systems (PVHCSs)

(12) dc circuit controllers

(13) Charge controllers

(14) PV module grounding and bonding devices

(15) Type PV wire

(16) Type DG cable

(17) Manufactured distributed generation wiring harnesses

(18) PV mating connectors

Supplemental Information

File Name	Description	Approved
690.2_SR_7576.docx		
NEC_CMP-4_SR-7576_690.2.docx	For prod use	

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 18:04:39 EDT 2024

Committee Statement

Committee Statement: Title is changed to comply with the NEC Style Manual for this section. Motor Generators is removed from this list as those are covered in article 445.

Changes were made to align references related to overcurrent protective devices with their defined terms and acronyms. This is related to the resolution of PC 1644.

Additional items are added to this list moving all listing requirements into a single list from other sections.

The list item for DC combiners was updated to DC combiners with OCPD to indicate that DC combiners without OCPD do not always require a specific listing.

Manufactured distributed generation wiring harnesses addresses those wiring harnesses that need to meet UL 9703 and does not extend to those wiring harnesses that are field assembled using listed components.

Response Message: SR-7576-NFPA 70-2024

Public Comment No. 1481-NFPA 70-2024 [Section No. 690.2]

Public Comment No. 529-NFPA 70-2024 [Section No. 690.2]

690.2 Listing Requirements.~~Equipment.~~

The following equipment, and any associated retrofit kits, shall be listed or be field evaluated~~ for the application and have a field label applied~~:

1. e~~E~~lectronic power converters

~~2. Motor generators~~

~~3.~~2. PV modules

~~4.~~3. ac modules

~~5.~~4. ac module systems

~~6.~~5. OCPDs used in PV system dc circuits~~PV dc overcurrent protective devices~~

~~7.~~6. dc combiners containing OCPDs

~~8.~~7. PV rapid shutdown equipment (PVRSE)

~~9.~~8. PV hazard control equipment (PVHCE)

~~10.~~9. PV hazard control systems (PVHCSs)

~~11.~~10. dc circuit controllers

11. c~~C~~harge controllers

12. PV module grounding and bonding devices

13. Type PV Wire

14. Type DG Cable

15. manufactured distributed generation wiring harnesses

~~12.~~16. PV mating connectors

Second Revision No. 7521-NFPA 70-2024 [Section No. 690.7(A)]

(A) Photovoltaic Source Circuits.

The maximum dc voltage for PV source circuits shall be the sum of the series-connected PV module rated open-circuit voltages ~~adjusted~~ corrected for ambient temperature using one of the following methods:

(1) Corrected for the lowest expected ambient temperature using the open-circuit voltage temperature coefficients in accordance with the instructions included in the listing or labeling of the module

(2) For crystalline and multicrystalline silicon modules, corrected for the lowest expected ambient temperature using the correction factors provided in Table 690.7(A)

(3) Documented and stamped PV system design, using an industry standard method maximum voltage calculation provided by a licensed professional electrical engineer

Informational Note No. 1:~~ The chapter titled "Extreme Annual Mean Minimum Design Dry Bulb Temperature" in~~ See the *ASHRAE Handbook — Fundamentals* (~~2017~~ 2021) ~~is~~ as one source for the lowest-expected, ~~ambient~~ extreme annual mean minimum dry bulb temperature design data for various locations. Such temperature data can be used to calculate maximum voltage.

Informational Note No. 2: See SAND 2004-3535, *Photovoltaic Array Performance Model*, for one industry standard method for calculating maximum voltage of a PV system.

Table 690.7(A) Voltage Correction Factors for Crystalline and Multicrystalline Silicon Modules, Ambient Temperatures Below 25°C (77°F)

Ambient Temperature (°C)	Factor	Ambient Temperature (°F)
24 to 20	1.02	76 to 68
19 to 15	1.04	67 to 59
14 to 10	1.06	58 to 50
9 to 5	1.08	49 to 41
4 to 0	1.10	40 to 32
–1 to –5	1.12	31 to 23
–6 to –10	1.14	22 to 14
–11 to –15	1.16	13 to 5
–16 to –20	1.18	4 to –4
–21 to –25	1.20	–5 to –13
–26 to –30	1.21	–14 to –22
–31 to –35	1.23	–23 to –31
–36 to –40	1.25	–32 to –40

Note: Multiply the rated open-circuit voltage by the appropriate correction factor provided.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 13:08:39 EDT 2024

Committee Statement

Committee Statement: The language of 690.7(A) is revised for correlation and clarity. “Adjusted” is changed to “corrected” in the charging paragraph to correlate with the test of (A)(1) and (A)(2). “Ambient temperature” was also added to the charging paragraph as that is the subject of the requirement.

The referenced document was an out of date publication, so the note has been updated to be consistent without changing the intent or meaning of the information.

Response Message: SR-7521-NFPA 70-2024

Public Comment No. 148-NFPA 70-2024 [Section No. 690.7(A)]

Second Revision No. 7524-NFPA 70-2024 [Section No. 690.7(D)]

(D) Marking DC PV Circuits.

It shall be permitted to round up to a value greater than the calculated PV dc circuit maximum voltage to allow standardized labeling. Permanent readily visible labels indicating the highest maximum dc voltage in PV systems shall be provided by installers at one of the following locations:

(1) DC PV system disconnecting means

(2) PV system electronic power conversion equipment

(3) Distribution equipment associated with PV systems

Informational Note:~~- Rounding up to a value greater than the calculated PV dc circuit maximum voltage (e.g., 600 volts dc, 1000 volts dc, or 1500 volts dc) allows standardized labeling.~~ Equipment manufacturers often provide permanent visible labels on electronic power conversion equipment.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 13:14:09 EDT 2024

Committee Statement

Committee Statement: Allowance previously stated in the informational note is moved into positive text to align with rules for informational notes in this code.

Response Message: SR-7524-NFPA 70-2024

Public Comment No. 508-NFPA 70-2024 [Section No. 690.7]

Second Revision No. 7533-NFPA 70-2024 [Section No. 690.8]

[SEE WORD FILE ATTACHED FOR CHANGES]

690.8 Circuit Sizing and Current.

(A) Calculation of Maximum Circuit Current.

The maximum current for the specific circuit shall be calculated in accordance with one of the methods in 690.8(A)(1) or 690.8(A)(2).

(1) PV System Circuits.

The maximum current shall be calculated in accordance with 690.8(A)(1)(a)through 690.8(A)(1)(c).

(a) *Photovoltaic Source Circuit Currents*. Maximum current shall be as calculated using one of the following methods:

(2) The sum of the highest short-circuit current rating of the PV modules connected in parallel multiplied by 125 percent

(3) The sum of the short-circuit current ratings of the PV modules connected in parallel calculated in accordance with the instructions included in the listing or labeling of the module

(4) Documented and stamped PV system design, using an industry standard method maximum current calculation provided by a licensed professional electrical engineer, as follows:

(5) The calculated maximum current value shall be based on the highest 3-hour current average resulting from the simulated local irradiance on the PV array accounting for elevation and orientation.

(6) The current value used by this method shall not be less than 70 percent of the value calculated using 690.8(A)(1)(a)(1) .

Informational Note No. 1: See SAND 2004-3535, *Photovoltaic Array Performance Model*, for one industry standard method for calculating maximum current of a PV system. This model is used by the System Advisor Model simulation program provided by the National Renewable Energy Laboratory.

Informational Note No. 2: Modules that can produce electricity when exposed to light on multiple surfaces are labeled with applicable short-circuit currents. Additional guidance is provided in the instructions included with the listing.

(g) *PV dc-to-dc Converter Circuit Currents.* Maximum current shall be the sum of parallel connected dc-to-dc converter continuous output current ratings.

(h) *Inverter Output Circuit Currents.* Maximum current shall be the inverter continuous output current rating.

(2) Circuits Terminating ~~on~~ to the Input of Electronic Power Converters (EPCs).

Where a circuit is terminated ~~at~~ to the input of an electronic power converter (EPC), the maximum current shall be permitted to be the rated input current of the EPC ~~input to which it is terminated if one~~ in accordance with any of the following conditions~~ is met~~ :

(1) The circuit terminated ~~at~~ to the input of the EPC is protected at its source of supply with an ~~overcurrent device~~ OCPD not exceeding the conductor ampacity.

(2) The circuit complies with 690.9(A)(1) for the maximum current as calculated in 690.8(A)(1).

(3) The circuit complies with 690.9(A)(3).

Informational Note: EPCs have rated maximum input short-circuit ratings. See 110.3(B).

(B) Conductor Ampacity.

Circuit conductors shall have an ampacity not less than the larger of 690.8(B)(1) or 690.8(B)(2).

(1) Without Adjustment and Correction Factors.

The minimum conductor size with an ampacity not less than the maximum currents calculated in 690.8(A) multiplied by 125 percent.

Exception No. 1: Circuits containing an assembly, together with its ~~overcurrent device(s)~~ OCPD , if any, that is listed for continuous operation at 100 percent of its rating shall be permitted to be used at 100 percent of its rating.

Exception No. 2: Where a portion of a circuit is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), it shall be permitted to have an ampacity not less than the calculated maximum current of 690.8(A). No portion of the circuit installed under this exception shall extend into an enclosure containing either the circuit supply or the circuit load terminations, as covered in 110.14(C)(1).

(2) With Adjustment and Correction Factors.

The maximum currents calculated in 690.8(A) with adjustment and correction factors.

(C) Systems with Multiple ~~Direct-Current~~ Dc Voltages.

For a PV power source that has multiple ~~output~~ PV dc circuit voltages and employs a common-return conductor, the ampacity of the common-return conductor shall not be less than the sum of the ampere ratings of the ~~overcurrent devices~~ OCPDs of the individual ~~output~~ circuits.

