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WORKING DRAFT OF NEC CODE-MAKING PANEL 2 MEETING OUTPUT

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

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Panel Activity: Comment Stage

This is a working draft, prepared by NFPA staff, to record the output generated at the Code-Making Panel 2 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. 7974-NFPA 70-2024 [Global Comment]

See attached word file for changes related to overcurrent protective devices in Annex D.

Supplemental Information

File Name	Description	Approved
70_CMP2_AnnexD_SR7974.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Thu Oct 17 19:19:02 EDT 2024

Committee Statement

Committee Statement: Revisions are made throughout Annex D Examples under the purview of CMP 2 to address the deletion of the term “Overcurrent Protective Device, Branch-Circuit”. This term is replaced by “Overcurrent Protective Device”, and is abbreviated as “OCPD”. The use of “OCPD” is generic and does not need the qualifier “branch-circuit”.

This change is in response to global PC-1642.

Response Message: SR-7974-NFPA 70-2024

Informative Annex D Examples

Example D3 Store Building

A store 80 ft by 60 ft, or 4,800 ft^2, has 30 ft of show window. There are a total of 80 duplex receptacles. The service is 120/240 V, single phase 3-wire service. Actual connected lighting load is 7,000 VA, all of which for this example is considered continuous. All calculations are rounded up or down as permitted in 120.5(B).

Calculated Load

(see 120.40)

Noncontinuous Loads		
Receptacle Load *(see 120.47)*		
80 receptacles at 180 VA		14,400 VA
10,000 VA at 100%		10,000 VA
14,400 VA - 10,000 VA = 4,400 VA at 50%		2,200 VA
	Subtotal	12,200 VA
Continuous Loads		
General Lighting*		
4,800 ft^2 at 1.9 VA/ft^2		9,120 VA
Show Window Lighting Load		
30 ft at 200 VA/ft *[see 120.14(G)]*		6,000 VA
Outside Sign Circuit *[see 120.14(F)]*		1,200 VA
	Subtotal	16,320 VA
	Subtotal from noncontinuous	12,200 VA
	Total noncontinuous loads + continuous loads =	28,520 VA

*In the example, the actual connected lighting load at 125% (7,000 VA × 1.25 VA) is less than the load from Table 120.42(A), so the required minimum lighting load from Table 120.42(A) is used in the calculation. Had the actual lighting load × 125% been greater than the value calculated from Table 120.42(A), the actual connected lighting load would have been used.

Minimum Number of Branch Circuits Required

General Lighting: Branch circuits need only be installed to supply the actual connected load *[see 210.11(B)].*

7,000 VA × 1.25 = 8,750 VA

8,750 VA ÷ 240 V = 36.45 A for 3-wire, 120/240 V

8,750 VA ÷ 120 V = 72.92 A

The lighting load would be permitted to be served by 2-wire or 3-wire, 15- or 20-A circuits with combined capacity equal to 36 A or greater for 3-wire circuits or 73 A or greater for 2-wire circuits. The feeder capacity as well as the number of branch-circuit positions available for lighting circuits in the panelboard must reflect the full calculated load of 9,120 VA. Lighting loads from Table 120.42(A) already include 125% for continuous load. See note at bottom of Table 120.42(A).

Show Window

6,000 VA × 1.25 = 7,500 VA

7,500 VA ÷ 240 V = 31.25 A for 3-wire, 120/240 V

7,500 VA ÷ 120 V = 62.5 A for 2-wire, 120 V

The show window lighting is permitted to be served by 2-wire or 3-wire circuits with a capacity equal to 31 A or greater for 3-wire circuits or 63 A or greater for 2-wire circuits.

Receptacles required by 210.62 are assumed to be included in the receptacle load above if these receptacles do not supply the show window lighting load.

Receptacles

Receptacle Load:

14,400 VA ÷ 240 V = 60 A for 3-wire, 120/240 V

14,400 VA ÷ 120 V = 120 A for 2-wire, 120 V

The receptacle load would be permitted to be served by 2-wire or 3-wire circuits with a capacity equal to 60 A or greater for 3-wire circuits or 120 A or greater for 2-wire circuits.

Minimum Size Feeder (or Service) ~~Overcurrent Protection~~ OCPD

(see 215.5 or 230.90)

Subtotal noncontinuous loads	12,200 VA
Subtotal continuous loads not from Table 120.42(A) at 125% (7,200 VA × 1.25) (sign and show window)	9,000 VA
Subtotal of calculated continuous loads with 125% already included	9,120 VA
Total	30,320 VA

30,320 VA ÷ 240 V = 126 A

The next higher standard size is 150 A *(see 240.6).*

Minimum Size Feeders (or Service Conductors) Required

[see 215.4, 230.42(A)]
For 120/240 V, 3-wire system,
30,320 VA ÷ 240 V = 126 A Service or feeder conductor is 1 AWG Cu in accordance with 215.5 and Table 310.16 (with 75°C terminations).

Example D3(a) Industrial Feeders in a Common Raceway

An industrial multi-building facility has its service at the rear of its main building, and then provides 480Y/277-volt feeders to additional buildings behind the main building in order to segregate certain processes. The facility supplies its remote buildings through a partially enclosed access corridor that extends from the main switchboard rearward along a path that provides convenient access to services within 15 m (50 ft) of each additional building supplied. Two building feeders share a common raceway for approximately 45 m (150 ft) and run in the access corridor along with process steam and control and communications cabling. The steam raises the ambient temperature around the power raceway to as much as 35°C. At a tee fitting, the individual building feeders then run to each of the two buildings involved. The feeder neutrals are not connected to the equipment grounding conductors in the remote buildings. All distribution equipment terminations are listed as being suitable for 75°C connections.
Each of the two buildings has the following loads:

Lighting, 11,600 VA, comprised of electric-discharge luminaires connected at 277 V

Receptacles, 22 125-volt, 20-ampere receptacles on general-purpose branch circuits, supplied by separately derived systems in each of the buildings

1 Air compressor, 460 volt, three phase, 5 hp

1 Grinder, 460 volt, three phase, 1.5 hp

3 Welders, AC transformer type (nameplate: 23 amperes, 480 volts, 60 percent duty cycle)

3 Industrial Process Dryers, 480 volt, three phase, 15 kW each (assume continuous use throughout certain shifts)

Determine the ~~overcurrent protection~~ OCPD and conductor size for the feeders in the common raceway, assuming the use of XHHW-2 insulation (90°C):

Calculated Load

{Note: For reasonable precision, volt-ampere calculations are carried to three significant figures only; where loads are converted to amperes, the results are rounded to the nearest ampere *[see 120.5(B)]*}.

Noncontinuous Loads		
Receptacle Load *(see 120.47)*		
22 receptacles at 180 VA		3,960 VA
Welder Load *[see 630.11(A), Table 630.11(A)]*		
Each welder: 480V × 23A × 0.78 = 8,610 VA		
All 3 welders *[see 630.11(B)]* (demand factors 100%, 100%, 85% respectively)		
8,610 VA + 8,610 VA + 7,320 VA =		24,500 VA
Subtotal, Noncontinuous Loads		**28,500 VA**
Motor Loads*(see 430.24, Table 430.250)*		
Air compressor: 7.6 A × 480 V × √3 =		6,310 VA
Grinder: 3 A × 480 V × √3 =		2,490 VA
Largest motor, additional 25%:		1,580 VA
Subtotal, Motor Loads		**10,400 VA**
By using 430.24, the motor loads and the noncontinuous loads can be combined for the remaining calculation.		
Subtotal for load calculations, Noncontinuous Loads		**38,900 VA**
Continuous Loads		
General Lighting		11,600 VA
3 Industrial Process Dryers	15 kW each	45,000 VA
Subtotal, Continuous Loads:		**56,600 VA**

~~*Overcurrent protection*~~*OCPD*

(see 215.5)
The ~~branch-circuit~~ OCPD must accommodate 125 percent of the continuous load, plus the noncontinuous load:

Continuous load	56,600 VA
Noncontinuous load	38,900 VA
Subtotal, actual load [actual load in amperes] [99,000 VA ÷ (480V × √3) = 119 A]	**95,500 VA**
(25% of 56,600 VA) (*See 215.5*)	**14,200 VA**
Total VA	**109,700 VA**

Conversion to amperes using three significant figures: 109,700 VA / (480V × √3) = 132 A

Minimum size ~~branch-circuit~~ OCPD: 132 A

Minimum standard size branch-circuit OCPD *(see 240.6)*: 150 amperes

Where the ~~branch-circuit~~ OCPD and its assembly are listed for operation at 100 percent of its rating, a 125 ampere ~~branch-circuit~~ OCPD would be permitted. However, ~~branch-circuit~~ OCPDs and their assemblies listed for 100 percent of their rating are typically not available at the 125-ampere rating. *(See 215.5 Exception.)*

Ungrounded Feeder Conductors

The conductors must independently meet requirements for (1) terminations, and (2) conditions of use throughout the raceway run.

Minimum size conductor at the ~~branch-circuit~~ OCPD termination *[see 110.14(C) and 215.4(A), using 75°C ampacity column in Table 310.16]*: 1/0 AWG.

Minimum size conductors in the raceway based on actual load *[see Article 100 for the definition of ampacity, and 310.15(C)(1) and correction factors to Table 310.16]*:

95,500 VA ÷ 0.7 ÷ 0.96 = 142,000 VA

[70% = 310.15(C)(1)] and [0.96 = Correction factors to Table 310.16]

Conversion to amperes:

142,000 VA ÷ (480 V × √3) = 171 A

Note that the neutral conductors are counted as current-carrying conductors *[see 310.15(E)(1)(3)]* in this example because the discharge lighting has substantial nonlinear content. This requires a 2/0 AWG conductor based on the 90°C column of Table 310.16. Therefore, the worst case is given by the raceway conditions, and 2/0 AWG conductors must be used. If the utility corridor were at normal temperatures [(30°C (86°F)], and if the lighting at each building were supplied from the local separately derived system (thus requiring no neutrals in the supply feeders), the raceway result (95,500 VA ÷ 0.8 = 119,000 VA; 119,000 VA ÷ (480 V × √3) = 143 A, or a 1 AWG conductor @ 90°C) could not be used, because the termination result (1/0 AWG) based on the 75°C column of Table 310.16 would become the worst case, requiring the larger conductor.

In every case, the ~~branch-circuit~~ OCPD shall provide overcurrent protection for the feeder conductors in accordance with their ampacity as provided by this code *(see 240.4)*. A 90°C 2/0 AWG conductor has a Table 310.16 ampacity of 195 amperes. Adjusting for the conditions of use (35°C ambient temperature, 8 current-carrying conductors in the common raceway),

195 A × 0.96 × 0.7 = 131 A

The 150-ampere circuit breaker protects the 2/0 AWG feeder conductors, because 240.4(B) permits the use of the next higher standard size ~~branch-circuit~~ OCPD. Note that the feeder layout precludes the application of 310.14(A)(2) Exception.

Feeder Neutral Conductor

(see 120.61)

Because 210.11(B) does not apply to these buildings, the load cannot be assumed to be evenly distributed across phases. Therefore, the maximum imbalance must be assumed to be the full lighting load in this case, or 11,600 VA. (11,600 VA ÷ 277 V = 42 A.) The ability of the neutral-to-return fault current *[see 250.32(B) Exception No. 2]* is not a factor in this calculation.

Because the neutral runs between the main switchboard and the building panelboard, likely terminating on a busbar at both locations, and not on ~~branch-circuit~~ the OCPD, the effects of continuous loading can be disregarded in evaluating its terminations *[see 215.4(A)(1) Exception No. 3]*. That calculation is (11,600 VA ÷ 277 V = 42 A), to be evaluated under the 75°C column of Table 310.16. The minimum size of the neutral might seem to be 8 AWG, but that size would not be sufficient to be depended upon in the event of a line-to-neutral fault *[see 215.4(B), second paragraph]*. Therefore, because the minimum size equipment grounding conductor for a 150 ampere circuit wired with 2/0 AWG conductors, as covered in Table 250.122(A), is 6 AWG, that is the minimum neutral size required for this feeder.

Second Revision No. 7511-NFPA 70-2024 [Detail]

[New definition in Article 100]

Ground-Fault Circuit Interrupter, Special Purpose, Class C (Class C SPGFCI).

A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a ground-fault current exceeds the values established for a Class C device. A device that is intended to be used in circuits with no conductor over 300 V AC to ground where reliable equipment grounding or double insulation is provided. (CMP 2)

Informational Note 1: See UL 943C, Outline of Investigation for Special-Purpose Ground-Fault Circuit Interrupters. Class C ground-fault circuit interrupters trip when the ground-fault current is 20 mA or higher and do not trip when the ground-fault current is less than 15 mA.

Informational Note 2: To provide limited-let-go protection, Class C ground-fault circuit interrupters are permitted to have a trip threshold greater than 6 mA but less than 15 mA.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 12:27:58 EDT 2024

Committee Statement

Committee Statement: This second revision includes one of three new defined terms which include Class C, D, and E special purpose GFCIs. Each term is used in the definition of a special purpose GFCI. Providing a clear definition for these terms is important for clarity in the proper application of these solutions.

The following second revisions are related to PC-1019, SR 7511, SR 7513 and SR 7514.

Response Message: SR-7511-NFPA 70-2024

Public Comment No. 1019-NFPA 70-2024 [New Definition after Definition: Ground-Fault Circuit Inter...]

Second Revision No. 7513-NFPA 70-2024 [Detail]

[New definition in Article 100]

Ground-Fault Circuit Interrupter, Special Purpose, Class D (Class D SPGFCI) .

A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a ground-fault current exceeds the values established for a Class D device. A device that is intended to be used in circuits with one or more conductors over 300 volts to ground, and with specially sized, reliable grounding, to provide a low impedance path so that the voltage across the body during a fault does not exceed 150 volts. (CMP-2)

Informational Note: See UL 943C, Outline of Investigation for Special-Purpose Ground-Fault Circuit Interrupters. Class D ground-fault circuit interrupters trip when the ground-fault current is 20 mA or higher and do not trip when the ground-fault current is less than 15 mA.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 12:30:10 EDT 2024

Committee Statement

Committee Statement: This second revision includes one of three new defined terms which include Class C, D, and E special purpose GFCIs. Each term is used in the definition of a special purpose GFCI. Providing a clear definition for these terms is important for clarity in the proper application of these solutions.

The following second revisions are related to PC-1019, SR 7511, SR 7513 and SR 7514.

Response Message: SR-7513-NFPA 70-2024

Second Revision No. 7514-NFPA 70-2024 [Detail]

[New definition in Article 100]

Ground-Fault Circuit Interrupter, Special Purpose, Class E (Class E SPGFCI).

A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a ground-fault current exceeds the values established for a Class E device. A device that is intended to be used in circuits with one or more conductors over 300 volts to ground but with conventional equipment grounding provided for the protected equipment in the system or double insulation. These ground-fault circuit-interrupters respond rapidly to open the circuit before the magnitude and duration of the current flowing through the person's body exceeds the limits for ventricular fibrillation. (CMP-2)

Informational Note: See UL 943C, Outline of Investigation for Special-Purpose Ground-Fault Circuit Interrupters. Class E ground-fault circuit interrupters trip when the ground-fault current is 20 mA or higher and do not trip when the ground-fault current is less than 15 mA.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 12:32:10 EDT 2024

Committee Statement

Committee Statement: This second revision includes one of three new defined terms which include Class C, D, and E special purpose GFCIs. Each term is used in the definition of a special purpose GFCI. Providing a clear definition for these terms is important for clarity in the proper application of these solutions.

The following second revisions are related to PC-1019, SR 7511, SR 7513 and SR 7514.

Response Message: SR-7514-NFPA 70-2024

Second Revision No. 7584-NFPA 70-2024 [Detail]

210.8(F) Outdoor Outlets.

For dwellings, all outdoor outlets, other than those covered in 210.8(A) Exception No. 1, including outdoor outlets installed at the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 60 amperes or less, shall be GFCI protected:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) Boathouses

If equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Effective September 1, 2026, GFCI or SPGFCI protection shall be provided for listed HVAC equipment.

Exception No. 1: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Exception No. 2: GFCI protection shall not be required for listed HVAC equipment. This exception shall expire September 1, 2029 ~~2026~~.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 18:31:30 EDT 2024

Committee Statement

Committee Statement: There are currently incompatibility issues between GFCI devices and HVAC equipment. The industry needs additional time to develop compatible products. Based upon new information brought up during panel discussion, loss of power to new HVAC equipment utilizing flammable refrigerants could present other hazards.

Response Message: SR-7584-NFPA 70-2024

Public Comment No. 1820-NFPA 70-2024 [Section No. 210.8(F)]

Second Revision No. 7658-NFPA 70-2024 [Detail]

210.12(B) Dwelling Units.

All 120-volt, nominal, single-phase, 10-, 15-, and 20-ampere branch circuits supplying outlets or devices installed in the following locations shall be protected by any of the means described in 210.12(A).

(1) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall not be required for the individual branch circuit supplying an outlet for arc welding equipment in a dwelling unit, its garages, and its accessory buildings.

Exception No. 3: AFCI protection shall not be required for an individual branch circuit supplying listed HVAC equipment.

Informational Note No. 1: See NFPA 72-2025, National Fire Alarm and Signaling Code, 29.9.4(5) for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 2: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Supplemental Information

File Name	Description	Approved
70_CMP2_210.12_B_SR7658.docx	For Staff Use	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 14:11:50 EDT 2024

Committee Statement

Committee Statement:	HVAC equipment can be located in areas where AFCIs are required, such as closets. And there is a concern about the compatibility between AFCI devices and HVAC equipment.
Response Message:	SR-7658-NFPA 70-2024

Public Comment No. 1913-NFPA 70-2024 [Section No. 210.12(B)]

Second Revision No. 7666-NFPA 70-2024 [Detail]

210.13 Ground-Fault Protection of Equipment.

Each branch-circuit disconnecting means rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with 230.95.

Informational Note: See 517.17 for requirements on buildings that contain health care occupancies.

Exception No. 1: This section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the branch circuit and on the load side of any transformer supplying the branch circuit.

~~*Exception No. 3: For fused disconnects, where the available fault current, at the fused disconnect, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38 percent of the available fault current , or if the disconnect switch complies with 240.67(B)(1), 240.67(B)(3), or 240.67(B)(4) and is set to operate at the lower of the calculated minimum arcing current or 38 percent of the available fault current.*~~

~~*Exception No. 4: For circuit breakers, where the available fault current, at the circuit breaker, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the circuit breaker complies with 240.87(B)(2), 240.87(B)(4), 240.87(B)(5), or 240.87(B)(6) and is set to operate at the lower of the calculated minimum arcing current or 38 percent of the available fault current.*~~

Supplemental Information

File Name	Description	Approved
70_CMP2_210.13_SR7666.docx	For reference	

Submitter Information Verification

Committee: NEC-P02
Submittal Date: Tue Oct 15 14:28:47 EDT 2024

Committee Statement

Committee Statement: The public inputs proposing the addition of these two exceptions were rejected by CMP-10. Deleting these exceptions will prevent correlation issues.

Response Message: SR-7666-NFPA 70-2024

Public Comment No. 459-NFPA 70-2024 [Section No. 210.13]

Public Comment No. 1182-NFPA 70-2024 [Section No. 210.13]

Second Revision No. 7743-NFPA 70-2024 [Detail]

210.12(B) Dwelling Units.

All 120-volt, nominal, single-phase, 10-, 15-, and 20-ampere branch circuits supplying outlets or devices installed in the following locations shall be protected by any of the means described in 210.12(A).

(1) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) Attics

(15 ~~4~~) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall not be required for the individual branch circuit supplying an outlet for arc welding equipment in a dwelling unit, its garages, and its accessory buildings.

Informational Note No. 1: See *NFPA 72*-2025, *National Fire Alarm and Signaling Code*, 29.9.4(5) for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 2: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Supplemental Information

File Name	Description	Approved
70_CMP2_210.12_B_SR7743.docx	For reference	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 11:41:17 EDT 2024

Committee Statement

Committee Statement: Data concerning the number of electrical fires was provided in a presentation to CMP-2 (see meeting minutes) which demonstrated the need for AFCI protection in attics. Some circuits in the attics are not individual circuits are already protected by an AFCI.

Response Message: SR-7743-NFPA 70-2024

Public Comment No. 1158-NFPA 70-2024 [Section No. 210.12(B)]

Public Comment No. 1741-NFPA 70-2024 [Section No. 210.12(B)]

Public Comment No. 1681-NFPA 70-2024 [Section No. 210.12(B)]

Second Revision No. 7752-NFPA 70-2024 [Detail]

210.12(B) Dwelling Units.

All 120-volt, nominal, single-phase, 10-, 15-, and 20-ampere branch circuits supplying outlets or devices installed in the following locations shall be protected by any of the means described in 210.12(A).

(1) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable in accordance with ~~meeting the applicable requirements of~~ 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall not be required for the individual branch circuit supplying an outlet for arc welding equipment in a dwelling unit, ~~its~~ garages, and ~~its~~ accessory buildings.

Informational Note No. 1: See *NFPA 72*-2025, *National Fire Alarm and Signaling Code*, 29.9.4(5) for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 2: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Supplemental Information

File Name	Description	Approved

70_CMP2_210.12_B_SR7752.docx For reference

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 12:07:25 EDT 2024

Committee Statement

Committee Statement: The language is revised to comply with NEC Style Manual 4.1.3. The redundant "its" were removed as directed by the Correlating Committee.

Response Message: SR-7752-NFPA 70-2024

Public Comment No. 467-NFPA 70-2024 [Section No. 210.12(B)]

Second Revision No. 7759-NFPA 70-2024 [Detail]

210.52(A)(2) Wall Space.

As used in this section, a wall space shall include the following:

(1) Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways and similar openings, fireplaces, stationary appliances, and fixed cabinets ~~that do not have countertops or similar work surfaces~~

(2) The space occupied by fixed panels in walls, excluding sliding panels

(3) The space afforded by fixed room dividers, such as freestanding bar-type counters or railings

Supplemental Information

File Name	Description	Approved
70_CMP2_210.52_A_SR7759.docx	For reference	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 12:29:49 EDT 2024

Committee Statement

Committee Statement: This second revision addresses unintended consequences of requiring receptacle outlets in areas such as kitchens where cabinets have countertops or similar worksurfaces where receptacles are already required as part of 210.52(C). Stationary appliance is being retained as this would be new material.

Response Message: SR-7759-NFPA 70-2024

Public Comment No. 135-NFPA 70-2024 [Section No. 210.52(A)(2)]

Second Revision No. 7532-NFPA 70-2024 [Definition: Branch Circuit (Branch-Circuit).]

Branch Circuit (Branch-Circuit).

The circuit conductors between the final ~~overcurrent~~ overcurrent protective device (OCPD) protecting the circuit and the outlet(s). (CMP-2)

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 13:40:00 EDT 2024

Committee Statement

Committee Statement: The modifications made align with the new defined term “overcurrent protective device (OCDP)” Aligns with defined terms.

Response Message: SR-7532-NFPA 70-2024

Public Comment No. 1642-NFPA 70-2024 [Global Input]

Second Revision No. 7516-NFPA 70-2024 [Definition: Ground-Fault Circuit Interrupter (GFCI).]

Ground-Fault Circuit Interrupter (GFCI) (Class A GFCI) .

A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a ground-fault current exceeds the values established for a Class A device. (CMP-2)

Informational Note: See UL 943, *Standard for Ground-Fault Circuit Interrupters*, for further information. Class A ground-fault circuit interrupters trip when the ground-fault current is 6 mA or higher and do not trip when the ground-fault current is less than 4 mA.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 12:46:30 EDT 2024

Committee Statement

Committee Statement: Adding “(Class A GFCI)” to the definition of a GFCI adds clarity and is consistent with changes made to other types of GFCIs being introduced to the NEC.

Response Message: SR-7516-NFPA 70-2024

Public Comment No. 1020-NFPA 70-2024 [Definition: Ground-Fault Circuit Interrupter (GFCI).]

Second Revision No. 7518-NFPA 70-2024 [Definition: Ground-Fault Circuit Interrupter, Special Purpo...]

Ground-Fault Circuit Interrupter, Special Purpose (SPGFCI). (Special Purpose Ground-Fault Circuit Interrupter)

A ~~device intended for the detection of ground-fault currents that functions to de-energize a circuit or portion of a circuit within an established period of time established for Class C~~ term used to refer to SPGFCI Classes C , D, ~~or~~ and E- ~~devices~~ . (CMP-2)

Informational Note: See UL 943C, *Outline of Investigation for Special Purpose Ground-Fault Circuit Interrupters*, for information on Classes C, D, ~~or E special purpose ground-fault circuit interrupters~~ and E .

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 12:53:56 EDT 2024

Committee Statement

Committee Statement: The definition is being modified to recognize that new defined terms have been added for SPGFCI Classes C, D, and E. The SPGFCI definition provides a general overview and identifies that a SPGFCI can be any one of these classes of devices.

Response Message: SR-7518-NFPA 70-2024

Public Comment No. 1018-NFPA 70-2024 [Definition: Ground-Fault Circuit Interrupter, Special Purpo...]

Second Revision No. 7777-NFPA 70-2024 [Section No. 120.1]

120.1 Scope.

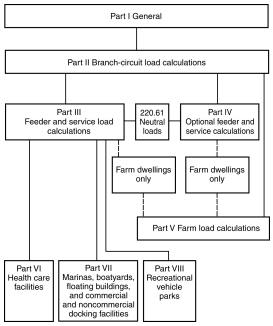
This article provides requirements for calculating branch-circuit, feeder, and service loads. Part I provides general requirements for calculation methods. Part II provides calculation methods for branch-circuit loads. Part III and Part IV provide calculation methods for feeder and service loads. Part V provides calculation methods for farm loads. Part VI provides calculation methods for health care facilities. Part VII provides calculation methods for marinas, boatyards, floating buildings, ~~and commercial and noncommercial docking~~ and docking facilities. Part VIII provides calculation methods for recreational vehicle parks.

Informational Note No. 1: See Informative Annex D for examples.

Informational Note No. 2: See Figure Informational Note 120.1 for information on the organization of this article.

[Remove “commercial and noncommercial” from Part VII in the figure.]

Figure Informational Note 120.1 Branch-Circuit, Feeder, and Service Load Calculation Methods.



Supplemental Information

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70_CMP2_120.1_SR7777.docx	For Staff Use	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 13:34:09 EDT 2024

Committee Statement

Committee Statement: The Scope of Article 120 and Figure 120.1 are revised to reflect the correct title for Part VII and the addition of Part VIII.

Response Message: SR-7777-NFPA 70-2024

Public Comment No. 710-NFPA 70-2024 [Section No. 120.1]

Second Revision No. 7779-NFPA 70-2024 [Section No. 120.3]

120.~~3~~ 4 Other Articles for Specific-Purpose Calculations.

Table 120.~~3 shall~~ 4 shall provide references for specific-purpose calculation requirements not located in Chapters 5, 6, or 7 that amend or supplement the requirements of this article.

Table 120.~~3 Specific~~ 4 Specific -Purpose Calculation References

Calculation	Article	Section (or Part)
Air-conditioning and refrigerating equipment, branch-circuit conductor sizing	440	Part IV
Capacitors	460	460.8
Fixed electric heating equipment for pipelines and vessels, branch-circuit sizing	427	427.4
Fixed electric space-heating equipment, branch-circuit sizing	424	424.4
Fixed outdoor electric deicing and snow-melting equipment, branch-circuit sizing	426	426.4
Fixed resistance and electrode industrial process heating equipment	425	425.4
Motors, feeder demand factor	430	430.26
Motors, multimotor and combination-load equipment	430	430.25
Motors, several motors or a motor(s) and other load(s)	430	430.24
Over 1000-volt ac and 1500-volt dc branch-circuit calculations	235	235.19
Over 1000-volt feeder calculations	215	236.4
Phase converters, conductors	455	455.6
Storage-type water heaters	422	422.13

Submitter Information Verification

Committee: NEC-P02
Submittal Date: Wed Oct 16 13:38:41 EDT 2024

Committee Statement

Committee Statement: Section 120.3 is relocated to 120.4 to comply with Section 2.2.1 of the NEC Style Manual. Section 120.3 is reserved for “Reconditioned Equipment”.
Response Message: SR-7779-NFPA 70-2024

Public Comment No. 712-NFPA 70-2024 [Section No. 120.3]

Second Revision No. 7782-NFPA 70-2024 [Section No. 120.5(A)]

(A) Voltages.

Unless other voltages are specified, for purposes of calculating branch-circuit and feeder loads, nominal system voltages of 120, 120/240, 208Y/120, 240, 347, 416Y/240, 480Y/277, 480, 600Y/347, and 600 volts shall be used.

Informational Note: DC electrical systems are often described with a nominal voltage and a wide voltage band. For DC electrical systems with a wide voltage band, both the upper and lower limits of the bands are important considerations for load calculations.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 13:42:11 EDT 2024

Committee Statement

Committee Statement: DC electrical systems may have a wide range of upper and lower nominal voltage limits due to variable power generation, and the system may operate indefinitely under these conditions. Additionally, the load current drawn by the utilization equipment may be significantly different between the nominal, maximum or minimum voltages. Furthermore, the maximum current drawn by the utilization equipment may not occur at the maximum voltage. The informational note provides the user with clarity that both the maximum and minimum voltage limits are important considerations when conducting load calculations for such DC electrical systems.

Response Message: SR-7782-NFPA 70-2024

Public Comment No. 1889-NFPA 70-2024 [Section No. 120.5(A)]

Second Revision No. 7609-NFPA 70-2024 [Section No. 120.5(E)]

(E) Percent Multiplier.

Load calculations shall not require continuous loads to be calculated at 125 percent.

Informational Note: A 125-percent multiplier could be required for reasons other than continuous load. Continuous loads impact the sizing of the conductor and ~~overcurrent device~~ OCPD but might not influence the load.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 19:52:14 EDT 2024

Committee Statement

Committee Statement: CMP 2 applied the use of the “OCPD” acronym in the First Draft (reference FR 8210). Applying the acronym in this occurrence is consistent with the action taken at the first draft. Global Public Comment 1642 is seeking to add a new defined term for “Overcurrent Protective Device (OCPD)”. In accordance with Section 3.2.3 of the NEC Style Manual, an acronym that is identified in Article 100 is permitted to be used in the NEC.

Response Message: SR-7609-NFPA 70-2024

Second Revision No. 7785-NFPA 70-2024 [Section No. 120.7]

120.7 Power Control System (PCS).

PCS shall be permitted to be used for branch-circuit, feeder, or service load calculations. When used in load calculations, the installation shall comply with 120.7(A) through 120.7(~~D~~ C).

(A) PCS Requirements.

The PCS shall comply with Article 130, Part II.

(B) PCS ~~Current Setpoint~~ Control Setting .

The PCS ~~current setpoint~~ control setting shall be determined by qualified ~~personnel and~~ persons and shall be set to no greater than 80 percent of the rating of the ~~overcurrent protective device for the circuit for which the PCS is providing~~ OCPD for the circuits being monitored by the PCS to provide overload control.

(C) Load Calculations Using PCS.

~~Load calculations that use PCS shall be~~

The load on the branch-circuit, feeder, or service shall be the sum of the controlled loads, as determined in 120.7(C)(1), and noncontrolled loads, as determined in 120.7(C)(2).

(1) Controlled Loads.

Controlled loads shall be based on the monitoring used by the PCS to provide overload control and the control configuration of the PCS and shall comply with one or both of the following:

(1) ~~Monitoring only controlled loads: When~~ If the PCS monitors only controlled loads, the ~~current setpoint~~ control setting of the PCS shall be used in place of the controlled loads in load calculations.

(2) ~~Monitoring controlled and noncontrolled loads: When~~ If the PCS monitors both controlled and noncontrolled loads, the minimum operating current of the controlled loads shall be used in place of the controlled loads in the load calculations.

Informational Note: Minimum operating current is a value greater than or equal to zero representing the minimum current ~~allowed for each load by the PCS~~ of the controlled loads .

(~~D~~ 2) Noncontrolled Loads.

The load calculations for loads that are not controlled by the PCS shall meet the requirements in Article 120, Parts II through VII.

Informational Note: See Informative Annex D, Examples D14(a) through D14(d) for examples of load calculations with loads managed by PCS.

Supplemental Information

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70_CMP2_120.7_SR7785.docx		
70_CMP2_120.7_SR7785.docx	For prod use	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 13:47:11 EDT 2024

Committee Statement

Committee Statement: Revisions were made to align terminology with the product standard for Power Control Systems, UL 3141 - changing “current setpoint” to “control setting”. “Minimum operating current” is necessary to allow for use of PCS in scenarios where both controlled and non-controlled loads are monitored.

Revisions were made in the language of 120.7(C) and 120.7(D) to further clarify how PCS are used in load calculations.

The term “qualified personnel” was changed to “qualified persons” to align with a defined term in Article 100.

The 80% limit for the control setting of the PCS is not modified. The PCS may or may not be a continuous load. Sizing at 80% is a conservative approach that allows the use of PCS technology without resulting in overloading of OCPDs.

Additionally, it is clarified that the 80% value is for the rating of the OCPD being monitored by the PCS, which is provided for overload control of the system. This is consistent with the examples provided in Annex D.

Response Message: SR-7785-NFPA 70-2024

Public Comment No. 1974-NFPA 70-2024 [Section No. 120.7(B)]

Public Comment No. 1754-NFPA 70-2024 [Section No. 120.7]

Public Comment No. 2001-NFPA 70-2024 [Section No. 120.7]

Public Comment No. 1939-NFPA 70-2024 [Section No. 120.7(C)]

120.7 Power Control System (PCS).
PCS shall be permitted to be used for branch-circuit, feeder, or service load calculations. When used in load calculations, the installation shall comply with 120.7(A) through 120.7(D).

(A) PCS Requirements.
The PCS shall comply with Article 130, Part II.

(B) PCS ~~Current Setpoint~~Control Setting.
The PCS ~~current setpoint~~control setting shall be determined by qualified ~~personnel~~ persons and shall be set to no greater than 80 percent of the rating of the ~~overcurrent protective device~~OCPD for the circuit ~~for~~ being monitored by the PCS to provide ~~which the PCS is providing~~ overload control.

(C) Load Calculations Using PCS.
The load on the branch-circuit, feeder, or service shall be the sum of the controlled loads, as determined in 120.7(C)(1), and noncontrolled loads, as determined in 120.7(C)(2).

(1) Controlled Loads.
Controlled loads ~~Load calculations that use PCS~~ shall be based on the monitoring used by the PCS to provide overload control and the control configuration of the PCS and shall comply with one or both of the following:

(1) ~~Monitoring only controlled loads: When~~If the PCS monitors only controlled loads, the ~~current setpoint~~control setting of the PCS shall be used in place of the controlled loads in load calculations.

(2) ~~Monitoring controlled and noncontrolled loads: When~~If the PCS monitors both controlled and noncontrolled loads, the minimum operating current of the controlled loads shall be used in place of the controlled loads in the load calculations.

Informational Note: Minimum operating current is a value greater than or equal to zero representing the minimum current ~~allowed for each load by the PCS~~of the controlled loads.

(2~~D~~) Noncontrolled Loads.
The load calculations for loads that are not controlled by the PCS shall meet the requirements in Article 120, Parts II through VII.
Informational Note: See Informative Annex D, Examples D14(a) through D14(d) for examples of load calculations with loads managed by PCS.

Second Revision No. 7796-NFPA 70-2024 [Section No. 120.14(H)]

(H) Fixed Multioutlet Assemblies.

Fixed multioutlet assemblies used in other than dwelling units or the guest rooms or guest suites of hotels or motels shall be calculated in accordance with the following:

(1) Where ~~appliances are~~ utilization equipment is unlikely to be used simultaneously, each 1.5 m (5 ft) or fraction thereof of each separate and continuous length shall be considered as one outlet of not less than 180 volt-amperes.

(2) Where ~~appliances are likely~~ utilization equipment is likely to be used simultaneously, each 300 mm (1 ft) or fraction thereof shall be considered as an outlet of not less than 180 volt-amperes.

For the purposes of this section, the calculation shall be permitted to be based on the portion that contains receptacles.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 14:06:05 EDT 2024

Committee Statement

Committee Statement: The term “utilization equipment” more accurately describes the electrical equipment that may be supplied by the receptacles in a multioutlet assembly. The term appliance was removed as it implies a more limited scope than intended.

Response Message: SR-7796-NFPA 70-2024

Public Comment No. 1160-NFPA 70-2024 [Section No. 120.14(H)]

Public Comment No. 1038-NFPA 70-2024 [Section No. 120.14(H)]

Second Revision No. 7797-NFPA 70-2024 [Section No. 120.42(A)]

(A) General.

A unit load of not less than that specified in Table 120.42(A) for non-dwelling occupancies and the floor area determined in 120.5(C) shall be used to calculate the minimum lighting load. Motors rated less than ⅛ HP and connected to a lighting circuit shall be considered general lighting load.

Informational Note: The unit values of Table 120.42(A) are based on minimum load conditions and 80 percent power factor and might not provide sufficient capacity for the installation contemplated.

Table 120.42(A) General Lighting Loads by Non-Dwelling Occupancy

Type of Occupancy	Unit Load	
	Volt-amperes/ m^2	Volt-amperes/ ft^2
Automotive facility	16	1.5
Convention center	15	1.4
Courthouse	15	1.4
Dormitory	16	1.5
Exercise center	15	1.4
Fire station	14	1.3
Gymnasium[1]	18	1.7
Health care clinic	17	1.6
Hospital	17	1.6
Hotel or motel, or apartment house without provisions for cooking by tenants[2]	18	1.7
Library	16	1.5
Manufacturing facility[3]	24	2.2
Motion picture theater	17	1.6
Museum	17	1.6
Office[4]	14	1.3
Parking garage[5]	3	0.3
Penitentiary	13	1.2
Performing arts theater	16	1.5
Police station	14	1.3
Post office	17	1.6
Religious facility	24	2.2
Restaurant[6]	16	1.5
Retail[7, 8]	20	1.9
School/university	16	1.5
Sports arena	16	1.5
Town hall	15	1.4
Transportation	13	1.2
Warehouse	13	1.2
Workshop	18	1.7

~~Note: The 125 percent multiplier for a continuous load as specified in 210.20(A) is included, therefore no additional multiplier shall be required when using the unit loads in this table for~~

~~calculating the minimum lighting load for a specified occupancy.~~

[1] Armories and auditoriums are considered gymnasium-type occupancies.

[2] Lodge rooms are similar to hotels and motels.

[3] Industrial commercial loft buildings are considered manufacturing-type occupancies.

[4] Banks are office-type occupancies.

[5] Commercial (storage) garages are considered parking garage occupancies.

[6] Clubs are considered restaurant occupancies.

[7] Barber shops and beauty parlors are considered retail occupancies.

[8] Stores are considered retail occupancies.

Supplemental Information

File Name	Description	Approved
70_CMP2_120.42_A_SR7797.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 14:10:00 EDT 2024

Committee Statement

Committee Statement: Lighting loads were updated in the 2020 code and are appropriate based on the change approved. The note with the table is confusing and while it does identify the continuous nature of these loads, the fact that these are considered continuous should not be considered the sole reason for the 125-percent multiplier, refer to the Informational Note for 120.5(E). The note in table 120.42(A) is removed to clarify that the table values are not to be adjusted by 125-percent for continuous loading.

Response Message: SR-7797-NFPA 70-2024

Public Comment No. 38-NFPA 70-2024 [Section No. 120.42(A)]

120.42 Lighting Load for Non-Dwelling Occupancies.

(A) General.

A unit load of not less than that specified in Table 120.42(A) for non-dwelling occupancies and the floor area determined in 120.5(C) shall be used to calculate the minimum lighting load. Motors rated less than 1/8 HP and connected to a lighting circuit shall be considered general lighting load.

Informational Note: The unit values of Table 120.42(A) are based on minimum load conditions and 80 percent power factor and might not provide sufficient capacity for the installation contemplated.

Table 120.42(A) General Lighting Loads by Non-Dwelling Occupancy

Type of Occupancy	Unit Load	
	Volt-amperes/ m^2	Volt-amperes/ ft^2
Automotive facility	16	1.5
Convention center	15	1.4
Courthouse	15	1.4
Dormitory	16	1.5
Exercise center	15	1.4
Fire station	14	1.3
Gymnasium[1]	18	1.7
Health care clinic	17	1.6
Hospital	17	1.6
Hotel or motel, or apartment house without provisions for cooking by tenants[2]	18	1.7
Library	16	1.5
Manufacturing facility[3]	24	2.2
Motion picture theater	17	1.6
Museum	17	1.6
Office[4]	14	1.3
Parking garage[5]	3	0.3
Penitentiary	13	1.2
Performing arts theater	16	1.5
Police station	14	1.3
Post office	17	1.6
Religious facility	24	2.2
Restaurant[6]	16	1.5
Retail[7, 8]	20	1.9
School/university	16	1.5
Sports arena	16	1.5
Town hall	15	1.4
Transportation	13	1.2
Warehouse	13	1.2
Workshop	18	1.7

~~Note: The 125 percent multiplier for a continuous load as specified in 210.20(A) is included, therefore no additional multiplier shall be required when using the unit loads in this table for calculating the minimum lighting load for a specified occupancy.~~

[1]Armories and auditoriums are considered gymnasium-type occupancies.

[2]Lodge rooms are similar to hotels and motels.

[3]Industrial commercial loft buildings are considered manufacturing-type occupancies.

[4]Banks are office-type occupancies.

[5]Commercial (storage) garages are considered parking garage occupancies.
[6]Clubs are considered restaurant occupancies.
[7]Barber shops and beauty parlors are considered retail occupancies.
[8]Stores are considered retail occupancies.

Second Revision No. 7804-NFPA 70-2024 [Section No. 120.54]

120.54 Electric Clothes Dryers — Dwelling Unit(s).

The load for household electric clothes dryers in a dwelling unit(s) shall be the nameplate rating ~~when~~ if available or 5000 watts (volt-amperes), whichever is larger, for each dryer served. The use of the demand factors in Table 120.54 shall be permitted. Where two or more single-phase dryers are supplied by a 3-phase, 4-wire feeder or service, the total load shall be calculated on the basis of twice the maximum number connected between any two phases. Kilovolt-amperes (kVA) shall be considered equivalent to kilowatts (kW) for loads calculated in this section.

Table 120.54 Demand Factors for Household Electric Clothes Dryers

Number of Dryers	Demand Factor (%)
~~1–5~~ 1–2	~~80~~ 100
3- 5	~~85~~ 80
6	75
7	65
8	60
9	55
10	50
11	47
12–23	47% minus 1% for each dryer exceeding 11
24–42	35% minus 0.5% for each dryer exceeding 23
43 and over	25%

Supplemental Information

File Name	Description	Approved
70_CMP2_120.54_SR7804.docx	For Staff Use	

Submitter Information Verification

Committee: NEC-P02
Submittal Date: Wed Oct 16 14:19:12 EDT 2024

Committee Statement

Committee Statement: First Revision FR-8044 revised the dryer circuit demand factor to 80% for feeder/service load calculations.

Many households have two dryers that would be used simultaneously therefore the table has been updated for 1-2 dryers at 100% demand factor.