(D) Multiple PV String Circuits.

Where an ~~overcurrent device~~ OCPD is used to protect more than one set of parallel-connected PV string circuits, the ampacity of each conductor protected by the device shall not be less than the sum of the following:

(1) The rating of the ~~overcurrent device~~ OCPD

(2) The sum of the maximum currents as calculated in 690.8(A)(1)(a) for the other parallel-connected PV string circuits protected by the ~~overcurrent device~~ OCPD

Supplemental Information

File Name	Description	Approved
690.8_SR_7533.docx		
690.8_SR_7533_CMP-4.docx	For prod use	

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 13:41:48 EDT 2024

Committee Statement

Committee Statement:	Changes were made to align references related to overcurrent protective devices with their defined terms and acronyms. This is related to the resolution of PC 1644.
Response Message:	SR-7533-NFPA 70-2024

Public Comment No. 1915-NFPA 70-2024 [Section No. 690.8(C)]

Public Comment No. 152-NFPA 70-2024 [Section No. 690.8(A)(2)]

690.8 Circuit Sizing and Current.

(A) Calculation of Maximum Circuit Current.

The maximum current for the specific circuit shall be calculated in accordance with one of the methods in 690.8(A)(1) or 690.8(A)(2).

(1) PV System Circuits.

The maximum current shall be calculated in accordance with 690.8(A)(1)(a) through 690.8(A)(1)(c).

(a) *Photovoltaic Source Circuit Currents*. Maximum current shall be as calculated using one of the following methods:

(1) The sum of the highest short-circuit current rating of the PV modules connected in parallel multiplied by 125 percent

(2) The sum of the short-circuit current ratings of the PV modules connected in parallel calculated in accordance with the instructions included in the listing or labeling of the module

(3) Documented and stamped PV system design, using an industry standard method maximum current calculation provided by a licensed professional electrical engineer, as follows:

a. The calculated maximum current value shall be based on the highest 3-hour current average resulting from the simulated local irradiance on the PV array accounting for elevation and orientation.

b. The current value used by this method shall not be less than 70 percent of the value calculated using 690.8(A)(1)(a)(1).

Informational Note No. 1: See SAND 2004-3535, *Photovoltaic Array Performance Model*, for one industry standard method for calculating maximum current of a PV system. This model is used by the System Advisor Model simulation program provided by the National Renewable Energy Laboratory.

Informational Note No. 2: Modules that can produce electricity when exposed to light on multiple surfaces are labeled with applicable short-circuit currents. Additional guidance is provided in the instructions included with the listing.

(b) *PV dc-to-dc Converter Circuit Currents.* Maximum current shall be the sum of parallel connected dc-to-dc converter continuous output current ratings.

(c) *Inverter Output Circuit Currents.* Maximum current shall be the inverter continuous output current rating.

(2) Circuits Terminating to~~on~~ the Input of Electronic Power Converters (EPCs).

Where a ~~PV dc~~ circuit is terminated to~~at~~ the input of an electronic power converter (EPC), the maximum current shall be permitted to be the rated input current of the EPC in accordance with any of~~input to which it is terminated if one of~~ the following conditions~~ is met~~:

(1) The circuit terminated to~~at~~ the input of the EPC is protected at its source of supply with an ~~overcurrent device~~OCPD not exceeding the conductor ampacity.

(2) The circuit complies with 690.9(A)(1) for the maximum current as calculated in 690.8(A)(1).

(3) The circuit complies with 690.9(A)(3).

Informational Note: EPCs have rated maximum input short-circuit ratings. See 110.3(B).

(B) Conductor Ampacity.

Circuit conductors shall have an ampacity not less than the larger of 690.8(B)(1) or 690.8(B)(2).

(1) Without Adjustment and Correction Factors.

The minimum conductor size with an ampacity not less than the maximum currents calculated in 690.8(A) multiplied by 125 percent.

Exception No. 1: Circuits containing an assembly, together with its ~~overcurrent device(s)~~ OCPD, if any, that is listed for continuous operation at 100 percent of its rating shall be permitted to be used at 100 percent of its rating.

Exception No. 2: Where a portion of a circuit is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), it shall be permitted to have an ampacity not less than the calculated maximum current of 690.8(A). No portion of the circuit installed under this exception shall extend into an enclosure containing either the circuit supply or the circuit load terminations, as covered in 110.14(C)(1).

(2) With Adjustment and Correction Factors.

The maximum currents calculated in 690.8(A) with adjustment and correction factors.

(C) Systems with Multiple ~~Direct Current~~Dc Voltages.

For a PV power source that has multiple ~~output~~PV dc circuit voltages and employs a common-return conductor, the ampacity of the common-return conductor shall not be less than the sum of the ampere ratings of the ~~overcurrent devices~~OCPDs of the individual ~~output~~ circuits.

(D) Multiple PV String Circuits.

Where an ~~overcurrent device~~OCPD is used to protect more than one set of parallel-connected PV string circuits, the ampacity of each conductor protected by the device shall not be less than the sum of the following:

(1) The rating of the ~~overcurrent device~~OCPD

(2) The sum of the maximum currents as calculated in 690.8(A)(1)(a) for the other parallel-connected PV string circuits protected by the ~~overcurrent device~~OCPD

Second Revision No. 7538-NFPA 70-2024 [Section No. 690.9]

690.9 Overcurrent Protection.

(A) Circuits and Equipment.

PV system dc circuit and inverter output conductors and equipment shall be ~~protected against overcurrent. Each circuit shall be protected from overcurrent~~ provided with overcurrent protection in accordance with 690.9(A)(1), 690.9(A)(2), or 690.9(A)(3).

(1) Circuits Where Overcurrent Protection Not Required.

~~Overcurrent protective devices~~ OCPDs shall not be required where both of the following conditions are met:

(1) The conductors have sufficient ampacity for the maximum circuit current.

(2) The currents from all sources do not exceed the maximum ~~overcurrent protective device~~ OCPD rating specified for the PV module or electronic power converter.

(2) Circuits Where Overcurrent Protection is Required on One End.

A circuit conductor connected at one end to a current-limited supply, where the conductor is rated for the maximum circuit current from that supply, and also connected to sources having an available maximum circuit current greater than the ampacity of the conductor, shall be ~~protected from~~ provided with overcurrent protection at the point of connection to the higher current source.

Informational Note: Photovoltaic system dc circuits and electronic power converter outputs powered by these circuits are current-limited and in some cases do not need overcurrent protection. Where these circuits are connected to higher current sources, such as parallel-connected PV system dc circuits, energy storage systems, or a utility service, the ~~overcurrent device~~ OCPD is often installed at the higher current source end of the circuit conductor.

(3) Other Circuits.

Circuits that do not comply with 690.9(A)(1) or 690.9(A)(2) shall be protected with one of the following methods:

(1) Conductors not greater than 3 m (10 ft) in length and not in buildings, protected from overcurrent on one end

(2) Conductors not greater than 3 m (10 ft) in length and in buildings, protected from overcurrent on one end and in a raceway or metal clad cable

(3) Conductors protected from overcurrent on both ends

(4) Conductors not installed on or in buildings are permitted to be protected from overcurrent on one end of the circuit where the circuit complies with all of the following conditions:

a. The conductors are installed in metal raceways or metal-clad cables, or installed in enclosed metal cable trays, or underground, or where directly entering pad-mounted enclosures.

b. The conductors for each circuit terminate on one end at a single circuit breaker or a single set of fuses that limit the current to the ampacity of the conductors.

c. The overcurrent device for the conductors is an integral part of a disconnecting means or shall be located within 3 m (10 ft) of conductor length of the disconnecting means.

d. The disconnecting means for the conductors is installed outside of a building, or at a readily accessible location nearest the point of entrance of the conductors inside of a building, including installations complying with 230.6.

(B) Device Ratings.

Electronic devices that are listed to prevent backfeed current in PV system dc circuits shall be permitted to prevent overcurrent of conductors on the PV array side of the devices. ~~Overcurrent devices~~ OCPDs , where required, shall be rated in accordance with one of the following and permitted to be rounded up to the next higher standard size in accordance with 240.4(B):

(1) ~~Overcurrent devices~~ OCPDs shall be rated at not less than 125 percent of the maximum currents calculated in 690.8(A).

(2) An assembly, together with its ~~overcurrent device(s)~~ OCPD , that is listed for continuous operation at 100 percent of its rating shall be permitted to be used at 100 percent of its rating.

Informational Note: Some electronic devices prevent backfeed current which, in some cases, is the only source of overcurrent in PV system dc circuits.

(C) PV System DC Circuits.

A single ~~overcurrent protective device~~ OCPD , where required, shall be permitted to protect the PV modules, dc-to-dc converters, and conductors of each circuit. Where single ~~overcurrent protection devices~~ OCPDs are used to protect circuits, all ~~overcurrent devices~~ OCPDs shall be placed in the same polarity for all circuits within a PV system. The ~~overcurrent devices~~ OCPDs shall be accessible but shall not be required to be readily accessible.

Informational Note: Due to improved ground-fault protection required in PV systems by 690.41(B), a single ~~overcurrent protective device~~ OCPD in either the positive or negative conductors of a PV system in combination with this ground-fault protection provides adequate overcurrent protection.

(D) Marking.

OCPDs used in PV system dc circuits shall be marked Photovoltaic or PV.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 14:01:04 EDT 2024

Committee Statement

Committee Statement: New subdivision D is added to clarify that OCPDs used in PV system dc circuits must be marked as stated to meet the requirements in this article.

Changes were made to align references related to overcurrent protective devices with their defined terms and acronyms. This is related to the resolution of PC 1644.

Response Message: SR-7538-NFPA 70-2024

Public Comment No. 1320-NFPA 70-2024 [Section No. 690.9]

Second Revision No. 7597-NFPA 70-2024 [Section No. 690.12(B)(2)]

[SEE ATTACHED WORD FILE]

(2) Inside the Array Boundary.

The PV system shall comply with 690.12(B)(2)(a) or 690.12(B)(2)(b):

(a) The PV system shall provide shock hazard control for firefighters through the use of a PVHCS installed in accordance with the instructions included with the listing or field labeling. Where a PVHCS requires initiation to transition to a controlled state, the rapid shutdown initiation device required in 690.12(C) shall perform this initiation.

Informational Note: See UL 3741-2020, *Photovoltaic Hazard Control*. A listed or field-labeled PVHCS is comprised of either an individual piece of equipment that fulfills the necessary functions or multiple pieces of equipment coordinated to perform the functions as described in the installation instructions to reduce the risk of electric shock hazard within a damaged PV array for firefighters.

(b) The PV system shall provide shock hazard control for firefighters by limiting the highest voltage inside equipment or between any two conductors of a circuit or any conductor and ground inside array boundary to not more than 80 volts within 30 seconds of rapid shutdown initiation.

Informational Note: Common methods include the use of PV equipment with a limited maximum voltage of 80 volts as determined by 690.7, PVRSE, PVHCE, or any combination of these.

Supplemental Information

File Name	Description	Approved
690.12_B_2_SR_7597.docx		
NEC_CMP-4_SR-7597_690.12_B_2_.docx	For prod use	

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 19:00:01 EDT 2024

Committee Statement

Committee Statement: Editorial changes were made that do not change the technical requirements in this section however realign the text to comply with the rules in the NEC Style Manual allowing the fourth level subdivisions to be numbered, as these requirements have been for several cycles. This maintains consistency with previous editions to improve usability.

Response Message: SR-7597-NFPA 70-2024

Public Comment No. 1826-NFPA 70-2024 [Section No. 690.12(B)(2)]

(2) Inside the Array Boundary.

~~The~~ PV systems shall provide shock hazard control for firefighters in accordance with either of the following~~comply with 690.12(B)(2)(a) or 690.12(B)(2)(b)~~:

(~~a~~1) Through the use of a PVHCS installed in accordance with the following:

(a) ~~The PV system shall provide shock hazard control for firefighters through the use of a PVHCS installed in accordance with t~~The instructions included with the listing or field labeling.

(b) Use of the ~~Where a PVHCS requires initiation~~rapid shutdown initiation device required in 690.12(C) if the PVHCS requires initiation to transition to a controlled state~~, the rapid shutdown initiation device required in 690.12(C) shall perform this initiation~~.

Informational Note: See UL 3741-2020, *Photovoltaic Hazard Control*. A listed or field-labeled PVHCS is comprised of either an individual piece of equipment that fulfills the necessary functions or multiple pieces of equipment coordinated to perform the functions as described in the installation instructions to reduce the risk of electric shock hazard within a damaged PV array for firefighters.

(~~b~~2) ~~The PV system shall provide shock hazard control for firefighters b~~By limiting the highest voltage inside equipment or between any two conductors of a circuit or any conductor and ground inside array boundary to not more than 80 volts within 30 seconds of rapid shutdown initiation.

Informational Note: Common methods include the use of PV equipment with a limited maximum voltage of 80 volts as determined by 690.7, PVRSE, PVHCE, or any combination of these.

Second Revision No. 7542-NFPA 70-2024 [Section No. 690.13(D)]

(D) Maximum Number of Disconnects.

~~Each PV system disconnecting means~~ The disconnecting means for each PV system installed in accordance with 690.4(C) shall consist of not more than six switches or six sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, mounted in a single enclosure, or in a group of separate enclosures. A single PV system disconnecting means shall be permitted for the combined ac output of one or more inverters or ac modules.

~~Informational Note: This requirement does not limit the number of PV systems connected to a service. This requirement allows up to six disconnecting means to disconnect a single PV system. For PV systems where all power is converted through interactive inverters, a dedicated circuit breaker is an example of a single PV system disconnecting means.~~

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 14:18:02 EDT 2024

Committee Statement

Committee Statement: Text was added to reference 690.4(C) which allowed the deletion of the previous informational note.

Response Message: SR-7542-NFPA 70-2024

Public Comment No. 509-NFPA 70-2024 [Section No. 690.13]

Second Revision No. 7545-NFPA 70-2024 [Section No. 690.31(A)(1)]

(1) ~~Serviceability~~ Accessibility .

~~Where wiring devices with integral enclosures are used, sufficient length of cable~~ Wiring shall be ~~provided to facilitate replacement.~~ permitted to be made accessible in accordance with 690.34.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 14:32:00 EDT 2024

Committee Statement

Committee Statement: Changes are made to the language to remove the term wiring devices that no longer applies correctly based on recent changes to its definition. A reference to 690.34 is included to replace the previous use of vague terms. See PC 504 for related comments and SR 7610 for related changes.

Response Message: SR-7545-NFPA 70-2024

Second Revision No. 7549-NFPA 70-2024 [Section No. 690.31(C)]

[SEE ATTACHED WORD FILE FOR CHANGES]

(C) Cables.

PV wires or cables and distributed generation (DG) cables shall be listed. PV wires or cables shall be permitted in all locations where RHW-2 is permitted.

Informational Note: See UL 4703, *Standard for Photovoltaic Wire*, for PV wires and UL 3003, *Distributed Generation Cables*, for DG cables. PV wires and cables and DG cables have nonstandard outer diameters.

(1) Single-Conductor Cables.

Single-conductor cables shall comply with 690.31(C)(1)(a) through 690.31(C)(1)(c).

(a) Single-conductor cables in exposed outdoor locations in PV system dc circuits within PV arrays shall be permitted to be one of the following:

(2) PV wires or cables

(3) Single-conductor cables marked sunlight resistant and Type USE-2 and Type RHW-2

(d) Exposed cables shall be supported and secured by cable ties or fittings that are listed or identified for securement and support in outdoor locations.

(e) Cables sized larger than 8 AWG shall be supported and secured at intervals not to exceed 1400 mm (54 in.).

Exception: PV systems meeting the requirements of 691.4 shall be permitted to have support and securement intervals as defined in the engineered design.

(2) Cable Trays.

Single-conductor PV wires or cables of all sizes or DG cables of all sizes, with or without cable tray ratings, shall be permitted in cable trays installed in outdoor locations if the cables are supported at intervals not to exceed 300 mm (12 in.) and secured at intervals not to exceed 1400 mm (54 in.).

Where installed in uncovered cable trays, ampacity of single-conductor PV wire smaller than 1/0 AWG, the adjustment factors for 1/0 AWG single conductor cable in 392.80(A)(2) shall be permitted to be used.

Where single-conductor PV wires smaller than 1/0 AWG are installed in ladder or ventilated trough cable trays, the following shall apply:

(1) All single conductors shall be installed in a single layer.

(2) Conductors that are bound together to comprise each circuit pair shall be permitted to be installed in other than a single layer.

(3) The sum of diameters of all single conductor cables shall not exceed the cable tray width.

(3) Multiconductor Jacketed Cables.

Where part of a listed PV assembly, multiconductor jacketed cables shall be installed in accordance with the included instructions. Where not part of a listed assembly, or where not otherwise covered in this code, multiconductor jacketed cables, including DG cables, shall be permitted in PV systems if installed in accordance with the product listing and in accordance with the following:

(1) In raceways, where on or in buildings other than rooftops

(2) Where not in raceways, in accordance with the following:

(3) Marked sunlight resistant in exposed outdoor locations

(4) Protected or guarded, where subject to physical damage

(5) Closely following the surface of support structures

(6) Secured at intervals not exceeding 1.8 m (6 ft)

(7) Secured within 600 mm (24 in.) of mating connectors or entering enclosures

(8) Marked direct burial, where buried in the earth

(4) Flexible Cords and Cables Connected to Tracking PV Arrays.

Flexible cords and flexible cables, where connected to moving parts of tracking PV arrays, shall comply with Article 400 and the following:

(1) Be identified as a hard service cord type or portable power cable type

(2) Be suitable for extra-hard usage

(3) Be listed for outdoor use

(4) Be water and sunlight resistant

Allowable ampacities shall be in accordance with 400.5. Stranded copper PV wire shall be permitted to be connected to moving parts of tracking PV arrays in accordance with the minimum number of strands specified in Table 690.31(C)(4).

Table 690.31(C)(4) Minimum PV Wire Strands

PV Wire AWG	Minimum Strands
18	17
16–10	19
8–4	49
2	130
1 AWG–1000 kcmil	259

(5) Flexible, Fine-Stranded Cables.

Flexible, fine-stranded cables shall be terminated only with terminals, lugs, devices, or connectors in accordance with 110.14.

(6) Single-Conductor Cables.

Single-conductor cables listed for outdoor use that are sunlight resistant and moisture resistant in sizes 16 AWG and 18 AWG shall be permitted for module interconnections where such cables meet the ampacity requirements of 400.5. Section 310.14 shall be used to determine the cable ampacity adjustment and correction factors.

Supplemental Information

File Name	Description	Approved
690.31_C_SR_7549.docx		

NEC_CMP-4_SR-7549_690.31_C_.docx For prod use

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 16:06:22 EDT 2024

Committee Statement

Committee Statement: Wire and cable types in first sentence have been moved to 690.2. See SR 7576. Reference to specific types of wires and cables throughout this section have been edited to align with their designations and marking used in their listings. Where requirements apply more generally, terms have been adjusted to refer to conductors without the used of specific wire or cable types.

Details have been added to C(1) addressing supports of conductors. The requirement for maximum distance between supports for 8 AWG and below has been added back after inadvertently being deleted during the first draft of this cycle.