The request in PC-1708 to remove the statement “whichever is larger” is not supported, as user changes must be considered that allow the feeder or service calculation to be based on the nameplate rating of the equipment, or 5000 watts when

a larger dryer may be installed in the future.

This Second Revision corrects the inadvertent inclusion of the second row, as it is inconsistent with the first row.

Response Message: SR-7804-NFPA 70-2024

Public Comment No. 307-NFPA 70-2024 [Section No. 120.54]

Public Comment No. 704-NFPA 70-2024 [Section No. 120.54]

Public Comment No. 37-NFPA 70-2024 [Section No. 120.54]

Public Comment No. 1693-NFPA 70-2024 [Section No. 120.54]

Public Comment No. 1708-NFPA 70-2024 [Section No. 120.54]

Second Revision No. 7809-NFPA 70-2024 [Section No. 120.57]

120.57 Electric Vehicle Supply Equipment (EVSE) Load.

~~The EVSE~~ For each EVSE served, the EVSE loads shall be calculated at ~~either~~ the nameplate rating of the equipment, if available, or at 7200 watts (volt-amperes) ~~or~~ if the nameplate ~~rating of the equipment, whichever is larger, for each EVSE served, unless modified by~~ 625.42 ~~.~~ is not available.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 14:25:57 EDT 2024

Committee Statement

Committee Statement: The statement “unless modified by 625.42” is removed to avoid unnecessary forward references in the standard.

The revision allows the use of nameplate ratings, in lieu of the 7200 VA value. This is consistent with how the Code already allows EVSE loads to be reduced below a minimum rating using controls (EMS, adjustable settings or PCS).

Finally, treating EVSE loads based on amperage and not volt-amperes (as requested in PCs 1753, 2038) is inconsistent with the purpose of load calculations and with the approach used throughout Article 120.

Response Message: SR-7809-NFPA 70-2024

Public Comment No. 399-NFPA 70-2024 [Section No. 120.57]

Public Comment No. 705-NFPA 70-2024 [Section No. 120.57]

Public Comment No. 1713-NFPA 70-2024 [Section No. 120.57]

Public Comment No. 1753-NFPA 70-2024 [Section No. 120.57]

Public Comment No. 2038-NFPA 70-2024 [Section No. 120.57]

Second Revision No. 7812-NFPA 70-2024 [Section No. 120.61(B)(1)]

(1) Household Electric Ranges, Wall-Mounted Ovens, Counter-Mounted Cooking Units, and Dryers.

A demand factor of 70 percent shall be permitted to be applied to the portion of the feeder or service supplying household electric ranges, wall-mounted ovens, counter-mounted cooking units, and electric dryers, where the maximum unbalanced load has been determined in accordance with Table 120.55 for ranges and Table 120.54 for dryers.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 14:30:09 EDT 2024

Committee Statement

Committee Statement: The additional text clarifies that the 70% demand factor in 120.61(B)(1) applies only to the portion of the neutral load that is attributed to the appliances identified in this sub-section. Without this clarification, this allowance would apply to the entire neutral load of the feeder or service.

Response Message: SR-7812-NFPA 70-2024

Public Comment No. 1566-NFPA 70-2024 [Section No. 120.61(B)(1)]

Second Revision No. 7832-NFPA 70-2024 [Section No. 120.83]

120.83 Existing Dwelling Unit.

This section shall be permitted to be used to determine if the existing service or feeder is of sufficient capacity to serve additional loads ~~where~~ if the dwelling unit is served by a 120/240-volt or 208Y/120-volt, 3-wire service or feeder. The percentages listed in Table 120.83 shall be used for existing and additional new loads. The larger connected load of air-conditioning or space heating, but not both, shall be used.

Load calculations shall include the following:

(1) General lighting and general-use receptacles at 22 volt-amperes/m^2 or 2 volt-amperes/ft^2

(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit and each laundry branch circuit covered in 210.11(C)(1) and 210.11(C)(2)

(3) The nameplate rating of the following equipment that are not connected to the branch circuits addressed in 120.83(1) or 120.83(2) :

(4) All appliances that are fastened in place, permanently connected, or located to be on a specific circuit

(5) Ranges, wall-mounted ovens, counter-mounted cooking units

(6) Clothes

~~dryers that are not connected to the laundry branch circuit specified in 120.83(2)~~

a. dryers

b. Water heaters

c. Electric vehicle supply equipment (EVSE) supplied by an individual branch circuit

Table 120.83 Existing Dwelling Unit Load Percentages

Load (kVA)	Percent of Load
First 8 kVA of existing and new load	100
Remainder of existing load	40
New EVSE	80
New central electric resistance space heating	80
All other new loads	50

Supplemental Information

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70_CMP2_120.83_SR7832.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 16:29:51 EDT 2024

Committee Statement

Committee Statement: In accordance with 3.5.4 of the NEC Style Manual, the word “where“ is limited to the expression of location. The term is replaced with “if”, as the usage is for a conditioned based statement.

Additionally, the relocation of the statement in 120.83(3)(c), ensures that loads connected to branch circuits already treated with default values are not to be double-counted in the 120.83 calculations. This provision only applied to clothes dryers, but there is no technical reason why it should not apply to other loads specified in 120.83(3).

Response Message: SR-7832-NFPA 70-2024

Public Comment No. 84-NFPA 70-2024 [Section No. 120.83]

Public Comment No. 707-NFPA 70-2024 [Section No. 120.83]

120.83 Existing Dwelling Unit.
This section shall be permitted to be used to determine if the existing service or feeder is of sufficient capacity to serve additional loads ~~where~~ if the dwelling unit is served by a 120/240-volt or 208Y/120-volt, 3-wire service or feeder. The percentages listed in Table 120.83 shall be used for existing and additional new loads. The larger connected load of air-conditioning or space heating, but not both, shall be used.
Load calculations shall include the following:

(1) General lighting and general-use receptacles at 22 volt-amperes/m^2 or 2 volt-amperes/ft^2

(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit and each laundry branch circuit covered in 210.11(C)(1) and 210.11(C)(2)

(3) The nameplate rating of the following equipment that are not connected to the branch circuits addressed in 120.83(1) or 120.83(2):

a. All appliances that are fastened in place, permanently connected, or located to be on a specific circuit

b. Ranges, wall-mounted ovens, counter-mounted cooking units

c. Clothes dryers ~~that are not connected to the laundry branch circuit specified in 120.83(2)~~

d. Water heaters

e. Electric vehicle supply equipment (EVSE) supplied by an individual branch circuit

Table 120.83 Existing Dwelling Unit Load Percentages

Load (kVA)	Percent of Load
First 8 kVA of existing and new load	100
Remainder of existing load	40
New EVSE	80
New central electric resistance space heating	80
All other new loads	50

Second Revision No. 7835-NFPA 70-2024 [Section No. 120.84(A)]

(A) Feeder or Service Load.

It shall be permissible to calculate the load of a feeder or service that supplies three or more dwelling units of a multifamily dwelling in accordance with 120.84(A)(1) or 120.84(A)(2).

(1) Conditions.

The load shall be permitted to be calculated in accordance with Table 120.84(B) instead of Article 120 ,

~~Part III~~
Part III if all the following conditions are met:

(1) No dwelling unit is supplied by more than one feeder.

(2) Each dwelling unit is equipped with electric cooking equipment.

Exception: When the calculated load for multifamily dwellings without electric cooking in Article 120, Part III exceeds that calculated under Article 120, Part IV for the identical load plus electric cooking (based on 8 kW per unit), the lesser of the two loads shall be permitted to be used.

(3) Each dwelling unit is equipped with either electric space heating or air conditioning, or both. Feeders and service conductors whose calculated load is determined by this optional calculation shall be permitted to have the neutral load determined by 120.61.

(2) Total Demand

If all the conditions of 120.84(A)(1) are met, and if three or more single-phase 120/208V dwelling units are supplied by a 3-phase, 4-wire feeder or service, the total demand load shall be calculated on the basis of twice the maximum number connected between any two phases.

Supplemental Information

File Name	Description	Approved
70_CMP2_120.84_A_SR7835_JS.docx		
70_CMP2_120.84_A_SR7835.docx	For prod use	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 16:38:47 EDT 2024

Committee Statement

Committee Statement: Section 120.84(A) has been revised to properly address single phase 120/208 multifamily dwelling units. 120.84 applies where there are 3 or more dwelling units supplied by a feeder or service. Two family dwelling units are still addressed in 120.85. Two family dwelling units may be calculated per 120.85 as three identical units using the revised text of 120.84.

Response Message: SR-7835-NFPA 70-2024

Public Comment No. 90-NFPA 70-2024 [Section No. 120.84(A)]

120.84(A) Feeder or Service Load.
It shall be permissible to calculate the load of a feeder or service that supplies three or more dwelling units of a multifamily dwelling in accordance with 120.84(A)(1) or 120.84(A)(2)

(1) Conditions
The load shall be permitted to be calculated in accordance with Table 120.84(B) instead of Article 120, Part III if all the following conditions are met:

(1) No dwelling unit is supplied by more than one feeder.

(2) Each dwelling unit is equipped with electric cooking equipment.

Exception: When the calculated load for multifamily dwellings without electric cooking in Article 120, Part III exceeds that calculated under Article 120, Part IV for the identical load plus electric cooking (based on 8 kW per unit), the lesser of the two loads shall be permitted to be used.

(3) Each dwelling unit is equipped with either electric space heating or air conditioning, or both. Feeders and service conductors whose calculated load is determined by this optional calculation shall be permitted to have the neutral load determined by 120.61.

(2) Total Demand

If all the conditions of 120.84(A)(1) are met, and if three or more single-phase 120/208V dwelling units are supplied by a 3-phase, 4-wire feeder or service, the total demand load shall be calculated on the basis of twice the maximum number connected between any two phases.

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Second Revision No. 8044-NFPA 70-2024 [Sections 120.84(B), 120.84(C)]

[Move Table 120.84(B) to 120.84(C)]

Sections 120.84(B), 120.84(C)

(B) House Loads.

House loads shall be calculated in accordance with Article 120, Part III and shall be in addition to the dwelling unit loads calculated in accordance with Table 120.84(~~B~~ C).

Table 120.84(~~B~~ C) Optional Calculations — Demand Factors for Three or More Multifamily Dwelling Units

Number of Dwelling Units	Demand Factor (%)
3–5	45
6–7	44
8–10	43
11	42
12–13	41
14–15	40
16–17	39
18–20	38
21	37
22–23	36
24–25	35
26–27	34
28–30	33
31	32
32–33	31
34–36	30
37–38	29
39–42	28
43–45	27
46–50	26
51–55	25
56–61	24
62 and over	23

(C) Calculated Loads.

The calculated load to which the demand factors of Table 120.84(B) apply shall include the following:

(1) 22 volt-amperes/m^2 or 2 volt-amperes/ft^2 for general lighting and general-use receptacles

(2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit and each laundry branch circuit covered in 210.11(C)(1) and 210.11(C)(2)

(3) The nameplate rating of the following:

(4) All appliances that are fastened in place, permanently connected, or located to be on a specific circuit

(5) Ranges, wall-mounted ovens, counter-mounted cooking units

(6) Clothes dryers that are not connected to the laundry branch circuit specified in 120.84(C)(2)

(7) Water heaters

(8) The nameplate ampere or kVA rating of all permanently connected motors not included in 120.84(C)(3)

(9) The larger of the air-conditioning load or the fixed electric space-heating load

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Fri Oct 18 17:04:09 EDT 2024

Committee Statement

Committee Statement: Table 120.84(B) is located in the sub-section titled “House Loads”, but is used for “Calculated Loads” in

sub-section 120.84(C). The requirements for how to apply the table are in 120.84(C). In accordance with

clause 2.1.7.2 of the NEC Style Manual, the table shall be designated by the section number in which it is

referenced. Additionally, 120.84(B) should refer to all of 120.84(C), rather than just the table, as the

requirements in 120.84(C) also apply.

Response Message: SR-8044-NFPA 70-2024

Public Comment No. 87-NFPA 70-2024 [Section No. 120.84]

Second Revision No. 7849-NFPA 70-2024 [Section No. 120.87]

120.87 Determining Existing Loads.

The calculation of a feeder or service load for existing installations shall be permitted to use actual maximum demand to determine the existing load under all of the following conditions:

(1) The maximum demand data is available for a 1-year period.

Exception: If the maximum demand data for a 1-year period is not available, the calculated load shall be permitted to be based on the maximum demand (the highest average kilowatts reached and maintained for a 15-minute interval) continuously recorded over a minimum 30-day period using a recording ammeter or power meter connected to the highest loaded phase of the feeder or service, based on the initial loading at the start of the recording. The recording shall reflect the maximum demand of the feeder or service by being taken when the building or space is occupied and shall include by measurement or calculation the larger of the heating or cooling equipment load, and other loads that might be periodic in nature due to seasonal or similar conditions. This exception shall not be permitted if the feeder or service has a renewable energy system (i.e., solar photovoltaic or wind electric) or employs any form of peak load shaving.

(2) The maximum demand at 125 percent plus the new ~~load does~~ load minus any removed load determined in accordance with Article 120, Parts I, III, and IV does not exceed the ampacity of the feeder or rating of the service.

(3) The feeder has overcurrent protection in accordance with 240.4, and the service has overload protection in accordance with 230.90.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 17:12:55 EDT 2024

Committee Statement

Committee Statement: Item (2) currently references “new load” without specifying how that is determined. This may lead to different interpretations by users and AHJs. Revised text clarifies that the new or removed “loads” are permitted to be determined in accordance with Parts I, III, and IV of this article.

The data provided in the substantiation was specific to dwelling units. The impact to industrial establishments who have metering equipment that does not capture data at 15 minute intervals would be an unintended consequence of this change.

Response Message: SR-7849-NFPA 70-2024

Public Comment No. 1611-NFPA 70-2024 [Section No. 120.87]

Public Comment No. 86-NFPA 70-2024 [Section No. 120.87]

Second Revision No. 7528-NFPA 70-2024 [Section No. 210.1]

210.1 Scope.

This article provides the general requirements for branch circuits not over 1000 volts ac, 1500 volts dc, nominal.

Informational Note: See Article 265~~, Part II for~~ for requirements for branch circuits over 1000 volts ac, 1500 volts dc, nominal.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 13:32:03 EDT 2024

Committee Statement

Committee Statement: The change to the informational note was made to remove the reference to Part II of the Article as the entire article focuses Branch Circuit requirements for over 1000 volts AC, 1500 volts DC.

Response Message: SR-7528-NFPA 70-2024

Public Comment No. 533-NFPA 70-2024 [Section No. 210.1]

Second Revision No. 7530-NFPA 70-2024 [Section No. 210.3]

210.3 Reconditioned Equipment.

The following reconditioned equipment shall not be ~~installed~~ permitted :

(1) Equipment that provides ground-fault circuit-interrupter protection for personnel

(2) Equipment that provides arc-fault circuit-interrupter protection

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 13:36:14 EDT 2024

Committee Statement

Committee Statement: The changes make now uses the phrase "shall not be permitted" as it is all inclusive addressing installation of reconditioned equipment and the reconditioning of equipment that is already installed.

Response Message: SR-7530-NFPA 70-2024

Public Comment No. 136-NFPA 70-2024 [Section No. 210.3]

Public Comment No. 460-NFPA 70-2024 [Section No. 210.3]

Second Revision No. 7535-NFPA 70-2024 [Section No. 210.4]

210.4 Multiwire Branch Circuits.

(A) General.

Branch circuits recognized by this article shall be permitted as multiwire circuits. A ~~multiwire~~ multiwire branch circuit shall be permitted to be considered as multiple circuits. Except as permitted in 300.5(B)(4), all conductors of a multiwire branch circuit shall originate from the equipment containing ~~the branch-circuit overcurrent~~ the overcurrent protective device (OCPD).

Informational Note No. 1: A 3-phase, 4-wire, wye-connected power system used to supply power to nonlinear loads might necessitate that the power system design allow for the possibility of high harmonic currents on the neutral conductor.

Informational Note No. 2: See 300.15(B) for continuity of grounded conductors on ~~multiwire circuits~~ multiwire branch circuits .

(B) Disconnecting Means.

Each multiwire branch circuit shall be provided with a means that will simultaneously disconnect all ungrounded conductors at the point where the branch circuit originates.

Informational Note: See 240.15(B) for information on the use of single-pole circuit breakers as the disconnecting means.

(C) Line-to-Neutral Loads.

Multiwire branch circuits shall supply only line-to-neutral loads.

Exception No. 1: A multiwire branch circuit that supplies only one utilization equipment shall be permitted to supply line-to-line loads.

Exception No. 2: A multiwire branch circuit shall be permitted to supply line-to-line loads if all ungrounded conductors of the multiwire branch circuit are opened simultaneously by ~~the branch-circuit OCPD~~ the OCPD .

(D) Grouping.

The ungrounded and grounded circuit conductors of each multiwire branch circuit shall be grouped in accordance with 200.6(B).

Supplemental Information

File Name	Description	Approved
70_CMP2_210.4_SR7535.docx	For Staff Use	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 13:46:26 EDT 2024

Committee Statement

Committee Statement: Changes made to add clarity and align with the newly defined term which changed “Branch Circuit Overcurrent Protective Device” to “Overcurrent Protective Device (OCPD)”

Branch circuit was added to the second sentence of (A) and to informational note No. 2 to add clarity as this section has requirements for a multiwire branch circuit as per the title of 210.4.

The term “branch circuit overcurrent device” was replaced with overcurrent protective device in (A) and in (C).

This change is in response to global PC-1642.

Response Message: SR-7535-NFPA 70-2024

Second Revision No. 7550-NFPA 70-2024 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the following locations and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel:

(1) Bathrooms

(2) Garages

(3) ~~Accessory~~ Areas of accessory buildings not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(4) Outdoors

(5) Crawl spaces — at or below grade level

(6) Basements

(7) Kitchens

(8) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(9) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(10) Boathouses

(11) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(12) Laundry areas

(13) Indoor damp locations

(14) Indoor wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: GFCI protection shall not be required for a receptacle supplying only a permanently installed premises security system.

Exception No. 3: GFCI protection shall not be required for listed weight-supporting ceiling receptacles (WSCR) utilized in combination with compatible weight-supporting attachment fittings (WSAF) installed for the purpose of supporting a ceiling luminaire or ceiling-suspended fan. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling-suspended fan, GFCI protection shall be provided.

Exception No. 4: Factory-installed receptacles that are not readily accessible and are mounted internally to exhaust fan assemblies shall not require GFCI protection unless required by the installation instructions or listing.

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 16:07:08 EDT 2024

Committee Statement

Committee Statement: Item (3) modification: (PC 1237): List item 3 has been modified to specify areas of accessory buildings instead of accessory buildings. Changing “Accessory buildings” to Areas of accessory” adds clarity to the requirement.

Item (13) modification: (PC 137, 462, 1080)

List item 13 is modified Adding “Locations” for clarity. Corrected the language from “Indoor damp” to “Indoor damp locations”. This was inadvertently left off in the first revision language. This change brings 210.8(A) consistent with language in 210.8(B).

Response Message: SR-7550-NFPA 70-2024

Public Comment No. 1237-NFPA 70-2024 [Section No. 210.8(A)]

Public Comment No. 1080-NFPA 70-2024 [Section No. 210.8(A)]

Public Comment No. 462-NFPA 70-2024 [Section No. 210.8(A)]

Public Comment No. 137-NFPA 70-2024 [Section No. 210.8(A)]

Second Revision No. 7560-NFPA 70-2024 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) Kitchens

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

(6) Outdoors

(7) Sinks where receptacles or cord-and plug-connected fixed or stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(8) Indoor damp locations

(9) Indoor wet locations

(10) Locker rooms with associated showering facilities

(11) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(12) Crawl spaces at or below grade level

(13) Unfinished areas of basements

(14) ~~Aquariums, bait wells, and similar open~~ Open aquatic vessels or containers, such as aquariums, bait wells, and similar tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(15) Laundry areas

(16) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: At industrial establishments where conditions of maintenance and supervision ensure that only qualified personnel are involved, if a greater hazard is created by power interruption to outdoor fixed and stationary cord- and plug-connected equipment or that has a design that is not compatible with GFCI protection, an assured equipment grounding conductor program in accordance with 590.7(B)(2) shall be implemented and enforced in lieu of GFCI protection provided at the receptacle outlet.

Exception No. 3: Receptacles or cord- and plug-connected fixed and stationary appliances installed within 1.8 m (6 ft) from the top inside edge of a bowl of a sink shall not be required to be GFCI protected in industrial laboratories where the receptacles are used to supply equipment if removal of power would introduce a greater hazard.

Exception No. 4: Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

Exception No. 5: GFCI protection shall not be required for listed weight-supporting ceiling receptacles (WSCR) utilized in combination with compatible weight-supporting attachment fittings (WSAF) installed for the purpose of serving a ceiling luminaire or ceiling-suspended fan. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling-suspended fan, GFCI protection shall be provided.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 16:51:31 EDT 2024

Committee Statement

Committee Statement: List item 14 has been modified to make it clear when the code rule is to be applied. The existing language has been reorganized to "open aquatic vessels or containers" not within 6 feet of aquariums or bait wells not with a closed top or lid.

Response Message: SR-7560-NFPA 70-2024

Public Comment No. 726-NFPA 70-2024 [Section No. 210.8(B)]

Second Revision No. 7617-NFPA 70-2024 [Section No. 210.8(D)]

(D) **Branch-Circuits Supplying** Specific Appliances.