Changes made to C(4) to remove the use of the undefined term "tracking" to better address the need to provide appropriate wiring characteristics where regular movement between parts of PV arrays is expected. Reorganized into two new subsections for improved use and clarity. Added DG Cable that is recognized for use with these systems provided it meets the same minimum strands as are already allowed for PV Wire. Changed table to clarify this minimum stranding applies to any conductor used in these conditions.

Response Message: SR-7549-NFPA 70-2024

Public Comment No. 1317-NFPA 70-2024 [Section No. 690.31(C)(1)]

Public Comment No. 1917-NFPA 70-2024 [Section No. 690.31(C)(4)]

Public Comment No. 1963-NFPA 70-2024 [Section No. 690.31(C)(1)]

Public Comment No. 1937-NFPA 70-2024 [Section No. 690.31(C)]

Public Comment No. 113-NFPA 70-2024 [Section No. 690.31(C)(1)]

(C) Wires and Cables.

~~PV wires or cables and distributed generation (DG) cables shall be listed.~~ Type PV W~~w~~ire~~s or cables~~ shall be permitted in all locations where Type RHW-2 is permitted. Type DG cable shall be permitted in all locations where Type TC is permitted.

Informational Note: See UL 4703, *Standard for Photovoltaic Wire*, for PV W~~w~~ire~~s~~ and UL 3003, *Distributed Generation Cables*, for DG C~~c~~ables. PV W~~w~~ire~~s and cables~~ and DG C~~c~~able~~s~~ have nonstandard outer diameters.

(1) Single-Conductor~~s Cables~~.

Single-conductor~~s~~ shall comply with 690.31(C)(1)(a) through 690.31(C)(1)(c).

(a) Single-conductor~~s cables~~ in exposed outdoor locations in PV system dc circuits within PV arrays shall be permitted to be one of the following:

(1) Type PV W~~w~~ire~~s or cables~~

(2) Single-conductor~~s cables~~ marked sunlight resistant and Type USE-2 and Type RHW-2

(b) Exposed ~~cables~~conductors shall be supported and secured by one of the following methods:

(1) ~~c~~Cable ties that are listed and identified for securement and support in outdoor locations

(2) Straps, hangers or similar fittings or other approved means, designed~~-~~ and installed so as not to damage the conductor~~s or fittings that are listed or identified for securement and support in outdoor locations.~~

(c) ~~C~~c~~ables~~Conductors sized larger than 8 AWG shall be supported and secured at intervals not to exceed 1400 mm (54 in.).

(d) Conductors sized 8 AWG and smaller shall be supported and secured at intervals not to exceed 600 mm (24 in.).

Exception: PV systems meeting the requirements of 691.4 shall be permitted to have support and securement intervals as defined in the engineered design.

(2) Cable Trays.

~~Single-conductor~~ Type PV W~~w~~ire~~s or cables~~ of all sizes or Type DG C~~c~~able~~s~~ of all sizes, with or without cable tray ratings, shall be permitted in cable trays ~~installed~~ in outdoor locations if the cables are supported at intervals not to exceed 300 mm (12 in.) and secured at intervals not to exceed 1400 mm (54 in.).

Where ~~installed~~ in uncovered cable trays, ampacity of ~~single-conductor~~ Type PV W~~w~~ire smaller than 1/0 AWG, the adjustment factors for 1/0 AWG single conductor cable in 392.80(A)(2) shall be permitted to be used.

Where ~~single conductors~~ T~~t~~ype PV W~~w~~ire~~s~~ smaller than 1/0 AWG are ~~installed~~ in ladder or ventilated trough cable trays, the following shall apply:

(1) All ~~single~~ conductors shall be installed in a single layer.

(2) Conductors that are bound together to comprise each circuit pair shall be permitted to be installed in other than a single layer.

(3) The sum of diameters of all ~~single~~ conductor~~ cable~~s shall not exceed the cable tray width.

(3) Multiconductor Jacketed Cables.

Where part of a listed PV assembly, multiconductor jacketed cables shall be installed in accordance with the included instructions. Where not part of a listed assembly, or where not otherwise covered in this code, multiconductor jacketed cables, including Type DG C~~c~~able~~s~~, shall be permitted in PV systems if installed in accordance with the product listing and in accordance with the following:

(1) In raceways, where on or in buildings other than rooftops

(2) Where not in raceways, in accordance with the following:

a. Marked sunlight resistant in exposed outdoor locations

b. Protected or guarded, where subject to physical damage

c. Closely following the surface of support structures

d. Secured at intervals not exceeding 1.8 m (6 ft)

e. Secured within 600 mm (24 in.) of mating connectors or entering enclosures

f. Marked direct burial, where buried in the earth

(4) ~~Flexible Cords and Cables~~Circuits Connected to Moving Parts~~Tracking~~ of PV Arrays.

Conductors exposed to cyclical movement in PV arrays with movable components shall meet~~Flexible cords and flexible cables, w~~Where ~~connected to moving parts of tracking PV arrays, wires and cables shall~~ the requirements in 690.31(C)(4)(a) or 690.31(C)(4)(b) ~~comply with Article 400 and the following~~:

(a) Flexible cords or flexible cables complying with 400.4 and the following:

(1) Be identified as a hard service cord type or portable power cable type

(2) Be suitable for extra-hard usage

(3) Be listed for outdoor use

(4) Be water and sunlight resistant

(5)

~~Allowable ampacities shall B~~be in accordance with 400.5 for allowable ampacities.

(b) Stranded copper Type PV W~~w~~ire and Type DG Ccable ~~shall be permitted to be connected to moving parts of tracking PV arrays in accordance~~ with the minimum number of strands specified in Table 690.31(C)(4).

Table 690.31(C)(4) Minimum ~~PV Wire~~ Conductor Strands

~~PV Wire~~ AWG	Minimum Strands
18	17
16–10	19
8–4	49
2	130
1 AWG–1000 kcmil	259

(5) Flexible, Fine-Stranded Cables.

Flexible, fine-stranded cables shall be terminated only with terminals, lugs, devices, or connectors in accordance with 110.14.

(6) Single-Conductor Cables.

Single-conductor cables listed for outdoor use that are sunlight resistant and moisture resistant in sizes 16 AWG and 18 AWG shall be permitted for module interconnections where such cables meet the ampacity requirements of 400.5. Section 310.14 shall be used to determine the cable ampacity adjustment and correction factors.

Second Revision No. 7559-NFPA 70-2024 [Section No. 690.31(E)]

(E) Bipolar Photovoltaic Systems.

Where the sum, without consideration of polarity, of the voltages of the two monopole circuits exceeds the rating of the conductors and connected equipment, monopole circuits in a bipolar PV system shall be physically separated, and the electrical output circuits from each monopole circuit shall be installed in separate raceways until connected to the inverter. The disconnecting means and ~~overcurrent protective devices~~ OCPDs for each monopole circuit output shall be in separate enclosures. All conductors from each separate monopole circuit shall be routed in the same raceway. 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.

Exception: Listed switchgear rated for the maximum voltage between circuits and containing a physical barrier separating the disconnecting means for each monopole circuit shall be permitted to be used instead of disconnecting means in separate enclosures.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 16:50:28 EDT 2024

Committee Statement

Committee Statement: Changes were made to align references related to overcurrent protective devices with their defined terms and acronyms. This is related to the resolutions of PC 1644.

Response Message: SR-7559-NFPA 70-2024

Second Revision No. 7610-NFPA 70-2024 [Section No. 690.34]

690.34 Access to Boxes.

Junction boxes , pull boxes , and ~~outlet boxes~~ devices located behind modules or panels shall be so installed that the wiring contained in them can be rendered accessible directly or by displacement of a module(s) or panel(s) secured by removable fasteners and connected by a flexible wiring system.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 01:01:15 EDT 2024

Committee Statement

Committee Statement: List of equipment permitted behind PV modules is revised to include the general category of devices based on changes made in 690.31(A)(1) to remove the term wiring devices. See SR 7545 for related changes and see PC 504.

Response Message: SR-7610-NFPA 70-2024

Second Revision No. 7566-NFPA 70-2024 [Section No. 690.41(A)]

(A) PV System DC Circuit Grounding Configurations.

One or more of the following system configurations shall be employed for PV system dc circuits:

(1) Functionally grounded ~~circuits~~ through listed equipment

(1) ~~Bipolar circuits according to 690.7(C) with a functional ground reference (center tap)~~

(2) ~~Circuits not isolated from the grounded inverter output circuits~~

(3) Ungrounded circuits

(4) Solidly grounded circuits as permitted in 690.41(B)

(5) ~~Circuits protected by equipment listed and identified for the use~~

Supplemental Information

File Name	Description	Approved
690.41_A_SR_7566.docx		

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 17:18:22 EDT 2024

Committee Statement

Committee Statement: List has been consolidated to better identify the three general allowances for PV system dc circuits with respect to their ground reference. Previous list items 2 and 5 have been struck as they are more accurately covered under the modified list item 1. Previous list items 3 and 4 remain as they are permitted, however there are unique restrictions in this article limiting these methods.

Response Message: SR-7566-NFPA 70-2024

Public Comment No. 510-NFPA 70-2024 [Section No. 690.41(A)]

(A) PV System DC Circuit Grounding Configurations.

One or more of the following system configurations shall be employed for PV system dc circuits:

(1) Functionally grounded ~~circuits~~through listed equipment

(2) ~~Circuits not isolated from the grounded inverter output circuits~~

~~(3)~~ Ungrounded circuits

(34) Solidly grounded circuits as permitted in 690.41(B)

~~(5) Circuits protected by equipment listed and identified for the use~~

Second Revision No. 7570-NFPA 70-2024 [Section No. 690.43(E)]

[SEE ATTACHED WORD FILE]

(E) Flexible Equipment Grounding Conductors Connected to Tracking PV Arrays.

Where connected to moving parts of tracking PV arrays, wire-type equipment grounding conductors shall be installed in accordance with 690.31(C)(4).

Supplemental Information

File Name	Description	Approved
690.43_E_SR_7570.docx		
NEC_CMP-4_SR-7570_690.43_E_.docx	For prod use	

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 17:35:44 EDT 2024

Committee Statement

Committee Statement: Changes made to remove the use of the undefined term "tracking" to better address the need to provide appropriate wiring characteristics where regular movement between parts of PV arrays is expected. This pertains to tracking systems but also floating systems where regular cyclical movement is expected.

Response Message: SR-7570-NFPA 70-2024

Public Comment No. 165-NFPA 70-2024 [Section No. 690.43(E)]

Public Comment No. 1482-NFPA 70-2024 [Section No. 690.43(E)]

(E) Flexible Equipment Grounding and Bonding Conductors Connected to ~~Tracking~~ Moving Parts of PV Arrays.

Equipment grounding or bonding conductors exposed to cyclical movement in PV arrays with movable components shall be one or more of the following:

(1) ~~Where connected to moving parts of tracking PV arrays,~~ W~~w~~ire-type equipment grounding conductors ~~shall be installed~~that meet the requirements in ~~accordance with~~ 690.31(C)(4).
(2) Flexible braided bonding straps listed and identified as suitable for the application.
(3) Other equipment listed and identified as suitable for the application.

Formatted: Font: (Default) +Body (Aptos), 11 pt, Font color: Auto

Formatted: Font: (Default) +Body (Aptos), 11 pt, Font color: Auto

Formatted: List Paragraph

Second Revision No. 7573-NFPA 70-2024 [Section No. 690.45]

690.45 Size of Equipment Grounding Conductors.

Equipment grounding conductors for PV system circuits shall be sized in accordance with 250.122. Where no ~~overcurrent protective device~~ OCPD is used in the circuit, an assumed ~~overcurrent device~~ OCPD rated in accordance with 690.9(B) shall be used when applying Table 250.122(A).

Increases in equipment grounding conductor size to address voltage drop considerations shall not be required.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 17:50:10 EDT 2024

Committee Statement

Committee Statement: Changes were made to align references related to overcurrent protective devices with their defined terms and acronyms. This is related to the resolutions of PC 1644.

Response Message: SR-7573-NFPA 70-2024

Public Comment No. 1644-NFPA 70-2024 [Global Input]

Second Revision No. 7611-NFPA 70-2024 [Section No. 691.11(A)]

(A) Grounding Electrode System.

Details of the grounding electrode system shall be included in the documentation required by 691.6.

Informational Note: See IEEE 2778-2020, *Guide for Solar Power Plant Grounding for Personnel Protection* , for additional information on grounding system design. Grounding requirements for personnel and equipment safety for large-scale PV electric supply stations are designed under engineering supervision based on site-specific geotechnical data. ~~See IEEE 2778-2020, *Guide for Solar Power Plant Grounding for Personnel Protection* .~~

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 01:28:26 EDT 2024

Committee Statement

Committee Statement: The informational note order is revising per the CC Note to conform with the NEC Style Manual.

Response Message: SR-7611-NFPA 70-2024

Public Comment No. 511-NFPA 70-2024 [Section No. 691.11]

Second Revision No. 8090-NFPA 70-2024 [Sections 692.8, 692.9]

Sections 692.8, 692.9

692.8 Circuit Sizing and Current.

(A) Nameplate Rated Circuit Current.

The nameplate(s) rated circuit current shall be the rated current indicated on the fuel cell nameplate(s).

(B) Conductor Ampacity and Overcurrent Protective Device Ratings.

The ampacity of the feeder circuit conductors from the fuel cell system(s) to the premises wiring system shall not be less than the greater of (1) nameplate(s) rated circuit current or (2) the rating of the fuel cell system(s) overcurrent protective device(s).

(C) Ampacity of Grounded or Neutral Conductor.

If an interactive single-phase, 2-wire fuel cell output(s) is connected to the grounded or neutral conductor and a single ungrounded conductor of a 3-wire system or of a 3-phase, 4-wire, wye-connected system, the maximum unbalanced neutral load current plus the fuel cell system(s) output rating shall not exceed the ampacity of the grounded or neutral conductor.

692.9 Overcurrent Protection.

(A) Circuits and Equipment.

If the fuel cell system is provided with ~~overcurrent protection~~ OCPDs sufficient to protect the circuit conductors that supply the load, additional circuit overcurrent devices shall not be required. Equipment and conductors connected to more than one electrical source shall be protected.

(B) Accessibility.

~~Overcurrent devices~~ OCPDs shall be readily accessible.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Sat Oct 19 14:10:10 EDT 2024

Committee Statement

Committee Statement: Changes were made to align references related to overcurrent protective devices with their defined terms and acronyms. This is related to the resolutions of PC 1644.

Response Message: SR-8090-NFPA 70-2024

Second Revision No. 7602-NFPA 70-2024 [Section No. 694.30(B)]

(B) Flexible Cords and Cables.

Flexible cords and cables, where used to connect the moving parts of turbines or where used for ready removal for maintenance and repair, shall either be part of the listed equipment or comply with all of the following:

(1) Be identified as hard service cord type or portable power cable type

(2) Be suitable for extra-hard usage

(3) Be listed for outdoor use

(4) Be water resistant

(5) Comply with Table 400.4

(6) Be sunlight resistant where exposed to sunlight

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 19:21:49 EDT 2024

Committee Statement

Committee Statement: The revision allows for use of the wind turbine safety standard certifications for verifying flexible cords and cables where listed as part of the system.

Response Message: SR-7602-NFPA 70-2024

Public Comment No. 1476-NFPA 70-2024 [Section No. 694.30(B)]

Second Revision No. 7789-NFPA 70-2024 [Section No. 694.52]

694.52 ~~Power~~ Systems Employing Energy Storage.

Wind electric systems employing energy storage shall be marked with the maximum operating voltage, any equalization voltage, and the polarity of the grounded circuit conductor.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Wed Oct 16 13:53:43 EDT 2024

Committee Statement

Committee Statement: The correct term for the title of this section is just system as it is the wind electric systems that are employing energy storage and not power sources as defined in article 100. This revision is related to the resolutions of PC 506.

Response Message: SR-7789-NFPA 70-2024

Second Revision No. 7603-NFPA 70-2024 [Section No. 705.1]

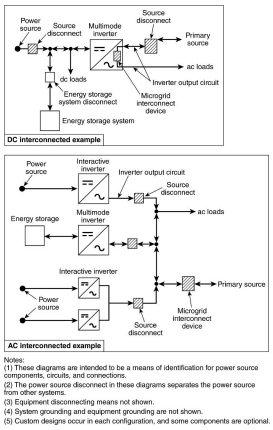
705.1 Scope.

This article covers installation of one or more electric power production sources operating in parallel with a primary source ~~(s)~~ of electricity.

Informational Note No. 1:~~ Examples of the types of primary sources include a utility supply or an on-site electric power source(s)~~ See definitions of primary source and microgrid .

Informational Note No. 2: See Figure Informational Note 705.1.

Figure Informational Note 705.1 Identification of Power Source Components in Common Configurations.



Notes:
(1) These diagrams are intended to be a means of identification for power source components, circuits, and connections.
(2) The power source disconnect in these diagrams separates the power source from other systems.
(3) Equipment disconnecting means not shown.
(4) System grounding and equipment grounding are not shown.
(5) Custom designs occur in each configuration, and some components are optional.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Mon Oct 14 19:27:30 EDT 2024

Committee Statement

Committee Statement: The parenthesis (s) is removed from primary source in the scope since the new definition of primary source can be made up of multiple power sources. A microgrid can function as a primary source per the definition in Article 100 and it does not need to be called out in the requirement. The Informational Note No.1 was not consistent with the new definition of primary source so the IN was changed to a simple reference to the Article 100 definition as this change of definition is causing confusion to the users of this Code and needs to be highlighted for at least a few code cycles.

Response Message: SR-7603-NFPA 70-2024

Public Comment No. 100-NFPA 70-2024 [Section No. 705.1]

Second Revision No. 7614-NFPA 70-2024 [Section No. 705.11(A)]

(A) Service Connections.

An electric power production source shall be permitted to be connected to a service by one of the following methods:

(1) To a new service in accordance with 230.4(A) or 268.4(A)

(2) To the supply side of the service disconnecting means in accordance with 230.82(6) or 268.82(4)

(3) To an additional set of service entrance conductors in accordance with 230.40, Exception No. 5 or 268.40, Exception No. 3.

These connections shall comply with 705.11(B) through 705.11(C).

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 02:11:48 EDT 2024

Committee Statement

Committee Statement: References are added for the corresponding sections of Article 268 that parallel Article 230. The cross reference to Article 268 is needed for medium voltage services. The TC requests that the CC look into the reference in 268.40 Exception No. 3 as it has an error as it refers to 268.82(5) and 268.82(6) which do not match what was intended. The correct references that should be in 268.40 Exception No. 3 should 268.82(3) and 268.82(4) which aligns with the language in 230.40 Exception No. 5.

Response Message: SR-7614-NFPA 70-2024

Public Comment No. 1802-NFPA 70-2024 [Section No. 705.11(A)]

Second Revision No. 7620-NFPA 70-2024 [Section No. 705.11(C)]

[SEE WORD FILE ATTACHED]

(C) Overcurrent Protection.

Power source service conductors shall be protected from overcurrent in accordance with 705.30.

(1) Power Source Connections in Buildings.