GFCI protection shall be provided for the branch circuit or outlet supplying the ~~following appliances rated 150 volts or less to ground and 60 amperes or less, single-phase or 100 amperes or less, 3-phase:~~

(1) ~~Automotive vacuum machines~~

(2) ~~Drinking water coolers and bottle fill stations~~

(3) ~~High-pressure spray washing machines~~

(4) ~~Tire inflation machines~~

(5) ~~Vending machines~~

(6) ~~Sump pumps~~

(7) ~~Dishwashers~~

(8) ~~Electric ranges~~

(9) ~~Wall-mounted ovens~~

(10) ~~Counter-mounted cooking units~~

(11) ~~Clothes dryers~~

(12) ~~Microwave ovens~~

appliances identified in 422.5.

Supplemental Information

File Name	Description	Approved
70_CMP2_210.8_D_SR7617.docx	For Staff Use	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 11:06:51 EDT 2024

Committee Statement

Committee Statement: This second revision ensures that the requirements found in 210.8(D) only apply to the protection of branch circuits or outlets and not the appliance. The list of appliances is driven off of those found in Article 422, section 422.5. CMP-2 reaffirms that it would like to maintain the GFCI protection of the branch circuit and the outlet for the appliances listed in 210.8(D)(1)-(12) as a shock hazard can exist in these installations as documented in CPSC data that was used when CMP-2 generated the items in this list.

Response Message: SR-7617-NFPA 70-2024

Public Comment No. 1273-NFPA 70-2024 [Section No. 210.8(D)]

Public Comment No. 1162-NFPA 70-2024 [Section No. 210.8(D)]

Public Comment No. 1081-NFPA 70-2024 [Section No. 210.8(D)]

Second Revision No. 7590-NFPA 70-2024 [Section No. 210.8(F)]

(F) Outdoor Outlets.

For dwellings, all outdoor outlets, other than those covered in 210.8(A) Exception No. 1, including outdoor outlets installed at the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 60 amperes or less, shall be GFCI protected:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) Boathouses

If equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

~~Effective September 1, 2026, GFCI or SPGFCI protection shall be provided for listed HVAC equipment.~~ If a Class C SPGFCI is provided, the disconnect serving the HVAC equipment shall be marked "Warning: Class C SPGFCI Protection Provided for HVAC Unit."

Exception No. 1: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Exception No. 2: GFCI protection shall not be required for listed HVAC equipment. This exception shall expire September 1, 2026.

Exception No. 3: A listed Class C SPGFCI protection shall be permitted for listed HVAC equipment.

Informational Note: See UL 943C, Outline of Investigation for Special Purpose Ground-Fault Circuit Interrupters, for further information. SPGFCIs marked "HF" or "HF+" do not trip when the frequency weighted differential current is less than the specified value for a Class C, D, or E SPGFCI.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 18:42:17 EDT 2024

Committee Statement

Committee Statement: PC 464: The existing language for permission of using the SPGFCI was written into an exception. In addition, it was clarified that the SPGFCI for this application that is permitted is the Class C SPGFCI. The date was removed to permit the use of this technology when the code is adopted and not prohibit its use before 9/1/2026.

PC 2035: A new marking requirement is added for the disconnect that serves HVAC equipment protected by a Class C SPGFCI. This will provide information for the electrical worker noting that there is protection but it is not a class A GFCI. This information could provide additional information for possible troubleshooting. It will not cause the electrical worker to do anything different while work is performed but will raise awareness on the level of protection provided.

See also SR-7539.

Response Message: SR-7590-NFPA 70-2024

Public Comment No. 464-NFPA 70-2024 [Section No. 210.8(F)]

Public Comment No. 2035-NFPA 70-2024 [Section No. 210.8(F)]

Second Revision No. 7539-NFPA 70-2024 [Section No. 210.8 [Excluding any Sub-Sections]]

A listed ~~Class A or Class A-HF GFCI~~ Class A GFCI shall provide protection in accordance with 210.8(A) through 210.8(F). The GFCI shall be installed in a readily accessible location.

Exception: Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

Informational Note No. 1 : See 215.9 for GFCI protection on feeders.

For the purposes of this section, the distance from receptacles shall be measured as the shortest path the power supply cord connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier.

Informational Note No. 2: See UL 943, *Standard for Ground-Fault Circuit Interrupters* for further information regarding GFCIs marked “HF” or “HF+”. Class A GFCIs marked “HF” or “HF+” are evaluated for use with loads having high frequency leakage currents from power conversion components such as variable speed drives and inverters.

Supplemental Information

File Name	Description	Approved
70_CMP2_210.8_SR7539.docx	For Staff Use	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Mon Oct 14 14:11:19 EDT 2024

Committee Statement

Committee Statement: Removing “or class A HF” and adding a new Informational Note recognizes that the class A GFCI can be marked “HF” or “HF+”. This change maintains the fact that these are Class A GFCIs but offer a technology that can provide shock protection yet provide for a solution that is evaluated for use with loads that have high frequency leakage currents. Creating a Class A HF designation may deviate from OSHA reference for “Class A” GFCI. This marking requirement as shown in the new Informational Note will allow the user to select a Class A GFCI that has been evaluated and listed for specific GFCI requirements at high frequency if determined to be required for the application. This approach is consistent with other common ratings such as Tamper resistant (TR), Hospital Grade, Weather Resistant (WR), Switching Duty (SWD), and High Intensity Discharge (HID). Because this language is in the parent text of 210.8, this solution is available for first level subdivisions (A) through (F).

Response Message: SR-7539-NFPA 70-2024

Public Comment No. 112-NFPA 70-2024 [Section No. 210.8 [Excluding any Sub-Sections]]

Public Comment No. 461-NFPA 70-2024 [Section No. 210.8]

Public Comment No. 1703-NFPA 70-2024 [Section No. 210.8 [Excluding any Sub-Sections]]

Public Comment No. 1470-NFPA 70-2024 [Section No. 210.8 [Excluding any Sub-Sections]]

Public Comment No. 1857-NFPA 70-2024 [Section No. 210.8 [Excluding any Sub-Sections]]

Second Revision No. 7627-NFPA 70-2024 [Section No. 210.11(A)]

(A) Number of Branch Circuits.

The minimum number of branch circuits shall be determined from the total calculated load and the size or rating of the circuits used. In all installations, the number of circuits shall be sufficient to supply the load served. ~~In no case shall the~~ The calculated load on any circuit shall not exceed the maximum specified by 120.11.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 11:59:35 EDT 2024

Committee Statement

Committee Statement: The language is revised to comply with NEC Style Manual 3.1.1.

Response Message: SR-7627-NFPA 70-2024

Public Comment No. 465-NFPA 70-2024 [Section No. 210.11(A)]

Second Revision No. 7631-NFPA 70-2024 [Section No. 210.11(B)]

(B) Load Evenly Proportioned Among Branch Circuits.

Where the load is calculated on the basis of volt-amperes per square meter or per square foot, the wiring system up to and including the branch-circuit panelboard(s) shall be provided to serve not less than the calculated load. This load shall be evenly proportioned among multioutlet branch circuits within the panelboard(s). ~~Branch-circuit OCPD and~~ OCPDs and their associated circuits shall be required to be installed only to serve the connected load.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 12:02:48 EDT 2024

Committee Statement

Committee Statement: This revision aligns with the newly defined term Overcurrent Protective Device (OCPD). This change is related to global PC-1642.

Response Message: SR-7631-NFPA 70-2024

Second Revision No. 7640-NFPA 70-2024 [Section No. 210.12(A)]

(A) Means of Protection.

AFCI protection shall be provided by any of the following means:

(1) A listed combination-type AFCI installed at the origin of the branch circuit to protect the entire branch circuit

(2) A listed branch/feeder-type AFCI installed at the origin of the branch circuit in combination with a listed outlet branch-circuit-type AFCI installed on the branch circuit at the first outlet box, which is marked to indicate that it is the first outlet of the branch circuit

(3) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit-type AFCI installed on the branch circuit at the first outlet box if all of the following conditions are met:

(4) The branch-circuit wiring shall be continuous from the branch-circuit OCPD to the outlet branch-circuit AFCI.

(5) The maximum length of the branch-circuit wiring from the branch-circuit OCPD to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.

(6) The first outlet box shall be marked to indicate that it is the first outlet of the branch circuit.

(7) A listed outlet branch-circuit-type AFCI installed on the branch circuit at the first outlet in combination with a listed branch-circuit OCPD if all of the following conditions are met:

(8) The branch-circuit wiring shall be continuous from the branch-circuit OCPD to the outlet branch-circuit AFCI.

(9) The maximum length of the branch-circuit wiring from the branch-circuit OCPD to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.

(10) The first outlet box shall be marked to indicate that it is the first outlet of the branch circuit.

(11) The combination of the branch-circuit OCPD and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and listed as such.

(12) If metal raceway, metal wireways, metal auxiliary gutters, or Type MC or Type AC cable ~~meeting the applicable requirements of~~ in accordance with 250.118, with metal boxes, metal conduit bodies, and metal enclosures are installed for the portion of the branch circuit between the branch-circuit OCPD and the first outlet, a listed outlet branch-circuit-type AFCI installed at the first outlet to protect the remaining portion of the branch circuit

(13) Where a listed metal or nonmetallic conduit or tubing or Type MC cable is encased in not less than 50 mm (2 in.) of concrete for the portion of the branch circuit between the branch-circuit OCPD and the first outlet, a listed outlet branch-circuit-type AFCI installed at the first outlet to protect the remaining portion of the branch circuit

Informational Note: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Supplemental Information

File Name	Description	Approved

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Submitter Information Verification

Committee: NEC-P02
Submittal Date: Tue Oct 15 13:11:39 EDT 2024

Committee Statement

Committee Statement: The language is revised to comply with NEC Style Manual 4.1.3.
Response Message: SR-7640-NFPA 70-2024

Public Comment No. 466-NFPA 70-2024 [Section No. 210.12(A)]

210.12(A) Means of Protection.
AFCI protection shall be provided by any of the following means:

(1) A listed combination-type AFCI installed at the origin of the branch circuit to protect the entire branch circuit

(2) A listed branch/feeder-type AFCI installed at the origin of the branch circuit in combination with a listed outlet branch-circuit-type AFCI installed on the branch circuit at the first outlet box, which is marked to indicate that it is the first outlet of the branch circuit

(3) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit-type AFCI installed on the branch circuit at the first outlet box if all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit OCPD to the outlet branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit OCPD to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.

c. The first outlet box shall be marked to indicate that it is the first outlet of the branch circuit.

(4) A listed outlet branch-circuit-type AFCI installed on the branch circuit at the first outlet in combination with a listed branch-circuit OCPD if all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit OCPD to the outlet branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit OCPD to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.

c. The first outlet box shall be marked to indicate that it is the first outlet of the branch circuit.

d. The combination of the branch-circuit OCPD and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and listed as such.

(5) If metal raceway, metal wireways, metal auxiliary gutters, or Type MC or Type AC cable ~~meeting the applicable requirements of~~in accordance with 250.118, with metal boxes, metal conduit bodies, and metal enclosures are installed for the portion of the branch circuit between the branch-circuit OCPD and the first outlet, a listed outlet branch-circuit-type AFCI installed at the first outlet to protect the remaining portion of the branch circuit

(6) Where a listed metal or nonmetallic conduit or tubing or Type MC cable is encased in not less than 50 mm (2 in.) of concrete for the portion of the branch circuit between the branch-circuit OCPD and the first outlet, a listed outlet branch-circuit-type AFCI installed at the first outlet to protect the remaining portion of the branch circuit

Informational Note: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Second Revision No. 7738-NFPA 70-2024 [Section No. 210.12(B)]

(B) Dwelling Units.

All 120-volt, nominal, single-phase, 10-, 15-, and 20-ampere branch circuits supplying outlets or devices installed in the following locations shall be protected by any of the means described in 210.12(A).

(1) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) Bathroom lighting outlets

(15) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall not be required for the individual branch circuit supplying an outlet for arc welding equipment in a dwelling unit, its garages, and its accessory buildings.

Informational Note No. 1: See *NFPA 72*-2025, *National Fire Alarm and Signaling Code*, 29.9.4(5) for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 2: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 11:13:14 EDT 2024

Committee Statement

Committee Statement:	Technical substantiation has been provided to support the addition of bathroom lighting outlets to be included in the list of areas with AFCI protection. Bathrooms have been included for several cycles in dormitories. The circuits are the same as other lighting outlets in the dwelling.
Response Message:	SR-7738-NFPA 70-2024

Public Comment No. 1157-NFPA 70-2024 [Section No. 210.12(B)]

Public Comment No. 1742-NFPA 70-2024 [Section No. 210.12(B)]

Public Comment No. 1683-NFPA 70-2024 [Section No. 210.12(B)]

Second Revision No. 7671-NFPA 70-2024 [Section No. 210.13]

210.13 Ground-Fault Protection of Equipment.

(A) Solidly Grounded Wye Electrical Systems.

Each branch-circuit disconnecting means rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with 230.95.

(B) Solidly Grounded DC Electrical Systems.

Each branch-circuit disconnecting means rated 1000 amperes or more and installed on solidly grounded dc electrical systems of more than 150 volts to ground, but not exceeding 1500 volts line-to-line, shall be provided with ground-fault protection of equipment in accordance with 230.95.

Informational Note: See 517.17 for requirements on buildings that contain health care occupancies.

Exception No. 1: This section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the branch circuit and on the load side of any transformer supplying the branch circuit.

Exception No. 3: For fused disconnects, where the available fault current, at the fused disconnect, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38 percent of the available fault current , or if the disconnect switch complies with 240.67(B)(1), 240.67(B)(3), or 240.67(B)(4) and is set to operate at the lower of the calculated minimum arcing current or 38 percent of the available fault current.

Exception No. 4: For circuit breakers, where the available fault current, at the circuit breaker, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the circuit breaker complies with 240.87(B)(2), 240.87(B)(4), 240.87(B)(5), or 240.87(B)(6) and is set to operate at the lower of the calculated minimum arcing current or 38 percent of the available fault current.

Supplemental Information

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Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 14:38:44 EDT 2024

Committee Statement

Committee Statement:	This proposal aligns 210.13 with the first draft action that CMP10 took on 215.10, 230.95 and 240.13, and closes a gap in the Code for DC circuits where similar hazards exist but ground-fault protection of equipment may not be provided.
Response Message:	SR-7671-NFPA 70-2024

Public Comment No. 1894-NFPA 70-2024 [Section No. 210.13]

210.13 Ground-Fault Protection of Equipment.

~~Each branch-circuit disconnecting means rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with 230.95.~~

~~Informational Note: See 517.17 for requirements on buildings that contain health care occupancies.~~

~~*Exception No. 1: This section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.*~~

~~*Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the branch circuit and on the load side of any transformer supplying the branch circuit.*~~

~~*Exception No. 3: For fused disconnects, where the available fault current, at the fused disconnect, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38 percent of the available fault current , or if the disconnect switch complies with 240.67(B)(1), 240.67(B)(3), or 240.67(B)(4) and is set to operate at the lower of the calculated minimum arcing current or 38 percent of the available fault current.*~~

~~*Exception No. 4: For circuit breakers, where the available fault current, at the circuit breaker, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the circuit breaker complies with 240.87(B)(2), 240.87(B)(4), 240.87(B)(5), or 240.87(B)(6) and is set to operate at the lower of the calculated minimum arcing current or 38 percent of the available fault current.*~~

(A) Solidly Grounded Wye Electrical Systems.

Each branch-circuit disconnecting means rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with 230.95.

(B) Solidly Grounded DC Electrical Systems.

Each branch-circuit disconnecting means rated 1000 amperes or more and installed on solidly grounded dc electrical systems of more than 150 volts to ground, but not exceeding 1500 volts line-to-line, shall be provided with ground-fault protection of equipment in accordance with 230.95.

Informational Note: See 517.17 for requirements on buildings that contain health care occupancies.

Exception No. 1: This section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the branch circuit and on the load side of any transformer supplying the branch circuit.

Exception No. 3: For fused disconnects, where the available fault current, at the fused disconnect, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38 percent of the available fault current , or if the disconnect switch complies with 240.67(B)(1), 240.67(B)(3), or 240.67(B)(4) and is set to operate at the lower of the calculated minimum arcing current or 38 percent of the available fault current.

Exception No. 4: For circuit breakers, where the available fault current, at the circuit breaker, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the circuit breaker complies with 240.87(B)(2), 240.87(B)(4), 240.87(B)(5), or 240.87(B)(6) and is set to operate at the lower of the calculated minimum arcing current or 38 percent of the available fault current.

Second Revision No. 7672-NFPA 70-2024 [Section No. 210.14]

210.14 Other ~~Articles~~ Requirements for Specific-Purpose Branch Circuits.

Table 210.14 lists references for specific equipment and applications not located in Chapters 5, 6, and 7 that amend or supplement the requirements of this article.

Table 210.14 Specific-Purpose Branch Circuits

Equipment	Article	Section	
Air-conditioning and refrigerating equipment	-		440.6, 440.31, and 440.32
Busways	-		368.17
Central heating equipment other than fixed electric space-heating equipment	-		422.12
Fixed electric heating equipment for pipelines and vessels	-		427.4
Fixed electric space-heating equipment	-		424.4
Fixed outdoor electrical deicing and snow-melting equipment	-		426.4
Infrared lamp industrial heating equipment	-		422.48 and 424.4
Motors, motor circuits, and controllers	430	Parts III and IV	
Switchboards and panelboards	-		408.52

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 14:43:18 EDT 2024

Committee Statement

Committee Statement: The language is revised to comply with NEC Style Manual 4.1.5.

Editorial correction made by NFPA staff to provide mandatory text in accordance with Section 2.1.7.2 of the NEC Style Manual.

Response Message: SR-7672-NFPA 70-2024

Public Comment No. 468-NFPA 70-2024 [Section No. 210.14]

Second Revision No. 7673-NFPA 70-2024 [Section No. 210.17]

210.17 Guest Rooms and Guest Suites.

Guest rooms and guest suites in the following occupancies that are provided with permanent provisions for cooking shall have branch circuits installed to meet the ~~rules~~ requirements for dwelling units:

(1) Hotels

(2) Motels

(3) Assisted living facilities

(4) Dormitories

Informational Note No. 1: See 210.11(C)(2) and 210.52(F) Exception No. 2 for information on laundry branch circuits and receptacle outlets.

Informational Note No. 2: See NFPA 101-2024, *Life Safety Code*, 3.3.205.12 and A.3.3.205.12(5) for the definition of *assisted living facilities*.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 14:46:42 EDT 2024

Committee Statement

Committee Statement: The language is revised to comply with NEC Style Manual 3.5.1.4.

Response Message: SR-7673-NFPA 70-2024

Public Comment No. 469-NFPA 70-2024 [Section No. 210.17]

Second Revision No. 7674-NFPA 70-2024 [Section No. 210.20]

210.20 Overcurrent Protection.

Branch-circuit conductors and equipment shall be protected ~~by branch-circuit OCPDs~~ by OCPDs that have a rating or setting that complies with 210.20(A) through 210.20(D).

(A) Continuous and Noncontinuous Loads.

Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the OCPDs protecting the branch - circuit ~~OCPDs~~ shall not be less than the noncontinuous load plus 125 percent of the continuous load.

Exception: Where the assembly, including the ~~branch-circuit~~ OCPDs, is listed for operation at 100 percent of its rating, the ampere rating of ~~the branch-circuit OCPD~~ the OCPD shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.

(B) Conductor Protection.

Conductors shall be protected in accordance with 240.4. Flexible cords and fixture wires shall be protected in accordance with 240.5.

(C) Equipment.

The rating or setting of ~~the branch-circuit OCPD~~ the OCPD shall not exceed that specified in the applicable articles for equipment.

(D) Outlet Devices.

The rating or setting shall not exceed that specified in 210.21 for outlet devices.

Supplemental Information

File Name	Description	Approved
70_CMP2_210.20_SR7674.docx	For Staff Use	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 14:52:44 EDT 2024

Committee Statement

Committee Statement: This revision aligns with the newly defined term Overcurrent Protective Device (OCPD). This change is related to global PC-1642.

Response Message: SR-7674-NFPA 70-2024

Second Revision No. 7677-NFPA 70-2024 [Section No. 210.22]

210.22 Permissible Loads, Individual Branch Circuits.

An individual branch circuit shall be permitted to supply any load for which it is rated~~, but in no case shall the load exceed the branch-circuit ampere rating~~ .

Exception: A 10-ampere individual branch circuit shall not be permitted to supply ~~a~~ receptacle ~~outlet~~ outlets .

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 16:31:49 EDT 2024

Committee Statement

Committee Statement: The sentence “but in no case shall the load exceed the branch circuit ampere rating” was deleted for clarity. The exception was revised to comply with the NEC Style Manual 3.5.3 for the use of plural terms.

Response Message: SR-7677-NFPA 70-2024

Public Comment No. 471-NFPA 70-2024 [Section No. 210.22]

Second Revision No. 7678-NFPA 70-2024 [Section No. 210.23]

210.23 Permissible Loads, Multiple-Outlet Branch Circuits.

~~In no case shall the load~~ Branch circuit loads shall not exceed the branch-circuit ampere rating. A branch circuit supplying two or more outlets or receptacles shall supply only the loads specified according to its size in accordance with 210.23(A) through 210.23(E) and as summarized in 210.24.

(A) 10-Ampere Branch Circuits.

10-ampere branch circuits shall be limited to supply any of the following:

(1) Lighting outlets

(2) Dwelling unit exhaust fans on bathroom and laundry room lighting circuits

(B) 15- and 20-Ampere Branch Circuits.

A 15- or 20-ampere branch circuit shall be permitted to supply lighting outlets, lighting units, or other utilization equipment, or any combination of them, and shall comply with 210.23(B)(1) and 210.23(B)(2).

Exception: The small-appliance branch circuits, laundry branch circuits, and bathroom branch circuits required in a dwelling unit(s) by 210.11(C)(1), 210.11(C)(2), and 210.11(C)(3) shall supply only the receptacle outlets specified in that section.