Power source service conductors located within buildings and connected to existing service conductors or equipment shall be protected in accordance with one of the following methods:

(1) In dwelling units, with an overcurrent protective device located within 3 m (10 ft) of conductor length from the point of connection.

(2) In other than dwelling units, with an overcurrent protective device located within 5 m (16.5 ft) of conductor length from the point of connection.

(3) In other than dwelling units with cable limiters located within 5 m (16.5 ft) of conductor length from the point of connection, with an overcurrent protective device located within 20 m (66 ft) of conductor length from the point of connection.

Informational Note: The limits in 705.11(C)(1) are intended to provide guidance on practical distances for unprotected power source service conductors inside buildings.

(2) Ground Fault Protection of Equipment.

The rating of overcurrent protective devices of power source service disconnecting means shall be used to determine if ground fault protection of equipment is required in accordance with 230.95.

Supplemental Information

File Name	Description	Approved
705.11_C_SR_7620.docx		
705.11_C_SR_7620_CMP-4.docx	For prod use	

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 11:16:25 EDT 2024

Committee Statement

Committee Statement: The requirements for cable limiters, including their use in parallel conductors, was revised to require engineering supervision, limit the use to services of 1000Vac or less, and the installation in switchgear or similar enclosures. Small changes were made to address other items beyond the scope of the task group actions. One action was to change text for “overcurrent device” to OCPD in several places to align with PC 1644. The requirement for one cable limiter per ungrounded conductor located within switchgear or enclosures is used to clarify that each of any parallel conductors requires a cable limiter, but does not exclude the allowance of a second cable limiter on the opposite end of the conductors as recommended by manufacturers.

Response Message: SR-7620-NFPA 70-2024

Public Comment No. 1941-NFPA 70-2024 [Section No. 705.11]

Public Comment No. 1769-NFPA 70-2024 [Section No. 705.11(C)]

Public Comment No. 1295-NFPA 70-2024 [Section No. 705.11(C)(1)]

Public Comment No. 512-NFPA 70-2024 [Section No. 705.11]

(C) Overcurrent Protection.

Power source service conductors shall have ~~be protected from~~ overcurrent protection in accordance with 705.30.

(1) Power Source Connections in Buildings.

Power source service conductors located within buildings and connected to existing service conductors or equipment shall be protected in accordance with one of the following methods:

(~~1~~a) In dwelling units, with an ~~overcurrent protective device~~OCPD located within 3 m (10 ft) of conductor length from the point of connection.

(~~2~~b) In other than dwelling units, with an ~~overcurrent protective device~~OCPD located within 5 m (16.5 ft) of conductor length from the point of connection.

(~~3~~c) Under engineering supervision for services not over 1000 volts ac nominal ~~I~~n in other than dwelling units in accordance with the following:

(1) with one cable limiter~~s~~ per ungrounded conductor, located within switchgear or similar enclosures, and within 5 m (16.5 ft) of conductor length from the point of connection,

(2) with an ~~overcurrent protective device~~OCPD located within 20 m (66 ft) of conductor length from the point of connection.

Informational Note: The limits in 705.11(C)(1) are intended to provide guidance on practical distances for unprotected power source service conductors inside buildings.

(2) Ground Fault Protection of Equipment.

The rating of ~~overcurrent protective devices~~ OCPDs of power source service disconnecting means shall be used to determine if ground fault protection of equipment is required in accordance with 230.95.

Formatted: Indent: Left: 0.73"

Formatted: Normal, Indent: Left: 0.5", Hanging: 0.25", Right: 0", Space Before: 8 pt, After: 0 pt, No bullets or numbering, Tab stops: Not at 0.5"

Second Revision No. 7615-NFPA 70-2024 [Sections 705.12(A), 705.12(B)]

[SEE WORD FILE ATTACHED]

Sections 705.12(A), 705.12(B)

(A) Feeders and Feeder Taps.

Where the power source output connection is made to a feeder, the following shall apply:

(1) The feeder ampacity shall be greater than or equal to 125 percent of the power-source output circuit current.

(2) Where the power-source output connection is made at a location other than the opposite end of the feeder from the primary source ~~overcurrent device~~ OCPD , that portion of the feeder on the load side of the power source output connection shall be protected by one of the following:

a. The feeder ampacity shall be not less than the sum of the rating of the primary source ~~overcurrent device~~ OCPD and 125 percent of the power-source output circuit current.

b. An ~~overcurrent device~~ OCPD at the load side of the power source connection point shall be rated not greater than the ampacity of the feeder.

(3) For taps sized in accordance with 240.21(B)(2) or 240.21(B)(4), the ampacity of taps conductors shall not be less than one-third of the sum of the rating of the ~~overcurrent device~~ OCPD protecting the feeder plus the ratings of any power source ~~overcurrent devices~~ OCPD connected to the feeder.

(B) Busbars.

For power source connections to distribution equipment with no specific listing and instructions for combining multiple sources, one or more of the following methods shall be used to determine the required ampere ratings of busbars:

(1) The sum of 125 percent of the power source(s) output circuit current and the rating of the ~~overcurrent device~~ OCPD protecting the busbar shall not exceed the busbar ampere rating.

(2) Where two sources, one being a primary power source and the other another power source, are located at opposite ends of a busbar that contains loads, the following shall apply:

(3) The sum of 125 percent of the power-source output circuit currents and the rating of the

~~overcurrent device~~

a. OCPD protecting the busbar shall not exceed 120 percent of the busbar ampere rating.

b. A permanent warning label shall be applied to the distribution equipment adjacent to the power source

~~overcurrent device~~

a. OCPD that displays the following or equivalent wording:

WARNING:

POWER SOURCE OUTPUT. DO NOT RELOCATE THIS OVERCURRENT DEVICE.

(4) The sum of the ampere ratings of all overcurrent devices protecting circuits connected to 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.

(5) A connection at either end of a center-fed panelboard in dwellings shall be permitted where the sum of 125 percent of the power-source output circuit currents and the rating of the ~~overcurrent device~~ OCPD protecting the busbar does not exceed 120 percent of the busbar ampere rating. The warning label in 705.12(B)(2) shall be applied to the power source ~~overcurrent devices~~ OCPDs complying with 705.12(B)(4).

(6) Connections shall be permitted on busbars of panelboards that supply lugs connected to feed-through conductors or are supplied by feed-through conductors in accordance with the following:

(7) The feed-through conductors shall be sized in accordance with 705.12(A).

(8) Where an

~~overcurrent device~~

a. OCPD is installed at either end of the feed-through conductors, panelboard busbars on either side of the feed-through conductors shall be permitted to be sized in accordance with 705.12(B)(1) through 705.12(B)(3).

(9) Connections shall be permitted on switchgear, switchboards, and panelboards in configurations other than those permitted in 705.12(B)(1) through 705.12(B)(5) where designed under engineering supervision that includes available fault-current and busbar load calculations.

Informational Note: See UL 1741-2023, *Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources*. Specifically designed equipment exists for the combination and distribution of sources to supply loads. The options provided in 705.12(B) are for equipment with no specific listing for combining sources.

Supplemental Information

File Name	Description	Approved
705.12_A_B_SR_7615.docx		

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 02:18:35 EDT 2024

Committee Statement

Committee Statement: These changes throughout 705.12 are to address the global comment that references to overcurrent devices be changed to the acronym OCPD. A request was made to change the language of the labels from overcurrent device to “overcurrent protective device.” This is adding unnecessary words to already wordy labels and adds no additional information to the user in the field. The language on labels is not required to follow the language of the NEC.

Response Message: SR-7615-NFPA 70-2024

A) Feeders and Feeder Taps.

Where the power source output connection is made to a feeder, the following shall apply:

(1) The feeder ampacity shall be greater than or equal to 125 percent of the power-source output circuit current.

(2) Where the power-source output connection is made at a location other than the opposite end of the feeder from the primary source ~~overcurrent device~~OCPD, that portion of the feeder on the load side of the power source output connection shall be protected by one of the following:

a. The feeder ampacity shall be not less than the sum of the rating of the primary source ~~overcurrent device~~OCPD and 125 percent of the power-source output circuit current.

b. An ~~overcurrent device~~OCPD at the load side of the power source connection point shall be rated not greater than the ampacity of the feeder.

(3) For taps sized in accordance with 240.21(B)(2) or 240.21(B)(4), the ampacity of taps conductors shall not be less than one-third of the sum of the rating of the ~~overcurrent device~~OCPD protecting the feeder plus the ratings of any power source ~~overcurrent devices~~OCPD connected to the feeder.

(B) Busbars.

For power source connections to distribution equipment with no specific listing and instructions for combining multiple sources, one or more of the following methods shall be used to determine the required ampere ratings of busbars:

(1) The sum of 125 percent of the power source(s) output circuit current and the rating of the ~~overcurrent device~~OCPD protecting the busbar shall not exceed the busbar ampere rating.

(2) Where two sources, one being a primary power source and the other another power source, are located at opposite ends of a busbar that contains loads, the following shall apply:

a. The sum of 125 percent of the power-source output circuit currents and the rating of the ~~overcurrent device~~OCPD protecting the busbar shall not exceed 120 percent of the busbar ampere rating.

b. A permanent warning label shall be applied to the distribution equipment adjacent to the power source ~~overcurrent device~~OCPD that displays the following or equivalent wording:

WARNING:

POWER SOURCE OUTPUT. DO NOT RELOCATE THIS OVERCURRENT DEVICE.

(3) The sum of the ampere ratings of all ~~overcurrent devices~~OCPDs protecting circuits connected to panelboards, both load and supply devices, excluding the rating of the ~~overcurrent device~~OCPD protecting the busbar, shall not exceed the ampacity of the busbar. The rating of the ~~overcurrent device~~OCPD 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.

(4) A connection at either end of a center-fed panelboard in dwellings shall be permitted where the sum of 125 percent of the power-source output circuit currents and the rating of the ~~overcurrent device~~OCPD protecting the busbar does not exceed 120 percent of the busbar ampere rating. The warning label in 705.12(B)(2) shall be applied to the power source ~~overcurrent devices~~OCPDs complying with 705.12(B)(4).

(5) Connections shall be permitted on busbars of panelboards that supply lugs connected to feed-through conductors or are supplied by feed-through conductors in accordance with the following:

a. The feed-through conductors shall be sized in accordance with 705.12(A).

b. Where an ~~overcurrent device~~OCPD is installed at either end of the feed-through conductors, panelboard busbars on either side of the feed-through conductors shall be permitted to be sized in accordance with 705.12(B)(1) through 705.12(B)(3).

(6) Connections shall be permitted on switchgear, switchboards, and panelboards in configurations other than those permitted in 705.12(B)(1) through 705.12(B)(5) where designed under engineering supervision that includes available fault-current and busbar load calculations.

Informational Note: See UL 1741-2023, *Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources*. Specifically designed equipment exists for the combination and distribution of sources to supply loads. The options provided in 705.12(B) are for equipment with no specific listing for combining sources.

Second Revision No. 7638-NFPA 70-2024 [Section No. 705.13]

705.13 Power Control Systems (PCSs).

Power control systems (PCSs) of the multisource PCS type in accordance with Article 130, Part II, shall be permitted to limit current and loading on busbars and conductors supplied by the output of one or more interconnected electric power production or energy storage sources.

Informational Note 1 : See UL 3141-2024, *Outline of Investigation for Power Control Systems* , and UL 1741-2023, *Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources,* for information on PCSs. A listed PCS is a type of EMS that is capable of monitoring multiple power sources and controlling the current on busbars and conductors to prevent overloading. A multisource PCS may include a connection to an electric power production and distribution network.

Informational Note 2: See 120.7 and 705.28 (A) for more information. Bidirectional power production sources act as a load and a source depending on their operational state.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 12:55:07 EDT 2024

Committee Statement

Committee Statement: The revised terms are aligned with article 130, 750 terminology as well as the published UL3141, October, 9 2024. Multisource PCS are common and are defined and addressed in UL 3141. The marking requirements for PCS to be marked and listed are in 130.2 and are not necessary to repeat here. Informational note 2 was added to clarify that bidirectional sources can function as both a source and a load depending on if they are in a charge or discharge operational state.

Response Message: SR-7638-NFPA 70-2024

Public Comment No. 513-NFPA 70-2024 [Section No. 705.13]

Public Comment No. 1483-NFPA 70-2024 [Section No. 705.13]

Second Revision No. 7642-NFPA 70-2024 [Sections 705.20(D), 705.20(E), 705.20(F), 705.20(G)]

Sections 705.20(D), 705.20(E), 705.20(F), 705.20(G)

(D) Live Parts.

~~Disconnection~~ Disconnecting means shall be externally operable without exposed live parts.

(E) Indication.

~~Disconnection~~ Disconnecting means shall plainly indicate whether it is in the open (off) or closed (on) position.

(F) Marking.

Where line and load terminals of disconnecting means are capable of being energized in the open position, disconnecting means shall 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.

(G) dc Power Source Connections.

Termination of dc power source output conductors to disconnecting means shall comply with one of the following:

(1) Terminate to either side of disconnecting means not marked “line” and “load”

(2) Terminate only to the line side of disconnecting means marked “line” and “load”

Informational Note No.1 : The disconnect markings referred to in this section relate to markings on the disconnect means itself and not to the equipment in which it is mounted. A dc disconnecting means marked “line” and “load” may have not been evaluated for source connection to the load terminals, backfeed, or reverse current.

Informational Note No. 2: See 705.30 (D) for backfed OCPDs used as a disconnecting means.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 13:22:20 EDT 2024

Committee Statement

Committee Statement: Informational Note #2 is added to alert users to the requirements of 705.30(D) for back fed OCPD. Some of the public commenter’s concerns related to misapplication of disconnects and overcurrent devices were addressed by the addition of the

	informational Note No. 2 with the reference to 705.30 (D) as the requirements for backfed OCPD are located in that section.
Response Message:	SR-7642-NFPA 70-2024

Public Comment No. 1919-NFPA 70-2024 [Section No. 705.20]

Second Revision No. 7685-NFPA 70-2024 [Section No. 705.20 [Excluding any Sub-Sections]]

Means shall be provided to disconnect power source output conductors of electric power production ~~equipment~~ sources from conductors of other systems. The power source service disconnecting means required in 705.11 shall also be permitted to meet the requirements of this section. A single disconnecting means shall be permitted to disconnect multiple power sources from conductors of other systems. Power source disconnecting means shall comply with 705.20(A) through 705.20(G).

Informational Note: See 480.7; Article 445, Part II; Article 690, Part III; Article 692, Part III; Article 694, Part III; and Article 706, Part II, for specific source disconnecting means requirements.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 16:53:04 EDT 2024

Committee Statement

Committee Statement: The definition “power production equipment” has been changed to “power production source” in Article 100 so the word “equipment” is changed to “source” for consistency with the new definition. A sentence is added to the first paragraph of 705.20 to clarify that the disconnecting means required in 705.11 is compliant with 705.20. An introductory sentence is added at the end of the paragraph to clarify that power source disconnects must meet 705.20(A) through (G). See SR 7681. These changes are related to the resolution of PC 1921.

Response Message: SR-7685-NFPA 70-2024

Second Revision No. 7652-NFPA 70-2024 [Section No. 705.25(B)]

(B) Identification of ~~dc~~ Dc Power Source Output Conductors.

Color coding, marking tape, tagging, or other approved means in accordance with 705.25(B)(1) through 705.25(B)(3) shall be used to identify dc power source output conductors at all termination, connection, and splice points.

(1) Positive Polarity.

Identification of dc positive conductors shall occur by one of the following means:

(1) Imprinted plus signs (+) or the word POSITIVE or POS durably marked on conductor insulation.

(2) An approved permanent marking means (e.g., sleeving or shrink-tubing) that is suitable for the conductor size at all termination, connection, and splice points, with imprinted plus signs (+) or the word POSITIVE or POS

(2) Negative Polarity.

Identification of dc negative conductors shall occur by one of the following means:

(1) Imprinted minus signs (–) or the word NEGATIVE or NEG durably marked on conductor insulation

(2) An approved permanent marking means (e.g., sleeving or shrink-tubing) that is suitable for the conductor size at all termination, connection, and splice points, with imprinted minus signs (–) or the word NEGATIVE or NEG

(3) Color Identification.

Where color is used, identification shall occur by one of the following means:

(1) For nonsolidly grounded dc positive conductors, marked with an insulation color other than green, white, or gray

(2) For nonsolidly grounded dc negative conductors, marked with an insulation color other than green, white, gray, or red

(3) For solidly grounded dc conductors, marked in accordance with 200.7

Informational Note: See Article 100 for the definitions of *functionally grounded* and *solidly grounded*.

Submitter Information Verification

Committee: NEC-P04
Submittal Date: Tue Oct 15 14:03:31 EDT 2024

Committee Statement

Committee Statement: The correct spelling of Dc is with a capital D and it is being corrected here.
Response Message: SR-7652-NFPA 70-2024

Public Comment No. 1789-NFPA 70-2024 [Section No. 705.25]

Second Revision No. 7660-NFPA 70-2024 [Sections 705.28(A), 705.28(B)]

Sections 705.28(A), 705.28(B)

(A) Power Source Output Maximum Current.

The maximum current for power sources shall be calculated in accordance the following:

(1) The sum of the continuous output current ratings of power production sources at the circuit nominal system voltage unless different requirements elsewhere in this code apply to the power sources

(2) ~~For~~ The PCS control settings for the power production sources controlled by ~~PCSs, the current setpoint of the PCSs~~ the PCS

(3) Where sources controlled by a PCS are combined with other sources on the same power source output circuit, the sum of 705.28(A)(1) and 705.28(A)(2)

Calculations shall be permitted to be rounded to the nearest whole ampere, with decimal fractions smaller than 0.5 dropped.

(B) Conductor Ampacity.

Power source output conductors shall have an ampacity not less than the larger of the following and comply with 110.14(C):

(1) The maximum currents in 705.28(A) multiplied by 125 percent without adjustment or correction factors

Exception No. 1: If the assembly, including the ~~overcurrent devices~~ OCPDs protecting the circuit, is listed for operation at 100 percent of its rating, the ampacity of the conductors shall be permitted to be not less than the calculated maximum current of 705.28(A).

Exception No. 2: Where a portion of a circuit is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), it shall be permitted to have an ampacity not less than the calculated maximum current of 705.28(A). No portion of the circuit installed under this exception shall extend into an enclosure containing either the circuit supply or the circuit load terminations, as covered in 110.14(C)(1).

Exception No. 3: Grounded conductors that are not connected to an ~~overcurrent device~~ OCPD shall be permitted to be sized at 100 percent of the calculated maximum current of 705.28(A).

(2) The maximum currents in 705.28(A) after the application of adjustment and correction factors in accordance with 310.14

(3) Where connected to feeders, if smaller than the feeder conductors, the ampacity as calculated in 240.21(B) based on the ~~over-current device~~ OCPD protecting the feeder

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 14:16:02 EDT 2024

Committee Statement

Committee Statement:	The revised terms are aligned with article 130, 750 terminology as well as the published UL3141, October, 9 2024. Changes were made to align references related to overcurrent protective devices with their defined terms and acronyms. This is related to the resolutions of PC 1644.
Response Message:	SR-7660-NFPA 70-2024

Public Comment No. 514-NFPA 70-2024 [Section No. 705.28(A)]

Second Revision No. 7720-NFPA 70-2024 [Section No. 705.30]

[SEE WORD FILE FOR CHANGES]

705.30 Overcurrent Protection.

(A) Circuit and Equipment.