(1) Cord-and-Plug-Connected Equipment Not Fastened in Place.

The rating of any one cord-and-plug-connected utilization equipment not fastened in place shall not exceed 80 percent of the branch-circuit ampere rating.

(2) Utilization Equipment Fastened in Place.

The total rating of utilization equipment fastened in place, other than luminaires, shall not exceed 50 percent of the branch-circuit ampere rating where lighting units, cord-and-plug-connected utilization equipment not fastened in place, or both, are also supplied.

(C) 30-Ampere Branch Circuits.

A 30-ampere branch circuit shall be permitted to supply fixed lighting units with heavy-duty lampholders in other than a dwelling unit(s) or utilization equipment in any occupancy. The rating of any one cord-and-plug-connected utilization equipment shall not exceed 80 percent of the branch-circuit ampere rating.

(D) 40- and 50-Ampere Branch Circuits.

A 40- or 50-ampere branch circuit shall be permitted to supply cooking appliances that are fastened in place in any occupancy. In other than dwelling units, such circuits shall be permitted to supply fixed lighting units with heavy-duty lampholders, infrared heating units, or other utilization equipment.

(E) Branch Circuits Larger Than 50 Amperes.

Branch circuits larger than 50 amperes shall supply only nonlighting outlet loads.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 16:34:51 EDT 2024

Committee Statement

Committee Statement: The language was revised for clarity and to align the language with other code sections.

Response Message: SR-7678-NFPA 70-2024

Public Comment No. 472-NFPA 70-2024 [Section No. 210.23]

Second Revision No. 7682-NFPA 70-2024 [Section No. 210.24]

210.24 Branch-Circuit Requirements — Summary.

The requirements for circuits that have two or more outlets or receptacles, other than the receptacle circuits of 210.11(C)(1), 210.11(C)(2), and 210.11(C)(3), are summarized in Table 210.24(1) for copper conductors and Table 210.24(2) for aluminum and copper-clad aluminum conductors. Table 210.24(1) and Table 210.24(2) provide only a summary of minimum requirements. See 210.19, 210.20, and 210.21 for the specific requirements applying to branch circuits.

Table 210.24(1) Summary of Branch-Circuit Requirements — Copper Conductors

Circuit Rating	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**
Conductors (min. size):	-	-	-	-	-	-
Circuit wires	~~14~~ 16	14	12	10	8	6
Taps	14	14	14	14	12	12
Fixture wires and cords	See 240.5.					
Overcurrent Protection	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**
Outlet devices:	-	-	-	-	-	-
Lampholders permitted	Any type	Any type	Any type	Heavy duty	Heavy duty	Heavy duty
Receptacle rating[1]	Not applicable[2]	15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A
Maximum Load	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**
Permissible load	See 210.23(A).	See 210.23(B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).

[1]For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[2]Branch circuits rated 10-amperes shall not supply 125-Volt through 250-Volt receptacle outlets rated 15-Ampere and larger .

Table 210.24(2) Summary of Branch-Circuit Requirements — Aluminum and Copper-Clad Aluminum Conductors

Circuit Rating	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Conductors (min. size):	-	-	-	-	-	-	
Circuit wires	~~12~~ 14[3]	12	10	8	6	4	
Taps	12	12	12	12	10	10	
Fixture wires and cords	-	-	-				See 240.5.
Overcurrent Protection	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Outlet devices:	-	-	-	-	-	-	
Lampholders permitted	Any type	Any type	Any type	Heavy duty	Heavy duty	Heavy duty	
Receptacle rating[1]	Not applicable[2]	15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A	
Maximum Load	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Permissible load	See 210.23(A).	See 210.23(B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).	

[1]For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[2]Branch circuits rated 10-amperes shall not supply receptacle outlets.

[3] Ampacity shall be applicable only to copper-clad aluminum conductors.

Supplemental Information

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Submitter Information Verification

Committee: NEC-P02
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Committee Statement

Committee Statement: The language was revised to correlate with the CMP-6 revisions to Table 310.16

Response Message: SR-7682-NFPA 70-2024

Public Comment No. 473-NFPA 70-2024 [Section No. 210.24]

Second Revision No. 7687-NFPA 70-2024 [Section No. 210.50]

210.50 Receptacle Outlets.

Receptacle outlets shall be installed as specified in 210.52 through 210.65.

Informational Note: ~~See Informative Annex J for information regarding ADA accessibility design~~ See ICC A117.1-2017, *Accessible and Usable Buildings and Facilities* , for information regarding accessibility for people with disabilities .

(A) Cord Pendants.

A cord connector that is supplied by a permanently connected cord pendant shall be considered a receptacle outlet.

(B) Cord Connections.

A receptacle outlet shall be installed wherever flexible cords with attachment plugs are used. Where flexible cords are permitted to be permanently connected, receptacles shall be permitted to be omitted for such cords.

(C) Appliance Receptacle Outlets.

Appliance receptacle outlets installed in a dwelling unit for specific appliances, such as laundry equipment, shall be installed within 1.8 m (6 ft) of the intended location of the appliance.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 16:56:59 EDT 2024

Committee Statement

Committee Statement: The contents of Annex J has been deleted, therefore this Informational note has been revised to point readers to up-to-date guidance and information regarding accessible design.

Response Message: SR-7687-NFPA 70-2024

Public Comment No. 16-NFPA 70-2024 [Section No. 210.50 [Excluding any Sub-Sections]]

Public Comment No. 474-NFPA 70-2024 [Section No. 210.50]

Second Revision No. 7758-NFPA 70-2024 [Section No. 210.52(A)]

(A) General Provisions.

In every kitchen, family room, dining room, living room, parlor, library, den, sunroom, bedroom, recreation room, or similar room or area of dwelling units, receptacle outlets shall be installed in accordance with the general provisions specified in 210.52(A)(1) through 210.52(A)(~~4~~ 5).

(1) Spacing.

Receptacles shall be installed such that no point measured horizontally along the floor line of any wall space is more than 1.8 m (6 ft) from a receptacle outlet.

(2) Wall Space.

As used in this section, a wall space shall include the following:

(1) Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways and similar openings, fireplaces, stationary appliances, and fixed cabinets that do not have countertops or similar work surfaces

(2) The space occupied by fixed panels in walls, excluding sliding panels

(3) The space afforded by fixed room dividers, such as freestanding bar-type counters or railings

(3) Floor Receptacles.

Receptacle outlets in or on floors shall not be counted as part of the required number of receptacle outlets unless located within 450 mm (18 in.) of the wall.

(4) Countertop and Similar Work Surface Receptacle Outlets.

Receptacles installed for countertop and similar work surfaces as specified in 210.52(C) shall not be considered as the receptacle outlets required by 210.52(A).

(5) Receptacle Outlet Locations Prohibited.

Where receptacle outlets are installed in spaces covered in 210.52(A)(2)(3) and the outlets are below countertops or worksurfaces, they shall not be installed within 610 mm (24 in.) of the countertop or worksurface.

Supplemental Information

File Name	Description	Approved
70_CMP2_210.52_A_SR7758.docx	See attached Word file.	

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 12:25:10 EDT 2024

Committee Statement

Committee Statement: The language is relocated to new subsection 210.52(A)(5) to permit receptacle outlets to be installed on walls of cabinets supporting a countertop or worksurface provided the receptacle outlets are not installed less than 24 inches beneath the countertop. Locating this provision in a new subsection (5) results in the requirement applying to all locations

where a countertop or worksurface is supported by a cabinet or fixed room divider. The reference in 210.52(A) was updated to include the new section.

Response Message: SR-7758-NFPA 70-2024

Public Comment No. 1239-NFPA 70-2024 [Section No. 210.52(A)(2)]

210.52(A) General Provisions.
In every kitchen, family room, dining room, living room, parlor, library, den, sunroom, bedroom, recreation room, or similar room or area of dwelling units, receptacle outlets shall be installed in accordance with the general provisions specified in 210.52(A)(1) through 210.52(A)(5)~~(4)~~.

(1) Spacing.
Receptacles shall be installed such that no point measured horizontally along the floor line of any wall space is more than 1.8 m (6 ft) from a receptacle outlet.

(2) Wall Space.
As used in this section, a wall space shall include the following:

(1) Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways and similar openings, fireplaces, stationary appliances, and fixed cabinets that do not have countertops or similar work surfaces

(2) The space occupied by fixed panels in walls, excluding sliding panels

(3) The space afforded by fixed room dividers, such as freestanding bar-type counters or railings

(3) Floor Receptacles.
Receptacle outlets in or on floors shall not be counted as part of the required number of receptacle outlets unless located within 450 mm (18 in.) of the wall.

(4) Countertop and Similar Work Surface Receptacle Outlets.
Receptacles installed for countertop and similar work surfaces as specified in 210.52(C) shall not be considered as the receptacle outlets required by 210.52(A).

(5) Receptacle Outlet Locations Prohibited

Where receptacle outlets are installed in spaces covered in 210.52(A)(2)(3) and the outlets are below countertops or worksurfaces, they shall not be installed within 610 mm (24 in.) of the countertop or worksurface.

Second Revision No. 7761-NFPA 70-2024 [Section No. 210.52(C)(1)]

(1) Wall Spaces.

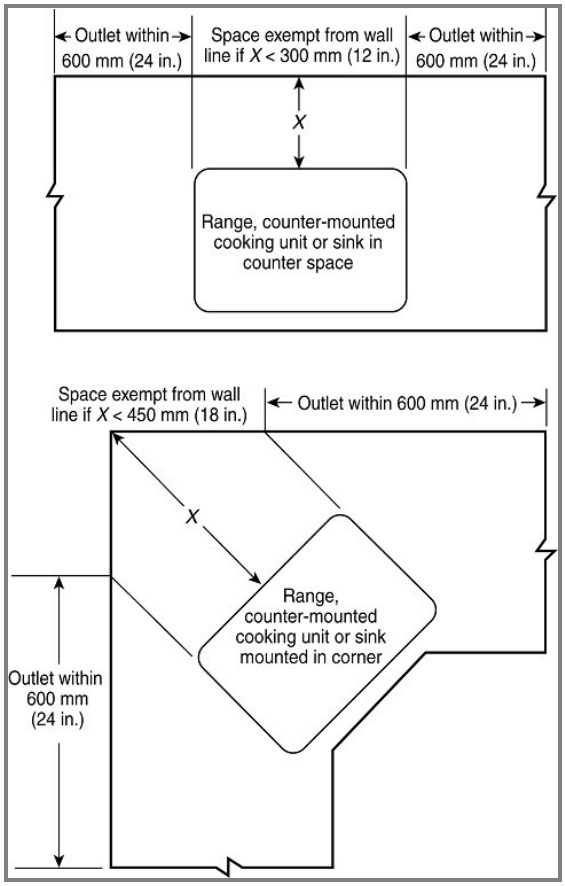
Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space. The location of the receptacles shall be in accordance with 210.52(C)(3).

Exception No. 1: Receptacle outlets shall not be required directly behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52(C)(1).

Exception No. 2: Where a required receptacle outlet cannot be installed in the wall areas shown in Figure 210.52(C)(1), the receptacle outlet shall be permitted to be installed as close as practicable to the countertop area to be served. The total number of receptacle outlets serving the countertop shall not be less than the number needed to satisfy 210.52(C)(1). These outlets shall be located in accordance with 210.52(C)(3).

~~Exception No. 3: Receptacle outlets located in the specified location in 210.52(A)(2)(3) shall not be located within 610 mm (24 in.) of the countertop or worksurface.~~

Figure 210.52(C)(1) Determination of Area Behind a Range, Counter-Mounted Cooking Unit, or Sink.



Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 12:35:24 EDT 2024

Committee Statement

Committee Statement: The requirement is moved to 210.52(A)(5) to permit a receptacle on a wall located on the back side of a cabinet but not within 24 inches of the countertop. This action aligns with the requested action by PC 1348.

Response Message: SR-7761-NFPA 70-2024

Public Comment No. 1238-NFPA 70-2024 [Section No. 210.52(C)(1)]

Second Revision No. 7701-NFPA 70-2024 [Section No. 210.52(C)(3)]

(3) Receptacle Outlet Location.

Receptacle outlets shall be located in one or more of the following:

(1) On or above, but not more than 500 mm (20 in.) above, a countertop or work surface

(2) In a countertop using receptacle outlet assemblies listed for use in countertops

(3) In a work surface using receptacle outlet assemblies listed for use in work surfaces or listed for use in countertops

Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(1) Exception No. 1 or appliances occupying assigned spaces shall not be considered as these required outlets.

Informational Note No. 1: See 406.14(E) for installation of receptacles in countertops and 406.14(F) for installation of receptacles in work surfaces. See 380.10 for installation of multioutlet assemblies.

Informational Note No. 2: See ~~Informative Annex J and~~ ANSI/ICC A117.1-2017,~~*Standard on Accessible*~~ *Accessible and Usable Buildings and Facilities*, ~~for additional information~~ for information regarding accessibility for people with disabilities .

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 17:57:06 EDT 2024

Committee Statement

Committee Statement: The Informational Note is revised to address the removal of content in Annex J. This action aligns with the requested action by PC 1348.

Response Message: SR-7701-NFPA 70-2024

Public Comment No. 18-NFPA 70-2024 [Section No. 210.52(C)(3)]

Public Comment No. 475-NFPA 70-2024 [Section No. 210.52(C)]

Second Revision No. 7762-NFPA 70-2024 [Section No. 210.52(C)(4)]

(4) Receptacle Outlet Locations Prohibited.

Required and permitted receptacle outlets ~~shall not be installed on cabinet sides or~~ installed in a location that is accessible outside the cabinet or wall surfaces that are below countertops and work surfaces ~~. Required and permitted receptacle~~ shall comply with the following:

(1) Receptacle outlets shall not be installed on adjacent walls extending from the base cabinets within 610 mm (24 in.)~~- horizontally and downward from the countertop and work surface edge~~

(2) Receptacle outlets beneath countertops shall not be located within 610 mm (24 in.) ~~vertically.~~ of the countertop or worksurface

Exception No. 1: Receptacle outlets installed in a drawer shall be permitted to be installed below countertops and work surfaces.

~~*Exception No. 2: Receptacle outlets located in the specified location in 210.52(A)(2) shall not be located within 610 mm (24 in.) of the countertop or worksurface.*~~

Supplemental Information

File Name	Description	Approved
NEC-CMP-2_SR-7762_210.52_C_4_.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 12:39:29 EDT 2024

Committee Statement

Committee Statement: The language is revised to clarify the restricted locations for receptacle outlets extending beyond and below the countertop surface. The language is moved to 210.52(A)(5) to permit a receptacle on a wall located on the back side of a cabinet but not within 24 inches of the countertop.

Response Message: SR-7762-NFPA 70-2024

Public Comment No. 1348-NFPA 70-2024 [Section No. 210.52(C)]

Public Comment No. 1241-NFPA 70-2024 [Section No. 210.52(C)(4)]

[210.52(C)]

(4) Receptacle Outlet Locations Prohibited.

Required and permitted receptacle outlets ~~shall not be~~ installed ~~on~~ in a location that is accessible outside the cabinet ~~sides~~ or wall surfaces that are below countertops and work surfaces shall comply with the following: ~~. Required and permitted receptacle outlets shall not be installed on adjacent walls extending from the base cabinets within 610 mm (24 in.) horizontally and downward from the countertop and work surface edge within 610 mm (24 in.) vertically.~~

Commented [SB1]: Move text to list item (1)

(1) ~~Required and permitted receptacle~~Receptacle outlets shall not be installed on adjacent walls extending from the base cabinets within 610 mm (24 in.) ~~horizontally and downward from the countertop and work surface edge within 610 mm (24 in.) vertically.~~

(2) Receptacle outlets beneath countertops shall not be located within 610 mm (24 in.) of the countertop or worksurface

Exception ~~No. 1~~: Receptacle outlets installed in a drawer shall be permitted to be installed below countertops and work surfaces.

~~*Exception No. 2: Receptacle outlets located in the specified location in 210.52(A)(2) shall not be located within 610 mm (24 in.) of the countertop or worksurface.*~~

Second Revision No. 7704-NFPA 70-2024 [Section No. 210.52(D)(2)]

(2) Receptacle Outlet Location.

The receptacle outlet shall be located on a wall or partition that is adjacent to the sink or sink countertop, located on the countertop, or installed on the side or face of the sink cabinet. ~~In no case shall the receptacle be~~ Receptacles shall not be located more than 300 mm (12 in.) below the top of the sink or sink countertop.

Submitter Information Verification

Committee: NEC-P02
Submittal Date: Tue Oct 15 18:07:23 EDT 2024

Committee Statement

Committee Statement: The language is revised per the NEC Style Manual.
Response Message: SR-7704-NFPA 70-2024

Public Comment No. 476-NFPA 70-2024 [Section No. 210.52(D)]

Second Revision No. 7709-NFPA 70-2024 [Section No. 210.60]

210.60 Guest Rooms and Guest Suites of Hotels, Motels, and Dormitories.

(A) General.

Guest rooms or guest suites in hotels, motels, and dormitories shall have receptacle outlets installed in accordance with 210.52(A) and 210.52(D). Guest rooms or guest suites provided with permanent provisions for cooking shall have receptacle outlets installed in accordance ~~with all of the applicable rules in~~ with 210.52.

(B) Receptacle Placement.

The total number of receptacle outlets shall not be less than required in 210.52(A). These receptacle outlets shall be permitted to be located conveniently for permanent furniture layout. At least two receptacle outlets shall be readily accessible. Where receptacles are installed behind the bed, the receptacle shall be located to prevent the bed from contacting any attachment plug that may be installed or the receptacle shall be provided with ~~a suitable guard~~ a guard to prevent physical damage of the attachment plug .

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 18:23:29 EDT 2024

Committee Statement

Committee Statement: The language has been revised to comply with the NEC Style Manual 4.1.3. The term “suitable guard” was modified as the language was vague and unenforceable per the NEC Style Manual 3.2.1.

Response Message: SR-7709-NFPA 70-2024

Public Comment No. 477-NFPA 70-2024 [Section No. 210.60]

Second Revision No. 7716-NFPA 70-2024 [Section No. 210.63(B)]

(B) Other Electrical Equipment.

In other than within a dwelling unit, a receptacle outlet shall be required ~~for premises wiring~~ for wiring systems that include a solidly grounded system operating at less than 150 volts to ground. The receptacle outlet shall be located within the same room or area as indoor switchboards, switchgear, panelboards, motor control centers, and service equipment.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue Oct 15 18:53:41 EDT 2024

Committee Statement

Committee Statement: The language has been revised to remove the “premises” as it does not add any further clarity to the sentence.

Response Message: SR-7716-NFPA 70-2024

Public Comment No. 478-NFPA 70-2024 [Section No. 210.63(B)]

Second Revision No. 7766-NFPA 70-2024 [Section No. 210.70(A)(1)]

(1) Habitable Rooms, Kitchens, Laundry Areas, and Bathrooms.

At least one lighting outlet controlled by a wall switch or listed wall-mounted control device shall be installed in every habitable room, kitchen, laundry area, and bathroom. The wall switch or wall-mounted control device shall be located near an entrance to the room on a wall.

Exception No. 1: In other than kitchens, laundry areas, and bathrooms, one or more receptacles controlled by a wall switch or listed wall-mounted control device shall be permitted in lieu of lighting outlets.

Exception No. 2: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to wall switches or listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.

Exception No. 3: A lighting outlet and its control switch installed to provide illumination to the laundry area shall be permitted to be installed outside the laundry area where a closet houses the laundry equipment.

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 12:49:58 EDT 2024

Committee Statement

Committee Statement: Exception 3 is added to permit the lighting outlet and control switch to be located outside a small laundry area in order to adequately illuminate the area.

Response Message: SR-7766-NFPA 70-2024

Public Comment No. 1304-NFPA 70-2024 [Section No. 210.70(A)(1)]

Second Revision No. 7869-NFPA 70-2024 [Definition: Example D.15 Load Calculations Using Power Cont...]

[See attached word document for updates to Example D.15]

Example D.15 Load Calculations Using Power Control Systems (PCS)

A new dwelling has a total service load of 29,040 volt-amperes (121 amperes, 240 volts) calculated according to Article 120, Parts III through VII. The available service from the electric utility is limited to 100 amperes. In order to accommodate the connected loads on the 100 ampere service, a power control system is used in accordance with 120.7. Examples D14(a) through D14(d) illustrate treatment of different PCS configurations in load calculations for the service.

Example D15(a) Monitoring Controlled and Noncontrolled Loads, 50 Ampere EVSE

The EVSE rated at 12,000 volt-amperes (50 amperes, 240 volts) is controlled by a PCS. The PCS is configured to monitor the service and to modulate the EVSE demand whenever the service exceeds the current setpoint of the PCS. The minimum operating current of the EVSE is 0 amperes. The PCS current setpoint is established by qualified personnel at 80 amperes, based on the maximum 80 percent of the 100 ampere OCPD protecting the service. In this configuration, the PCS monitors both controlled and noncontrolled loads, so the controlled EVSE is treated using the minimum operating current of the PCS. The noncontrolled loads are treated as specified in Article 120, Parts III through VII.

Total Load Before Application of the PCS

29,040 volt amperes (121 amperes, 240 volts)

Example D15(a) Monitoring Controlled and Noncontrolled Loads, 50 A EVSE

The EVSE rated at 12,000 volt-amperes (50 amperes, 240 volts) is controlled by a PCS. The PCS is configured to monitor the service and to modulate the EVSE demand whenever the service exceeds the current setpoint of the PCS. The minimum operating current of the EVSE is 0 A. The PCS current setpoint is established by qualified personnel at 80 A, based on the maximum 80 percent of the 100 ampere OCPD protecting the service. In this configuration, the PCS monitors both controlled and noncontrolled loads, so the controlled EVSE is treated using the minimum operating current of the PCS. The noncontrolled loads are treated as specified in Article 120, Parts III through VII.