Power source output conductors and equipment shall be provided with overcurrent protection. Circuits connected to more than one electrical source shall have overcurrent devices located to provide overcurrent protection from all sources.

(B) Overcurrent Device Ratings.

The overcurrent devices in other than generator systems shall be sized to carry not less than 125 percent of the maximum currents as calculated in 705.28(A). The rating or setting of overcurrent devices shall be permitted in accordance with 240.4(B) and 240.4(C).

Exception: Circuits containing an assembly together with its overcurrent device(s) that is listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.

(C) Marking.

Equipment containing overcurrent devices supplied from interconnected power sources shall be marked to indicate the presence of all sources.

(D) Suitable for Backfeed.

Suitability for backfeeding shall be determined as follows:

(1) Fused disconnects, unless otherwise marked, shall be considered suitable for backfeed.

(2) Circuit breakers not marked "line" and "load" shall be considered suitable for backfeed.

(3) Circuit breakers marked "line" and "load" shall not be used to satisfy the requirements in 705.30(A).

Informational Note: The markings referred to in this section relate to markings on the disconnecting means or circuit breaker itself and not the equipment on which it is mounted.

(E) Fastening.

Where power output circuits can only operate in interactive mode, plug-in-type circuit breakers shall be permitted to omit the additional fastener normally required by 408.36(D).

(F) Transformers.

The following apply to the installation of transformers:

(1) For the purpose of overcurrent protection, the primary side of transformers with sources on each side shall be the side connected to the largest source of available fault current.

(2) Transformer secondary conductors shall be protected in accordance with 240.21(C).

Supplemental Information

File Name	Description	Approved
705.30_SR_7720.docx		
705.30_SR_7720_CMP-4.docx	For prod use	

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 19:13:02 EDT 2024

Committee Statement

Committee Statement: The revisions were made to reduce the potential shock hazards associated with energized fuses. There are multimode inverters that have loss of phase detection to automatically shutdown if a plug-in breaker were to unlatch from the busbar. This comment allows for two methods to meet the requirements. Many inverters are not multimode so those inverters that only work in interactive mode comply without additional information. Multimode inverters may respond differently to loss of phase so additional information on the certification of the multimode inverter will need to comply with this section to remove the required fastener. Most plug-in type panelboards have one location where a fastener may be installed. The informational note clarifies the certification standard for these functions. The response of these multimode inverters are intended to be similar to interactive only mode inverters.

Changes were made to align references related to overcurrent protective devices with their defined terms and acronyms. This is related to the resolutions of PC 1644.

Response Message: SR-7720-NFPA 70-2024

Public Comment No. 123-NFPA 70-2024 [Section No. 705.30(D)]

Public Comment No. 1855-NFPA 70-2024 [Section No. 705.30(E)]

Public Comment No. 114-NFPA 70-2024 [Section No. 705.30(D)]

Public Comment No. 1925-NFPA 70-2024 [Section No. 705.30(D)]

Public Comment No. 1791-NFPA 70-2024 [Section No. 705.30(E)]

705.30 Overcurrent Protection.

(A) Circuit and Equipment.

Power source output conductors and equipment shall be provided with ~~overcurrent protection~~OCPDs. Circuits connected to more than one electrical source shall have ~~overcurrent devices~~ OCPDs located to provide overcurrent protection from all sources.

(B) ~~Overcurrent Device~~OCPD Ratings.

The ~~overcurrent devices~~OCPDs in other than generator systems shall be sized to carry not less than 125 percent of the maximum currents as calculated in 705.28(A). The rating or setting of OCPDs ~~overcurrent devices~~ shall be permitted in accordance with 240.4(B) and 240.4(C).

Exception: Circuits containing an assembly together with its ~~overcurrent device(s)~~ OCPDs that is listed for continuous operation at 100 percent of its rating shall be permitted to be utilized at 100 percent of its rating.

(C) Marking.

Equipment containing ~~overcurrent devices~~OCPDs supplied from interconnected power sources shall be marked to indicate the presence of all sources.

(D) Suitable for Backfeed.

Suitability for backfeeding shall be determined as follows:

(1) ~~(1)~~ Fused disconnects, unless otherwise marked, shall be considered suitable for backfeed where fuses are not energized when the disconnect is in the open position.

(2) Circuit breakers not marked "line" and "load" shall be considered suitable for backfeed.

(3) Circuit breakers marked "line" and "load" shall not be used to satisfy the requirements in 705.30(A).

Informational Note: The markings referred to in this section relate to markings on the disconnecting means or circuit breaker itself and not the equipment on which it is mounted.

(E) Fastening.

Where power output circuits ~~can only operate in interactive mode,~~ are connected to the load side of plug-in-type circuit breakers, the circuit breaker shall be permitted to omit the additional fastener ~~normally~~ required by 408.36(D) where the power source has either of the following functions ~~settings~~:

(1) the power source only operates in interactive mode

(2) the multimode inverter is equipped with island mode open-phase protection

Note: See UL 1741-2023, Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources, for information on power sources which may be evaluated for anti-islanding in interactive mode or open-phase protection in island mode.

(F) Transformers.

The following apply to the installation of transformers:

(1) For the purpose of overcurrent protection, the primary side of transformers with sources on each side shall be the side connected to the largest source of available fault current.

(2) Transformer secondary conductors shall be protected in accordance with 240.21(C).

Second Revision No. 7722-NFPA 70-2024 [Section No. 705.70]

705.70 Microgrid Interconnect Devices (MID).

Microgrid interconnect devices shall comply with the following:

(1) Be required for any connection between a microgrid system and a primary power source

(2) Be evaluated for the application and have a field label applied or be listed for the application

(3) Have ~~overcurrent devices~~ OCPDs located to provide overcurrent protection from all sources

Informational Note: MID functionality is often incorporated in an interactive or multimode inverter, energy storage system, or similar device identified for interactive operation.

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 19:30:10 EDT 2024

Committee Statement

Committee Statement: A change was made to align the reference related to overcurrent protective devices with the defined terms and acronyms. This is related to the resolutions of PC 1644.

Response Message: SR-7722-NFPA 70-2024

Second Revision No. 7700-NFPA 70-2024 [Article 710]

Article 710 Stand-Alone Systems

710.1 Scope.

This article covers stand-alone systems.

Informational Note: These systems operate independently from an electric utility and include isolated microgrid systems. Stand-alone systems often include a single source or a compatible interconnection of sources such as engine generators, solar PV, wind, ESS, or batteries.

710.2 Listing Requirements.

All power production equipment or systems shall be approved by one of the following:

(1) Listing

(2) Evaluation for the application and have a field label applied

Informational Note: See UL 1741-~~2021~~ 2023 , *Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources*, and UL 62109-1-2014, *Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements.* See UL 2200-2020, *Stationary Engine Generator Assemblies*, for engine generators used in stand-alone applications. This equipment is commonly used in power production sources.

710.10 Identification of Power Sources.

A permanent plaque, label, or directory shall be installed at each building power source disconnecting means location, or at an approved readily visible location, and denote the location of each power source disconnecting means for the building. Where multiple sources supply the building, markings shall comply with 705.10.

~~**710.15** Power Production Source Circuits.~~

~~Circuit conductors between stand-alone sources and building or structure disconnecting means shall be sized based on the sum of the output ratings of the stand-alone sources.~~

15 General.

(A) Capacity and Rating.

The stand-alone system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. The user of the system shall be permitted to select the loads connected to the system.

(B) Power Production Source Circuits.
Circuits shall comply with 705.28.

Supplemental Information

File Name	Description	Approved
NEC_CMP-4_SR-7700_Article_710.docx		

Submitter Information Verification

Committee: NEC-P04

Submittal Date: Tue Oct 15 17:54:40 EDT 2024

Committee Statement

Committee Statement:	This revision provides more clarity for users of the Code, and harmonize the Code requirements for standby and stand-alone systems. The reference to 705.28 is made to simplify and clarify circuit sizing and current requirements for power sources without rewriting the requirements in Article 705.
Response Message:	SR-7700-NFPA 70-2024

Public Comment No. 1807-NFPA 70-2024 [Section No. 710.15]

Article 710 Stand-Alone Systems

710.1 Scope.

This article covers stand-alone systems.

Informational Note: These systems operate independently from an electric utility and include isolated microgrid systems. Stand-alone systems often include a single source or a compatible interconnection of sources such as engine generators, solar PV, wind, ESS, or batteries.

710.2 Listing Requirements.

All power production equipment or systems shall be approved by one of the following:

1. Listing
2. Evaluation for the application and have a field label applied

Informational Note: See UL 1741-~~2021~~2023, *Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources*, and UL 62109-1-2014, *Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements.* See UL 2200-2020, *Stationary Engine Generator Assemblies*, for engine generators used in stand-alone applications. This equipment is commonly used in power production sources.

710.10 Identification of Power Sources.

A permanent plaque, label, or directory shall be installed at each building power source disconnecting means location, or at an approved readily visible location, and denote the location of each power source disconnecting means for the building. Where multiple sources supply the building, markings shall comply with 705.10.

~~710.15 Power Production Source Circuits.~~

~~Circuit conductors between stand-alone sources and building or structure disconnecting means shall be sized based on the sum of the output ratings of the stand-alone sources.~~

710.15 General.

(A) Capacity and Rating.

The stand-alone system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. The user of the system shall be permitted to select the loads connected to the system.

(B) Power Production Source Circuits.

Circuits shall comply with 705.28.