Total Load Before Application of the PCS

29,040 volt amperes (121 amperes, 240 volts)

Application of the PCS

Noncontrolled loads: Treated according to Article 120, Parts III through VII = 17,040 volt-amperes (71 amperes, 240 volts)

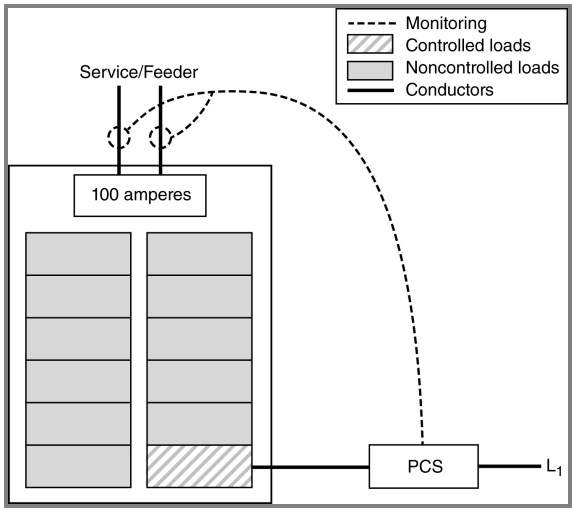
Controlled loads: Treated at minimum operating current of PCS = 0 volt-amperes (0 amperes, 240 volts)

Total Load After Application of the PCS

Total service load is noncontrolled plus controlled loads = 17,040 volt-amperes (71 amperes, 240 volts)

See Figure D.15(a).

Figure D.15(a) Monitoring Controlled and Noncontrolled Loads, 50 Amperes EVSE.



Example D15(b) Monitoring Controlled and Noncontrolled Loads, 30 Amperes EVSE

The EVSE rated at 7,200 volt-amperes (30 amperes, 240 volts) is controlled by a PCS. The PCS is configured to monitor the service and to modulate the EVSE demand whenever the service exceeds the current setpoint of the PCS. The minimum operating current of the EVSE is 8 amperes. The PCS current setpoint is established by qualified personnel at 80 amperes, based on the maximum 80 percent of the 100 ampere OCPD protecting the service. In this configuration, the PCS monitors both controlled and noncontrolled loads, so the controlled EVSE is treated using the minimum operating current of the PCS. The noncontrolled loads are treated as specified in Article 120, Parts III through VII.

Total Load Before Application of the PCS

29,040 volt-amperes (121 amperes, 240 volts)

Application of the PCS

Noncontrolled loads: Treated according to Article 120, Parts III through VII = 21,840 volt-amperes (91 amperes, 240 volts)

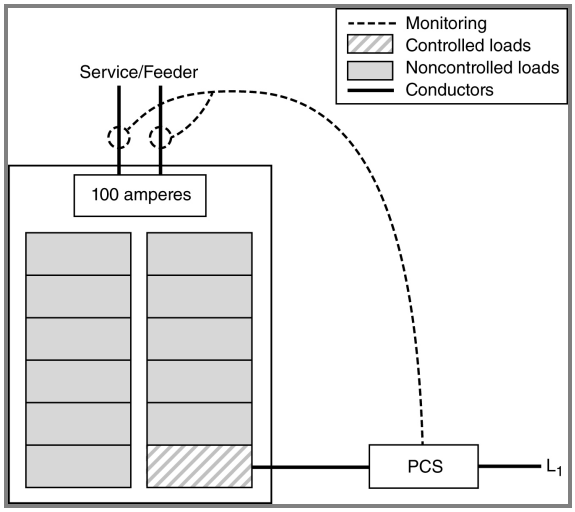
Controlled loads: Treated at minimum operating current of PCS = 1,920 volt-amperes (8 amperes, 240 volts)

Total Load After Application of the PCS

Total service load is noncontrolled plus controlled loads = 23,760 volt-amperes (99 amperes, 240 volts)

See Figure D.15(b).

Figure D.15(b) Monitoring Controlled and Noncontrolled Loads, 30 Amperes EVSE.



Example D15(c) Monitoring Only Controlled Loads, 35 Amperes EVSE, 20 Amperes Pool Pump, and 30 Amperes HVAC Heat Pump

The EVSE rated at 8,400 volt-amperes (35 amperes, 240 volts), pool pump rated at 4,800 volt-amperes (20 amperes, 240 volts) and HVAC heat pump rated at 7,200 volt-amperes (30 amperes, 240 volts) are all placed under PCS control. The PCS is configured to monitor each of the branch circuits serving the three loads being controlled. The PCS modulates the EVSE, pool pump and HVAC heat pump loads to ensure that their combined demand does not exceed the current setpoint of the PCS. The PCS current setpoint is established by qualified personnel at 35 amperes, which is less than the maximum 80 percent of the 100 ampere OCPD protecting the service. Each individual branch circuit remains protected by its own OCPD. In this configuration, the PCS monitors only the controlled loads, so the controlled EVSE, pool pump, and HVAC heat pump are treated in service load calculations using the PCS current setpoint of 35 amperes. The noncontrolled loads are treated as specified in Article 120, Parts III through VII.

Total Load Before Application of the PCS

29,040 volt amperes (121 amperes, 240 volts)

Application of the PCS

Noncontrolled loads: Treated according to Article 120, Parts III through VII = 14,640 volt-amperes (61 amperes, 240 volts)

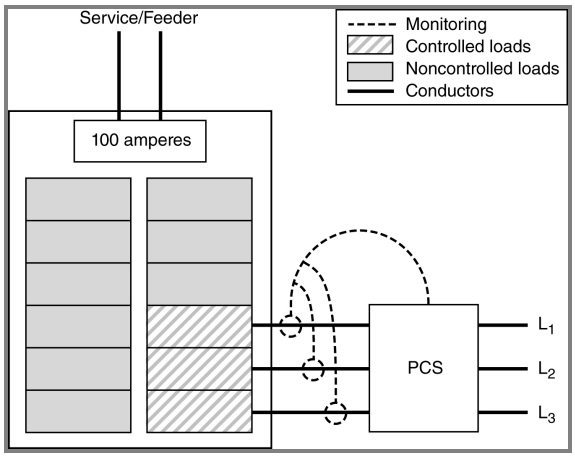
Controlled loads: Treated at current setpoint of PCS = 8,400 volt-amperes (35 amperes, 240 volts)

Total Load After Application of the PCS

Total service load is noncontrolled plus controlled loads = 23,040 volt-amperes (96 amperes, 240 volts)

See Figure D.15(c).

Figure D.15(c) Monitoring Only Controlled Loads, 35 Amperes EVSE, 20 Amperes Pool Pump, and 30 Amperes HVAC Heat Pump.



Example D15(d) Monitoring Only Controlled Loads, All Loads Controlled

The PCS is configured to monitor the service and to modulate all loads. The PCS current setpoint is established by qualified personnel at 80 amperes, based on the maximum 80 percent of the 100 ampere OCPD protecting the service. In this configuration, the PCS monitors only controlled loads, so the controlled loads are treated in service load calculations using the PCS current setpoint of 80 amperes.

Total Load Before Application of the PCS

29,040 volt amperes (121 amperes, 240 volts)

Application of the PCS

Noncontrolled loads: Treated according to Article 120, Parts III through VII = 0 volt-amperes (0 amperes, 240 volts)

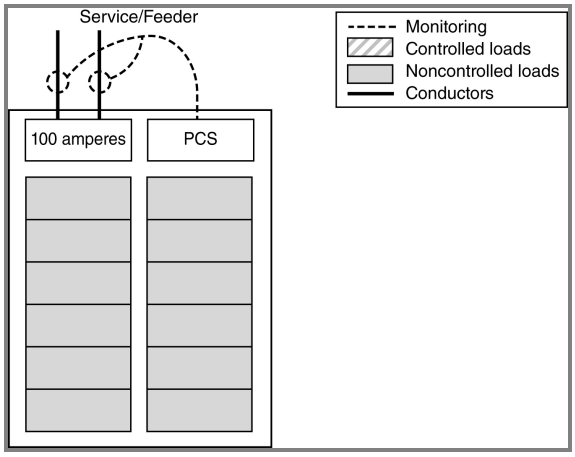
Controlled loads: Treated at current setpoint current of PCS = 19,200 volt-amperes (80 amperes, 240 volt)

Total Load After Application of the PCS

Total service load is noncontrolled plus controlled loads = 19,200 volt-amperes (80 amperes, 240 volt)

See Figure D.15(d).

Figure D.15(d) Monitoring Only Controlled Loads, All Loads Controlled.



Supplemental Information

File Name	Description	Approved
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70_CMP2_AnnexD_FigureD.15_d_SR7869.docx	For editorial use only	
70_CMP2_AnnexD_ExD.15_SR7869.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Wed Oct 16 20:02:35 EDT 2024

Committee Statement

Committee Statement: The language in Example D.15 was modified to align with the changes that were made in Section 120.7. For PC 1942, refer to actions taken on PC 1939, as not all suggested revisions were included in the Second Revision to 120.7.

Figure D.15(D) was corrected to show that the PCS is monitoring only controlled loads.

The titles to Examples D15(a) and D15(b) were expanded to provide additional information regarding the content of those examples.

There was an error in the first revision that resulted in duplicate text in the beginning of Example D.15(a). This duplicate text is removed.

Example D15(c) was incorrect, as it mentioned monitoring all loads, which was not consistent with the drawing. The example was modified to address recommendations in PC 1850 and ensure the drawing and the calculations in the example accurately reflect application of the requirements in 120.7.

Response Message: SR-7869-NFPA 70-2024

Public Comment No. 1942-NFPA 70-2024 [Definition: Example D.15 Load Calculations Using Power Cont...]

Public Comment No. 1850-NFPA 70-2024 [Definition: Example D15(b) Monitoring Controlled and Noncon...]

Public Comment No. 88-NFPA 70-2024 [Definition: Total Load After Application of the PCS]

Example D.15 Load Calculations Using Power Control Systems (PCS)

A new dwelling has a total service load of 29,040 volt-amperes (121 amperes, 240 volts) calculated according to Article 120, Parts III through VII. The available service from the electric utility is limited to 100 amperes. In order to accommodate the connected loads on the 100 ampere service, a power control system is used in accordance with 120.7. Examples D14(a) through D14(d) illustrate treatment of different PCS configurations in load calculations for the service.

~~*Example D15(a) Monitoring Controlled and Noncontrolled Loads, 50 Ampere EVSE*~~

~~The EVSE rated at 12,000 volt-amperes (50 amperes, 240 volts) is controlled by a PCS. The PCS is configured to monitor the service and to modulate the EVSE demand whenever the service exceeds the current setpoint of the PCS. The minimum operating current of the EVSE is 0 amperes. The PCS current setpoint is established by qualified personnel at 80 amperes, based on the maximum 80 percent of the 100 ampere OCPD protecting the service. In this configuration, the PCS monitors both controlled and noncontrolled loads, so the controlled EVSE is treated using the minimum operating current of the PCS. The noncontrolled loads are treated as specified in Article 120, Parts III through VII.~~

~~*Total Load Before Application of the PCS*~~

~~29,040 volt amperes (121 amperes, 240 volts)~~

*Example D15(a) Monitoring Controlled and Noncontrolled Loads, 50 A*mperes *EVSE*, *with a Minimum Operating Current of 0 Amperes*

The EVSE rated at 12,000 volt-amperes (50 amperes, 240 volts) is controlled by a PCS. The PCS is configured to monitor the service and to modulate the EVSE demand whenever the service exceeds the control setting ~~current setpoint~~ of the PCS. The minimum operating current of the EVSE is 0 A. The PCS control setting ~~current setpoint~~ is established by qualified personspersonnel ~~personnel~~ at 80 A, based on the maximum 80 percent of the 100 ampere OCPD protecting the service. In this configuration, the PCS monitors both controlled and noncontrolled loads, so the ~~controlled EVSE is treated using the~~ minimum operating current of the controlled load is used in place of the controlled load~~PCS~~. The noncontrolled loads are treated as specified in Article 120, Parts III through VII.

Total Load Before Application of the PCS

29,040 volt amperes (121 amperes, 240 volts)

Application of the PCS

Noncontrolled loads: Treated according to Article 120, Parts III through VII = 17,040 volt-amperes (71 amperes, 240 volts)

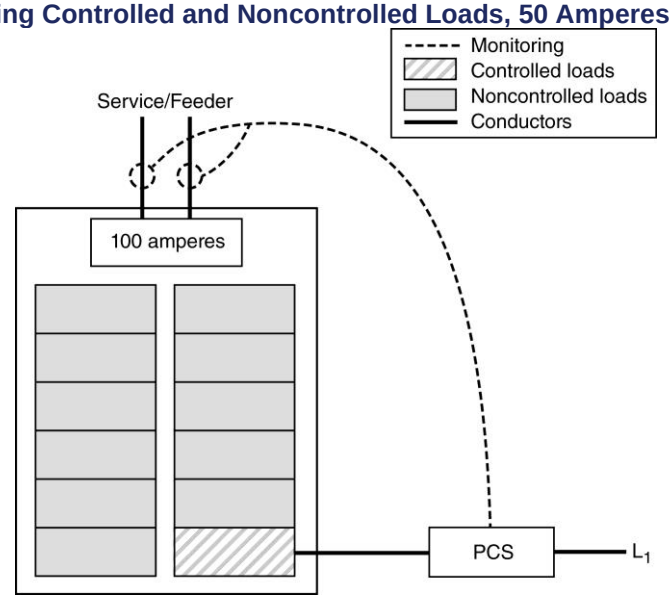
Controlled loads: Treated at minimum operating current of the controlled loads~~PCS~~ = 0 volt-amperes (0 amperes, 240 volts)

Total Load After Application of the PCS

Total service load is noncontrolled plus controlled loads = 17,040 volt-amperes (71 amperes, 240 volts)

See Figure D.15(a).

Figure D.15(a) Monitoring Controlled and Noncontrolled Loads, 50 Amperes EVSE.



Example D15(b) Monitoring Controlled and Noncontrolled Loads, 30 Amperes EVSE with a Minimum Operating Current of 8 Amperes

The EVSE rated at 7,200 volt-amperes (30 amperes, 240 volts) is controlled by a PCS. The PCS is configured to monitor the service and to modulate the EVSE demand whenever the service exceeds the control settingcurrent setpoint of the PCS. The minimum operating current of the EVSE is 8 amperes. The PCS control settingcurrent setpoint is established by qualified personspersonnel at 80 amperes, based on the maximum 80 percent of the 100 ampere OCPD protecting the service. In this configuration, the PCS monitors both controlled and noncontrolled loads, so the controlled EVSE is treated using the minimum operating current of the controlled load is used in place of the controlled loadPCS. The noncontrolled loads are treated as specified in Article 120, Parts III through VII.

Total Load Before Application of the PCS

29,040 volt-amperes (121 amperes, 240 volts)

Application of the PCS

Noncontrolled loads: Treated according to Article 120, Parts III through VII = 21,840 volt-amperes (91 amperes, 240 volts)

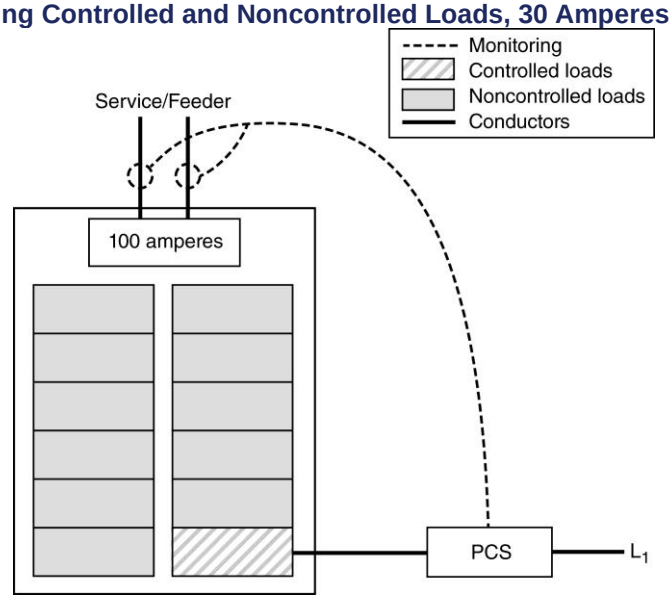
Controlled loads: Treated at minimum operating current of the controlled loadsPCS = 1,920 volt-amperes (8 amperes, 240 volts)

Total Load After Application of the PCS

Total service load is noncontrolled plus controlled loads = 23,760 volt-amperes (99 amperes, 240 volts)

See Figure D.15(b).

Figure D.15(b) Monitoring Controlled and Noncontrolled Loads, 30 Amperes EVSE.



Example D15(c) Monitoring Only Controlled Loads, 35 32 Amperes EVSE, 20 Amperes Pool Pump, and 30 Amperes HVAC Heat Pump

The EVSE rated at 7,6808,400 volt-amperes (3235 amperes, 240 volts), pool pump rated at 4,800 volt-amperes (20 amperes, 240 volts) and HVAC heat pump rated at 7,200 volt-amperes (30 amperes, 240 volts) placed under PCS control and are all connected to one branch circuit with OCPD rating of 40 amperes.are all placed under PCS control. The PCS is configured to monitor the 40 ampere branch circuit and to modulateeach of the branch circuits serving the three loads being controlled. The PCS modulates the EVSE, pool pump and HVAC heat pump loads to ensure that their combined demand does not exceed the control settingcurrent setpoint of the PCS. As the PCS monitors the 40 ampere branch circuit to provide overload control, tThe PCS control settingcurrent setpoint is established by qualified personspersonnel at 35 32 amperes, based on which is less than the maximum 80 percent of the 100 ampere OCPD protecting the branch circuitservice. Each individual branch circuit remains protected by its own OCPD. In this configuration, the PCS monitors only the controlled loads, so the controlled EVSE, pool pump, and HVAC heat pump are treated in service load calculations using the PCS control

settingcurrent setpoint of 35 32 amperes. The noncontrolled loads are treated as specified in Article 120, Parts III through VII.

Total Load Before Application of the PCS

29,040 volt amperes (121 amperes, 240 volts)

Application of the PCS

Noncontrolled loads: Treated according to Article 120, Parts III through VII = 29,040 – 7,680 – 4,800 – 7,200 = 14,6409,360 volt-amperes (3961 amperes, 240 volts)

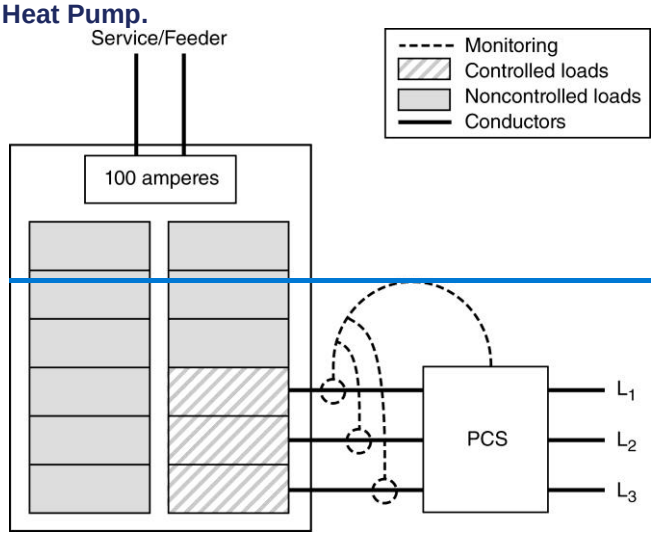
Controlled loads: Treated at control settingcurrent setpoint of PCS = 7,6808,400 volt-amperes (3235 amperes, 240 volts)

Total Load After Application of the PCS

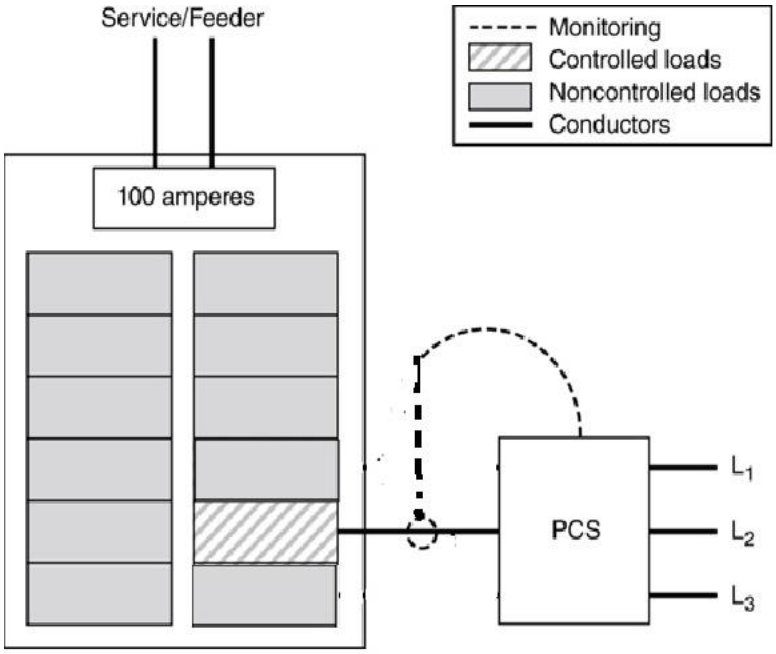
Total service load is noncontrolled plus controlled loads = 23,04017,040 volt-amperes (7196 amperes, 240 volts)

See Figure D.15(c).

Figure D.15(c) Monitoring Only Controlled Loads, 35 32 Amperes EVSE, 20 Amperes Pool Pump, and 30 Amperes HVAC Heat Pump.



[Replace Figure D.15(C) as shown below]



Example D15(d) Monitoring Only Controlled Loads, All Loads Controlled

The PCS is configured to monitor the service and to modulate all loads. The PCS control setting~~current setpoint~~ is established by qualified persons~~personnel~~ at 80 amperes, based on the maximum 80 percent of the 100 ampere OCPD protecting the service. In this configuration, the PCS monitors only controlled loads, so the controlled loads are treated in service load calculations using the PCS control setting~~current setpoint~~ of 80 amperes.

Total Load Before Application of the PCS

29,040 volt amperes (121 amperes, 240 volts)

Application of the PCS

Noncontrolled loads: Treated according to Article 120, Parts III through VII = 0 volt-amperes (0 amperes, 240 volts)

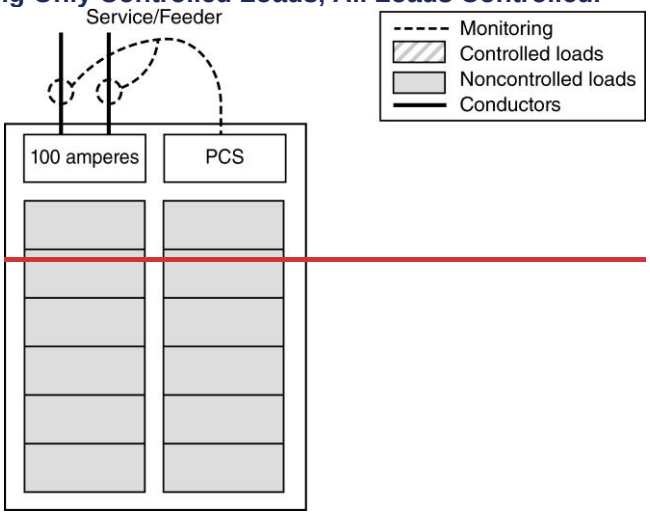
Controlled loads: Treated at control setting~~current setpoint current~~ of PCS = 19,200 volt-amperes (80 amperes, 240 volt)

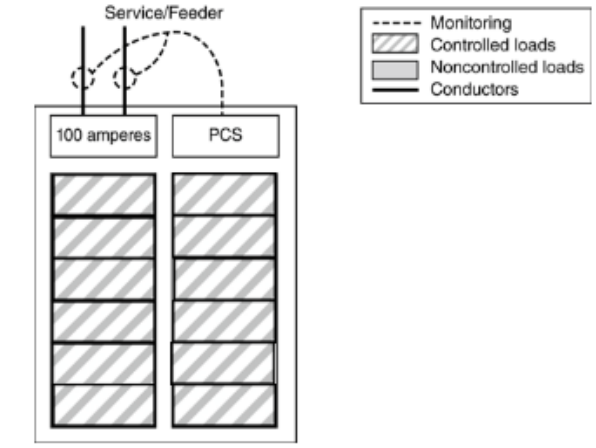
Total Load After Application of the PCS

Total service load is noncontrolled plus controlled loads = 19,200 volt-amperes (80 amperes, 240 volt)

See Figure D.15(d).

Figure D.15(d) Monitoring Only Controlled Loads, All Loads Controlled.




Service/Feeder
100 amperes
PCS
Monitoring
Controlled loads
Noncontrolled loads
Conductors

Second Revision No. 7950-NFPA 70-2024 [Definition: Example D1(a) One-Family Dwelling]

[See attached word document for updates to Example D1(a)]

Example D1(a) One-Family Dwelling

The dwelling has a floor area of 1500 ft^2, exclusive of an unfinished cellar not adaptable for future use, unfinished attic, and open porches. Appliances are a 12-kW, 120/240 volt range and a 5.5-kW, 120/240 volt clothes dryer. Assume range and dryer kW ratings equivalent to kVA ratings in accordance with 120.54 and 120.55.

Calculated Load

(see 120.40)

General Lighting Load

1500 ft^2 at ~~3 VA~~ 2 VA /ft^2 = ~~4500 VA~~ 3000 VA

Minimum Number of Branch Circuits Required

[see 210.11(A)]

General Lighting Load :

~~4500 VA ÷ 120 V = 38 A~~

For Branch Circuits in Dwelling Unit (see 120.13):

1500 ft^2 at 3 volt-amperes/ft^2 = 1500 x 3 = 4500 VA ÷120 V = 37.5 A

This requires three 15-A, 2-wire or two 20-A, 2-wire circuits.

Small-Appliance Load: Two 2-wire, 20-A circuits *[see 210.11(C)(1)]*

Laundry Load: One 2-wire, 20-A circuit *[see 210.11(C)(2)]*

Bathroom Branch Circuit: One 2-wire, 20-A circuit (no additional load calculation is required for this circuit) *[see 210.11(C)(3)]*

Minimum Size Feeder Required

[see 120.40]

General Lighting		~~4~~ 3 ,~~500 VA~~ 000 VA
Small Appliance		3,000 VA
Laundry		1,500 VA
	Total	~~9~~ 7 ,~~000 VA~~ 500 VA
3000 VA at 100%		3,000 VA
~~9000 VA~~ 7500 VA – 3000 VA = ~~6000 VA~~ 4500 VA at 35%		~~2~~ 1 ,~~100 VA~~ 575 VA
	Net Load	~~5~~ 4 ,~~100 VA~~ 575 VA
Range *(see Table 120.55)*		8,000 VA
Dryer Load *(see Table 120.54)*		5,500 VA
Net Calculated Load		~~18~~ 10 ,~~600 VA~~ 075 VA

Net Calculated Load for 120/240-V, 3-wire, single-phase service or feeder

18,~~600 VA~~ 075 VA ÷ 240 V = ~~78 A~~ 75 A

Sections 230.42(B) and 230.79(C) require service conductors and disconnecting means rated not less than 100 amperes.

Calculation for Neutral for Feeder and Service

Lighting and Small-Appliance Load		~~5~~ 4 ,~~100 VA~~ 575 VA
Range: 8000 VA at 70% *(see 120.61)*		5,600 VA
Clothes Dryer (see 120.54) : 5500 VA at 70% *(see 120.61)*		3,850 VA
	Total	14,~~550 VA~~ 025 VA

Calculated Load for Neutral

14,~~550 VA~~ 025 VA ÷ 240 V = ~~61 A~~ 58 A

Supplemental Information

File Name	Description	Approved
70_CMP2_AnnexD_ExD1_a_SR7950.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Thu Oct 17 18:08:48 EDT 2024

Committee Statement

Committee Statement: Example D1(a) is revised to reflect the revisions in Article 120. Additionally, “dryer” is identified as “clothes dryer” to be consistent with other examples and with the requirements in 120.54

Response Message: SR-7950-NFPA 70-2024

Public Comment No. 992-NFPA 70-2024 [Definitions (D): General Lig... to Calculated ...]

Example D1(a) One-Family Dwelling.

The dwelling has a floor area of 1500 ft^2, exclusive of an unfinished cellar not adaptable for future use, unfinished attic, and open porches. Appliances are a 12-kW, 120/240 volt range and a 5.5-kW, 120/240 volt clothes dryer. Assume range and dryer kW ratings equivalent to kVA ratings in accordance with 120.54 and 120.55.

Calculated Load

(see 120.40)

General Lighting Load

1500 ft^2 at 23 VA/ft^2 = 30004500 VA

Minimum Number of Branch Circuits Required

[see 210.11(A)]

General Lighting Load For Branch Circuits in Dwelling Unit (see 120.13):

4500 VA ÷ 120 V = 38 A 1500 ft^2 at 3 volt-amperes/ft^2 = 1500 x 3 = 4500 VA ÷120 V = 37.5 A

This requires three 15-A, 2-wire, or two 20-A, 2-wire, circuits.

Small-Appliance Load: Two 2-wire, 20-A circuits *[see 210.11(C)(1)]*

Laundry Load: One 2-wire, 20-A circuit *[see 210.11(C)(2)]*

Bathroom Branch Circuit: One 2-wire, 20-A circuit (no additional load calculation is required for this circuit) *[see 210.11(C)(3)]*

Minimum Size Feeder Required

[see 120.40]

General Lighting		3,0004,500 VA
Small Appliance		3,000 VA
Laundry		1,500 VA
	Total	9,0007,500 VA
3000 VA at 100%		3,000 VA
750090000 VA – 3000 VA = 450060000 VA at 35%		1,5752,100 VA
	Net Load	5,1004,575 VA
Range *(see Table 120.55)*		8,000 VA
Dryer Load *(see Table 120.54)*		5,500 VA

Net Calculated Load	~~18,600~~ 18,075 VA

Net Calculated Load for 120/240-V, 3-wire, single-phase service or feeder

~~18,600~~18,075 VA ÷ 240 V = ~~78~~ 75 A

Sections 230.42(B) and 230.79(C) require service conductors and disconnecting means rated not less than 100 amperes.

Calculation for Neutral for Feeder and Service

Lighting and Small-Appliance Load		~~5,100~~4,575 VA
Range: 8000 VA at 70% *(see 120.61)*		5,600 VA
Clothes Dryer (see 120.54): 5500 VA at 70% *(see 120.61)*		3,850 VA
	Total	~~14,550~~14,025 VA

Calculated Load for Neutral

~~14,550~~14,025 VA ÷ 240 V = ~~61~~ 58 A

Second Revision No. 7958-NFPA 70-2024 [Definition: Example D1(b) One-Family Dwelling]

[See attached word document for updates to Example D1(b)]

Example D1(b) One-Family Dwelling

Assume same conditions as Example No. D1(a), plus addition of one 6-A, 230-V, room air-conditioning unit and one 12-A, 115-V, room air-conditioning unit,* one 8-A, 115-V, rated waste disposer, and one 10-A, 120-V, rated dishwasher. See Article 430 for general motors and Article 440, Part VII, for air-conditioning equipment. Motors have nameplate ratings of 115 V and 230 V for use on 120-V and 240-V nominal voltage systems.

*(For feeder neutral, use larger of the two appliances for unbalance.)

From Example D1(a), feeder current is ~~78 A~~ 75 A (3-wire, 240 V).

-	Line A	Neutral	Line B
Amperes from Example D1(a)	~~78~~ 75	~~61~~ 58	~~78~~ 75
One 230-V air conditioner	6	—	6
One 115-V air conditioner and 120-V dishwasher	12	12	10
One 115-V disposer	—	8	8
25% of air-conditioner *(see 440.33)*	3	3	2
Total amperes per conductor	~~99~~ 96	~~84~~ 81	~~104~~ 101

Therefore, the service would be rated 110 A.

Supplemental Information

File Name	Description	Approved
70_CMP2_AnnexD_ExD1_b_SR7958.docx		

Submitter Information Verification

Committee: NEC-P02
Submittal Date: Thu Oct 17 18:38:49 EDT 2024

Committee Statement

Committee Statement: Example D1(b) is revised to reflect the changes made in Example D1(a), which was based on revisions in Article 120.

Response Message: SR-7958-NFPA 70-2024

Public Comment No. 1078-NFPA 70-2024 [Definition: Example D1(b) One-Family Dwelling]

Example D1(b) One-Family Dwelling

.

Assume same conditions as Example No. D1(a), plus addition of one 6-A, 230-V, room air-conditioning unit and one 12-A, 115-V, room air-conditioning unit,* one 8-A, 115-V, rated waste disposer, and one 10-A, 120-V, rated dishwasher. See Article 430 for general motors and Article 440, Part VII, for air-conditioning equipment. Motors have nameplate ratings of 115 V and 230 V for use on 120-V and 240-V nominal voltage systems.

*(For feeder neutral, use larger of the two appliances for unbalance.)

From Example D1(a), feeder current is 75~~78~~ A (3-wire, 240 V).

	Line A	Neutral	Line B
Amperes from Example D1(a)	~~78~~75	~~61~~58	~~78~~75
One 230-V air conditioner	6	—	6
One 115-V air conditioner and 120-V dishwasher	12	12	10
One 115-V disposer	—	8	8
25% of air-conditioner *(see 440.33)*	3	3	2
Total amperes per conductor	~~99~~96	~~84~~81	~~104~~101

Therefore, the service would be rated 110 A.

Second Revision No. 7961-NFPA 70-2024 [Definition: Example D2(a) Optional Calculation for One-Fami...]

[See attached word document for updates to Example D2(a)]

Example D2(a) Optional Calculation for One-Family Dwelling, Heating Larger Than Air Conditioning

(see 120.82)

The dwelling has a floor area of 1500 ft^2, exclusive of an unfinished cellar not adaptable for future use, unfinished attic, and open porches. It has a 12-kW range, a 2.5-kW water heater, a 1.2-kW dishwasher, 9 kW of electric space heating installed in five rooms, a 5-kW clothes dryer, and a 6-A, 230-V, room air-conditioning unit. Assume range, water heater, dishwasher, space heating, and clothes dryer kW ratings equivalent to kVA.

Air Conditioner kVA Calculation

6 A × 230 V ÷ 1000 = 1.38 kVA

This 1.38 kVA [item 1 from 120.82(C)] is less than 40% of 9 kVA of separately controlled electric heat [item 6 from 120.82(C)], so the 1.38 kVA need not be included in the service calculation.

General Load

1500 ft^2 at ~~3 VA~~ 2 VA		~~4~~ 3 ,~~500 VA~~ 000 VA
Two 20-A appliance outlet circuits at 1500 VA each		3,000 VA
Laundry circuit		1,500 VA
Range (at nameplate rating)		12,000 VA
Water heater		2,500 VA
Dishwasher		1,200 VA
Clothes dryer		5,000 VA
	Total	~~29~~ 28 ,~~700 VA~~ 200 VA

Application of Demand Factor

[see 120.82(B)]

~~7,880 VA~~ First ~~10 kVA~~ 8,000 VA of general load at 100%		~~10~~ 8 ,~~000 VA~~ 000 VA
Remainder of general load at 40%		
(~~19.7 kVA~~ 20,200 VA × 0.4)	-	8,080 VA
	Total of general load	~~17~~ 16 ,~~880 VA~~ 080 VA
9 kVA of heat at 40% (9000 VA × 0.4) =		3,600 VA
	Total	~~21~~ 19 ,~~480 VA~~ 680 VA

Calculated Load for Service Size

~~21.48 kVA = 21,480 VA~~

~~21,480 VA~~

19,680 VA ÷ 240 V =

~~90 A~~

82 A

Therefore, the minimum service rating would be 100 A in accordance with 230.42 (B) and 230.79 (C) .

Feeder Neutral Load in Accordance with 120.61

1500 ft 2 at

~~3 VA~~

2 VA

~~4~~

3 ,

~~500 VA~~

000 VA

Three 20-A circuits at 1500 VA 4,500 VA

Total

~~9~~

7 ,

~~000 VA~~

500 VA

3000 VA at 100% 3,000 VA

~~9000 VA~~

7500 VA - 3000 VA =

~~6000 VA~~

4500 VA at 35%

~~2~~

1 ,

~~100 VA~~

575 VA

Subtotal

~~5~~

4 ,

~~100 VA~~

575 VA

Range: 8 kVA at 70% 5,600 VA

Clothes dryer

~~: 5 kVA at 70%3,500 VA~~

(see 120.54): 4000 VA at 70% (see 120.61) 2,800 VA

Dishwasher 1,200 VA

Total

~~15~~

14 ,

~~400 VA~~

175 VA

Calculated Load for Neutral

~~15~~

14 ,

~~400 VA~~

175 VA ÷ 240 V=

~~64 A~~

59 A

Supplemental Information

File Name	Description	Approved
70_CMP2_AnnexD_ExD2_a_SR7961.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Thu Oct 17 18:46:43 EDT 2024

Committee Statement

Committee Statement: Example D2(a) is revised to reflect the revisions in Article 120.

Response Message: SR-7961-NFPA 70-2024

Public Comment No. 1079-NFPA 70-2024 [Definition: Example D2(a) Optional Calculation for One-Fami...]

Example D2(a) Optional Calculation for One-Family Dwelling, Heating Larger Than Air Conditioning

(see 120.82)

The dwelling has a floor area of 1500 ft^2, exclusive of an unfinished cellar not adaptable for future use, unfinished attic, and open porches. It has a 12-kW range, a 2.5-kW water heater, a 1.2-kW dishwasher, 9 kW of electric space heating installed in five rooms, a 5-kW clothes dryer, and a 6-A, 230-V, room air-conditioning unit. Assume range, water heater, dishwasher, space heating, and clothes dryer kW ratings equivalent to kVA.

Air Conditioner kVA Calculation

6 A × 230 V ÷ 1000 = 1.38 kVA

This 1.38 kVA [item 1 from 120.82(C)] is less than 40% of 9 kVA of separately controlled electric heat [item 6 from 120.82(C)], so the 1.38 kVA need not be included in the service calculation.

General Load

1500 ft^2 at ~~3~~ 2 VA		~~4,500~~3,000 VA
Two 20-A appliance outlet circuits at 1500 VA each		3,000 VA
Laundry circuit		1,500 VA
Range (at nameplate rating)		12,000 VA
Water heater		2,500 VA
Dishwasher		1,200 VA
Clothes dryer		5,000 VA
	Total	~~29,700~~28,200 VA

Application of Demand Factor
[see 120.82(B)]

First ~~10~~ 8,000 ~~k~~VA of general load at 100%		~~10,000~~8,000 VA
Remainder of general load at 40% (~~19.7~~20,200 ~~k~~VA × 0.4)		~~7,880~~8,080 VA
	Total of general load	~~17,880~~ 16,080VA
9 kVA of heat at 40% (9000 VA × 0.4) =		3,600 VA
	Total	~~21,480~~19,680 VA

Calculated Load for Service Size

~~21.48 kVA = 21,480 VA~~

~~21,480~~19,680 VA ÷ 240 V = 82~~90~~ A

Therefore, the minimum service rating would be 100 A in accordance with 230.42(B) and 230.79(C).

Feeder Neutral Load in Accordance with 120.61

1500 ft^2 at 2~~3~~ VA		~~4,500~~3,000 VA
Three 20-A circuits at 1500 VA		4,500 VA
	Total	~~9,000~~7,500 VA
3000 VA at 100%		3,000 VA
~~9000~~ 7500 VA - 3000 VA = 4500~~6000~~ VA at 35%		~~2,100~~1,575 VA
	Subtotal	~~5,100~~4,575 VA

Range: 8 kVA at 70%		5,600 VA
Clothes dryer (see 120.54): ~~5 k~~4000 VA at 70% (see 120.61)		~~3,500~~2,800 VA
Dishwasher		1,200 VA
	Total	~~15,400~~14,175 VA

Calculated Load for Neutral
~~15,400~~14,175 VA ÷ 240 V= 59~~64~~ A

Second Revision No. 7964-NFPA 70-2024 [Definition: Example D2(b) Optional Calculation for One-Fami...]

[See attached word document for updates to Example D2(b)]

Example D2(b) Optional Calculation for One-Family Dwelling, Air Conditioning Larger Than Heating

[see 120.82(A) and 120.82(C)]

The dwelling has a floor area of 1500 ft^2, exclusive of an unfinished cellar not adaptable for future use, unfinished attic, and open porches. It has two 20-A small appliance circuits, one 20-A laundry circuit, two 4-kW wall-mounted ovens, one 5.1-kW counter-mounted cooking unit, a 4.5-kW water heater, a 1.2-kW dishwasher, a 5-kW ~~combination~~ clothes ~~washer and~~ dryer, six 7-A, 230-V room air-conditioning units, and a 1.5-kW permanently installed bathroom space heater. Assume wall-mounted ovens, counter-mounted cooking unit, water heater, dishwasher, and combination clothes washer and dryer kW ratings equivalent to kVA.

Air Conditioning kVA Calculation

Total amperes = 6 units × 7 A = 42 A

42 A × 240 V ÷ 1000 = 10.08 kVA (assume PF = 1.0)

Load Included at 100%

Air Conditioning: Included below *[see item 1 in 120.82(C)]*

Space Heater:

Omit *[see item 5 in 120.82(C)]*

General Load

1500 ft^2 at ~~3 VA~~ 2 VA		~~4~~ 3 ,~~500 VA~~ 000 VA
Two 20-A small-appliance		-
circuits at 1500 VA each		3,000 VA
Laundry circuit		1,500 VA
Two ovens		8,000 VA
One cooking unit		5,100 VA
Water heater		4,500 VA
Dishwasher		1,200 VA
~~Washer/~~ Clothes dryer		5,000 VA
	Total general load	~~32~~ 31 ,~~800 VA~~ 300 VA
First ~~10 kVA~~ 8000 VA at 100%		~~10~~ 8 ,~~000 VA~~ 000 VA
Remainder at 40%		-
~~(22.8 kVA~~ (23,300 VA × 0.4~~ × 1000~~)		9,~~120 VA~~ 320 VA
	Subtotal general load	~~19~~ 17 ,~~120 VA~~ 320 VA
Air conditioning		10,080 VA
	Total	~~29~~ 27 ,~~200 VA~~ 400 VA

Calculated Load for Service

~~29~~ 27 ,~~200 VA~~ 400 VA ÷ 240 V = ~~122 A~~ 114 A (service rating)

Feeder Neutral Load, in accordance with 120.61

Assume that the two 4-kVA wall-mounted ovens are supplied by one branch circuit, the 5.1-kVA counter-mounted cooking unit by a separate circuit.

1500 ft^2 at ~~3 VA~~ 2 VA		~~4~~ 3 ,~~500 VA~~ 000 VA
Three 20-A circuits at 1500 VA		4,500 VA
	Subtotal	~~9~~ 7 ,~~000 VA~~ 500 VA
3000 VA at 100%		3,000 VA
~~9000 VA~~ 7500 VA - 3000 VA = ~~6000 VA~~ 4500 VA at 35%		~~2~~ 1 ,~~100 VA~~ 575 VA
	Subtotal	~~5~~ 4 ,~~100 VA~~ 575 VA

Two 4-kVA ovens plus one 5.1-kVA cooking unit = 13.1 kVA. Table 120.55 permits 55% demand factor or 13.1 kVA × 0.55 = 7.2 kVA feeder capacity.

	Subtotal from above	~~5~~ 4 ,~~100 VA~~ 575 VA
Ovens and cooking unit: 7200 VA × 70% for neutral load		5,040 VA
Clothes ~~washer/~~ dryer: 5 kVA × 70% for neutral load		3,500 VA
Dishwasher		1,200 VA
	Total	14,~~840 VA~~ 315 VA

Calculated Load for Neutral

14,~~840 VA~~ 315 VA ÷ 240 V = ~~62~~ 60

Supplemental Information

File Name	Description	Approved
70_CMP2_AnnexD_ExD2_b_SR7964.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Thu Oct 17 18:51:40 EDT 2024

Committee Statement

Committee Statement: Example D2(b) is revised to reflect the revisions in Article 120. Additionally, the example is modified to address a “clothes dryer” rather than a “combination clothes washer and dryer”, as 120.61(B)(1) does not address a combination washer/dryer.

Response Message: SR-7964-NFPA 70-2024

Public Comment No. 1345-NFPA 70-2024 [Definitions (D): General Loa... to Calculated ...]

Example D2(b) Optional Calculation for One-Family Dwelling, Air Conditioning Larger Than Heating

[see 120.82(A) and 120.82(C)]

.

The dwelling has a floor area of 1500 ft^2, exclusive of an unfinished cellar not adaptable for future use, unfinished attic, and open porches. It has two 20-A small appliance circuits, one 20-A laundry circuit, two 4-kW wall-mounted ovens, one 5.1-kW counter-mounted cooking unit, a 4.5-kW water heater, a 1.2-kW dishwasher, a 5-kW ~~combination~~ clothes ~~washer and~~ dryer, six 7-A, 230-V room air-conditioning units, and a 1.5-kW permanently installed bathroom space heater. Assume wall-mounted ovens, counter-mounted cooking unit, water heater, dishwasher, and combination clothes washer and dryer kW ratings equivalent to kVA.

Air Conditioning kVA Calculation

.

Total amperes = 6 units × 7 A = 42 A
42 A × 240 V ÷ 1000 = 10.08 kVA (assume PF = 1.0)

Load Included at 100%

.

Air Conditioning: Included below *[see item 1 in 120.82(C)]*
Space Heater:
Omit *[see item 5 in 120.82(C)]*
General Load

1500 ft^2 at ~~23~~ 23 VA		~~4,500~~ 3,000 VA
Two 20-A small-appliance		
circuits at 1500 VA each		3,000 VA
Laundry circuit		1,500 VA
Two ovens		8,000 VA
One cooking unit		5,100 VA
Water heater		4,500 VA
Dishwasher		1,200 VA
~~Washer/dryer~~Clothes dryer		5,000 VA
	Total general load	~~32,800~~31,300 VA
First ~~10 k~~8000 VA at 100%		~~10,000~~8,000 VA
Remainder at 40%		
(~~22.8 k~~23,300 VA × 0.4 ~~× 1000~~)		~~9,120~~9,320 VA
	Subtotal general load	~~19,120~~17,320 VA
Air conditioning		10,080 VA
	Total	~~29,200~~27,400 VA

Calculated Load for Service
~~29,200~~27,400 VA ÷ 240 V = 114~~122~~ A (service rating)

Feeder Neutral Load, in accordance with 120.61

.

Assume that the two 4-kVA wall-mounted ovens are supplied by one branch circuit, the 5.1-kVA counter-mounted cooking unit by a separate circuit.

1500 ft^2 at ~~3~~ 2 VA		~~4,500~~3,000 VA

Three 20-A circuits at 1500 VA		4,500 VA
	Subtotal	~~9,000~~7,500 VA
3000 VA at 100%		3,000 VA
~~9000~~ 7500 VA - 3000 VA = 4500~~6000~~ VA at 35%		~~2,100~~1,575 VA
	Subtotal	~~5,100~~4,575 VA

Two 4-kVA ovens plus one 5.1-kVA cooking unit = 13.1 kVA. Table 120.55 permits 55% demand factor or 13.1 kVA × 0.55 = 7.2 kVA feeder capacity.

	Subtotal from above	~~5,100~~4,575 VA
Ovens and cooking unit: 7200 VA × 70% for neutral load		5,040 VA
Clothes ~~washer/~~dryer: 5 kVA × 70% for neutral load		3,500 VA
Dishwasher		1,200 VA
	Total	~~14,840~~14,315 VA

Calculated Load for Neutral

.

~~14,840~~14,315 VA ÷ 240 V = 60~~62~~

Second Revision No. 7966-NFPA 70-2024 [Definition: Example D2(c) Optional Calculation for One-Fami...]

[See attached word document for updates to Example D2(c)]

Example D2(c) Optional Calculation for One-Family Dwelling with Heat Pump (Single-Phase, 240/120-Volt Service)

(see 120.82)

The dwelling has a floor area of 2000 ft^2, exclusive of an unfinished cellar not adaptable for future use, unfinished attic, and open porches. It has a 12-kW range, a 4.5-kW water heater, a 1.2-kW dishwasher, a 5-kW clothes dryer, and a 2½-ton (24-A) heat pump with 15 kW of ~~backup~~ supplementary heat.

~~***Heat Pump kVA Calculation***~~

~~24 A × 240 V ÷ 1000 = 5.76 kVA~~

~~This 5.76 kVA is less than 15 kVA of the backup heat; therefore, the heat pump load need not be included in the service calculation *[see 120.82(C)]* .~~

General Load

2000 ft 2 at

~~3 VA~~

2 VA

~~6~~

4 ,000 VA

Two 20-A appliance outlet circuits at

3,000 VA

1500 VA each

Laundry circuit	1,500 VA
Range (at nameplate rating)	12,000 VA
Water heater	4,500 VA
Dishwasher	1,200 VA
Clothes dryer	5,000 VA

Subtotal general load

~~33~~

31 ,200 VA

First

~~10 kVA~~

8,000 VA at 100%

~~10~~

8 ,

~~000 VA~~

000 VA

Remainder of general load at 40%

9,280 VA

(23,200 VA × 0.4)

Total net general load

~~19~~

17 ,280 VA

Heat Pump and Supplementary Heat [see 120.82(C)] *

240 V × 24 A = 5760 VA

15 kW Electric Heat:

5760 VA + (15,000 VA × 65%) =

~~5.76 kVA + 9.75 kVA = 15.51 kVA~~

5760 VA + 9750 VA = 15,510 VA

***If**

~~supplementary~~

the heat

~~is not on at~~

pump compressor is prevented from operating at the same time as the supplementary heat

~~pump~~

, the heat pump

~~kVA~~

VA need not be added to the total.

Totals

Net general load

~~19~~

17 ,280 VA

Heat pump and supplementary heat 15,510 VA

Total

~~34~~

32 ,

~~790 VA~~

790 VA

Calculated Load for Service

~~34.79 kVA × 1000~~

32,790 VA ÷ 240 V=

~~145 A~~

137 A

Therefore, this dwelling unit would be permitted to be served by a 150-A service.

Supplemental Information

File Name	Description	Approved
70_CMP2_AnnexD_ExD2_c_SR7966.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Thu Oct 17 18:59:52 EDT 2024

Committee Statement

Committee Statement: Example D2(c) is revised to reflect the revisions in Article 120. Additionally, the statement regarding the “Heat Pump kVA Calculation” is removed, as it is repeated below the table. Lastly, the terminology, and information provided as an “*” note is revised to be consistent with the associated requirement in 120.82(C).

Response Message: SR-7966-NFPA 70-2024

Public Comment No. 1887-NFPA 70-2024 [Definition: Heat Pump kVA Calculation]

Public Comment No. 1347-NFPA 70-2024 [Definitions (D): General Loa... to Calculated ...]

Example D2(c) Optional Calculation for One-Family Dwelling with Heat Pump (Single-Phase, 240/120-Volt Service)
(see 120.82)

.

The dwelling has a floor area of 2000 ft^2, exclusive of an unfinished cellar not adaptable for future use, unfinished attic, and open porches. It has a 12-kW range, a 4.5-kW water heater, a 1.2-kW dishwasher, a 5-kW clothes dryer, and a 2**1/2**-ton (24-A) heat pump with 15 kW of ~~backup~~supplementary heat.

~~*Heat Pump kVA Calculation*~~

~~.~~

~~24 A × 240 V ÷ 1000 = 5.76 kVA~~

~~.~~

~~This 5.76 kVA is less than 15 kVA of the backup heat; therefore, the heat pump load need not be included in the service calculation *[see 120.82(C)]*.~~

General Load

2000 ft^2 at ~~3~~ 2 VA		~~6,000~~4,000 VA
Two 20-A appliance outlet circuits at 1500 VA each		3,000 VA
Laundry circuit		1,500 VA
Range (at nameplate rating)		12,000 VA
Water heater		4,500 VA
Dishwasher		1,200 VA
Clothes dryer		5,000 VA
	Subtotal general load	~~33,200~~31,200 VA
First ~~10 k~~8,000 VA at 100%		~~10,000~~8,000 VA
Remainder of general load at 40% (23,200 VA × 0.4)		9,280 VA
	Total net general load	~~19,280~~17,280 VA

*Heat Pump and Supplementary Heat ~~{~~[see 120.82(C)~~}~~]**

.

240 V × 24 A = 5760 VA

15 kW Electric Heat:

5760 VA + (15,000 VA × 65%) ~~= 5.76~~5760 ~~k~~VA + 9750~~9.75 k~~ VA = 15,510~~15.51 k~~ VA

***If the heat pump compressor is prevented from operating at the same time as the supplementary heat, ~~is not on at same time as heat pump,~~the heat pump ~~k~~VA need not be added to the total.**

Totals

Net general load		~~19,280~~17,280 VA
Heat pump and supplementary heat		15,510 VA
	Total	~~34,790~~32,790 VA

Calculated Load for Service

~~34.79 k~~32,790 VA ~~× 1000~~ ÷ 240 V= 137~~145~~ A

Therefore, this dwelling unit would be permitted to be served by a 150-A service.

Second Revision No. 7967-NFPA 70-2024 [Definition: Example D3 Store Building]

[See attached word document for updates to Example D3]

Example D3 Store Building

A store 80 ft by 60 ft, or 4,800 ft^2, has 30 ft of show window. There are a total of 80 duplex receptacles. The service is 120/240 V, single phase 3-wire service. Actual connected lighting load is 7,000 VA, all of which for this example is considered continuous. All calculations are rounded up or down as permitted in 120.5(B).

Calculated Load

(see 120.40)

Noncontinuous Loads	-	
Receptacle Load *(see 120.47)*	-	
80 receptacles at 180 VA		14,400 VA
10,000 VA at 100%		10,000 VA
14,400 VA - 10,000 VA = 4,400 VA at 50%		2,200 VA
	Subtotal	12,200 VA
Continuous Loads		-
General Lighting*		-
4,800 ft^2 at 1.9 VA/ft^2		9,120 VA
Show Window Lighting Load		-
30 ft at 200 VA/ft *[see 120.14(G)]*		6,000 VA
Outside Sign Circuit *[see 120.14(F)]*		1,200 VA
	Subtotal	16,320 VA
	Subtotal from noncontinuous	12,200 VA
	Total noncontinuous loads +	
	continuous loads =	28,520 VA

*In the example, the actual connected lighting load ~~at 125%~~ (7,000 VA ~~× 1.25 VA~~) is less than the load from Table 120.42(A) (4 , 800 ft^2 x 1.9 VA/ft^2 = 9,120 VA) , so the required minimum lighting load from Table 120.42(A) is used in the calculation. Had the actual lighting load ~~× 125%~~ been greater than the value calculated from Table 120.42(A), the actual connected lighting load would have been used.

Minimum Number of Branch Circuits Required

General Lighting: Branch circuits need only be installed to supply the actual connected load *[see 210.11(B)].*

7,000 VA × 1.25 = 8,750 VA

8,750 VA ÷ 240 V = 36.45 A for 3-wire, 120/240 V

8,750 VA ÷ 120 V = 72.92 A

The lighting load would be permitted to be served by 2-wire or 3-wire, 15- or 20-A circuits with combined capacity equal to 36 A or greater for 3-wire circuits or 73 A or greater for 2-wire circuits. The feeder capacity as well as the number of branch-circuit positions available for lighting circuits in the panelboard must reflect the full calculated load of 9,120 VA. ~~Lighting loads from Table 120.42(A) already include 125% for continuous load. See note at bottom of Table 120.42(A) .~~

Show Window

6,000 VA × 1.25 = 7,500 VA

7,500 VA ÷ 240 V = 31.25 A for 3-wire, 120/240 V

7,500 VA ÷ 120 V = 62.5 A for 2-wire, 120 V

The show window lighting is permitted to be served by 2-wire or 3-wire circuits with a capacity equal to 31 A or greater for 3-wire circuits or 63 A or greater for 2-wire circuits.

Receptacles required by 210.62 are assumed to be included in the receptacle load above if these receptacles do not supply the show window lighting load.

Receptacles

Receptacle Load:

14,400 VA ÷ 240 V = 60 A for 3-wire, 120/240 V

14,400 VA ÷ 120 V = 120 A for 2-wire, 120 V

The receptacle load would be permitted to be served by 2-wire or 3-wire circuits with a capacity equal to 60 A or greater for 3-wire circuits or 120 A or greater for 2-wire circuits.

Minimum Size Feeder (or Service) Overcurrent Protection and Size Conductor

(see 215.~~5~~ 2 or 230.42 and 230. 90)

Subtotal noncontinuous loads		12,200 VA
Subtotal continuous loads ~~not from Table 120.42(A) at~~ multiplied by 125% (~~7,200 VA × 1.25) (sign and show window)~~		~~9,000 VA~~
~~Subtotal of calculated continuous loads with 125% already included~~		~~9,120 VA~~
	~~Total~~	~~30,320 VA~~
~~30,320 VA ÷ 240 V = 126 A~~		
16,320 VA x 125% = 20,400 VA)		20,400 VA
	Total	32,600 VA

32,600 VA ÷ 240 V = 136 A

The next higher standard size is 150 A *(see 240.6).*

Minimum Size Feeders (or Service Conductors) Required

[see 215.4, 230.42(A)]

For 120/240 V, 3-wire system,

~~30~~ 32 ,~~320 VA~~ 600 VA ÷ 240 V = ~~126 A~~ 136 A Service or feeder conductor is ~~1 AWG Cu~~ 1/0 AWG Cu in accordance with 215.5 and Table 310.16 (with 75°C terminations).

Supplemental Information

File Name	Description	Approved
70_CMP2_AnnexD_ExD3_SR7967.docx		

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Thu Oct 17 19:03:03 EDT 2024

Committee Statement

Committee Statement: Example D3 is revised to reflect the revisions in Article 120. This involves the delineation of load calculations based on Article 120 requirements, and sizing of the conductors and OCPD based on requirements in Articles 210, 215 and 230. These changes align with the requirement in 120.5(E).

Response Message: SR-7967-NFPA 70-2024

Public Comment No. 528-NFPA 70-2024 [Annex D]

Example D3 Store Building

.

A store 80 ft by 60 ft, or 4,800 ft^2, has 30 ft of show window. There are a total of 80 duplex receptacles. The service is 120/240 V, single phase 3-wire service. Actual connected lighting load is 7,000 VA, all of which for this example is considered continuous. All calculations are rounded up or down as permitted in 120.5(B).

Calculated Load
(see 120.40)

Noncontinuous Loads		
Receptacle Load *(see 120.47)*		
80 receptacles at 180 VA		14,400 VA
10,000 VA at 100%		10,000 VA
14,400 VA - 10,000 VA = 4,400 VA at 50%		2,200 VA
	Subtotal	12,200 VA
Continuous Loads		
General Lighting*		
4,800 ft^2 at 1.9 VA/ft^2		9,120 VA
Show Window Lighting Load		
30 ft at 200 VA/ft *[see 120.14(G)]*		6,000 VA
Outside Sign Circuit *[see 120.14(F)]*		1,200 VA
	Subtotal	16,320 VA
	Subtotal from noncontinuous	12,200 VA
	Total noncontinuous loads + continuous loads =	28,520 VA

*In the example, the actual connected lighting load ~~at 125%~~ (7,000 VA ~~× 1.25 VA~~) is less than the load from Table 120.42(A) (4,800 ft^2 x 1.9 VA/ft^2 = 9,120 VA), so the required minimum lighting load from Table 120.42(A) is used in the calculation. Had the actual lighting load ~~× 125%~~ been greater than the value calculated from Table 120.42(A), the actual connected lighting load would have been used.

Minimum Number of Branch Circuits Required

.

General Lighting: Branch circuits need only be installed to supply the actual connected load *[see 210.11(B)].*

7,000 VA × 1.25 = 8,750 VA
8,750 VA ÷ 240 V = 36.45 A for 3-wire, 120/240 V
8,750 VA ÷ 120 V = 72.92 A

The lighting load would be permitted to be served by 2-wire or 3-wire, 15- or 20-A circuits with combined capacity equal to 36 A or greater for 3-wire circuits or 73 A or greater for 2-wire circuits. The feeder capacity as well as the number of branch-circuit positions available for lighting circuits in the panelboard must reflect the full calculated load of 9,120 VA. ~~Lighting loads from Table 120.42(A) already include 125% for continuous load. See note at bottom of Table 120.42(A).~~

Show Window

6,000 VA × 1.25 = 7,500 VA
7,500 VA ÷ 240 V = 31.25 A for 3-wire, 120/240 V
7,500 VA ÷ 120 V = 62.5 A for 2-wire, 120 V

The show window lighting is permitted to be served by 2-wire or 3-wire circuits with a capacity equal to 31 A or greater for 3-wire circuits or 63 A or greater for 2-wire circuits.
Receptacles required by 210.62 are assumed to be included in the receptacle load above if these receptacles do not supply the show window lighting load.
Receptacles
.
Receptacle Load:
14,400 VA ÷ 240 V = 60 A for 3-wire, 120/240 V
14,400 VA ÷ 120 V = 120 A for 2-wire, 120 V
The receptacle load would be permitted to be served by 2-wire or 3-wire circuits with a capacity equal to 60 A or greater for 3-wire circuits or 120 A or greater for 2-wire circuits.

Minimum Size Feeder (or Service) Overcurrent Protection and Size Conductor
.
(see 215.25 or 230.42 and 230.90)

Subtotal noncontinuous loads	12,200 VA
Subtotal continuous loads ~~not from Table 120.42(A) at 125% (7,200 VA × 1.25) (sign and show window)~~ multiplied by 125% (16,320 VA x 125% = 20,400 VA)	~~9,000~~20,400 VA
~~Subtotal of calculated continuous loads with 125% already included~~	~~9,120 VA~~
Total	~~30,320~~32,600 VA

~~30,320~~32,600 VA ÷ 240 V = 136~~126~~ A
The next higher standard size is 150 A *(see 240.6).*
Minimum Size Feeders (or Service Conductors) Required
[see 215.4, 230.42(A)]
.
For 120/240 V, 3-wire system,
.
~~30,320~~32,600 VA ÷ 240 V = ~~126~~ 136 A Service or feeder conductor is 1/0 AWG Cu in accordance with 215.5 and Table 310.16 (with 75°C terminations).

Second Revision No. 7972-NFPA 70-2024 [Definition: Example D4(a) Multifamily Dwelling]

[See attached Word document for updates to Example D4(a)]

Example D4(a) Multifamily Dwelling

A multifamily dwelling has 40 dwelling units.

Meters are in two banks of 20 each with individual feeders to each dwelling unit.

One-half of the dwelling units are equipped with 120/240 volt electric ranges not exceeding 12 kW each. Assume range kW rating equivalent to kVA rating in accordance with 120.55. Other half of ranges are gas ranges.

Area of each dwelling unit is 840 ft^2.

Laundry facilities on premises are available to all tenants. Add no circuit to individual dwelling unit.

Calculated Load for Each Dwelling Unit

(see Article 120)

General Lighting: 840 ft^2 at ~~3 VA~~ 2 VA /ft^2 = ~~2520 VA~~ 1680 VA

Special Appliance: Electric range *(see 120.55)* = 8000 VA

Minimum Number of Branch Circuits Required for Each Dwelling Unit

[see 210.11(A)]

General Lighting Load: 2520 VA ÷ 120 V = 21 A or two 15-A, 2-wire circuits; or two 20-A, 2-wire circuits

Small-Appliance Load: Two 2-wire circuits of 12 AWG wire *[see 210.11(C)(1)]*

Range Circuit: 8000 VA ÷ 240 V = 33 A or a circuit of two 8 AWG conductors and one 10 AWG conductor in accordance with 210.19(C)

Minimum Size Feeder Required for Each Dwelling Unit

(see 215.4)

Calculated Load *(see Article 120)*:	
General Lighting	~~2~~ 1 ,~~520 VA~~ 680 VA
Small Appliance (two 20-ampere circuits)	3,000 VA
Subtotal Calculated Load (without ranges)	~~5~~ 4 ,~~520 VA~~ 680 VA

Application of Demand Factor

(see Table 120.45)

First 3000 VA at 100%	3,000 VA
~~5520 VA~~ 4680 VA - 3000 VA = ~~2520 VA~~ 1680 VA at 35%	~~882 VA~~ 588 VA
Net Calculated Load (without ranges)	3,882 VA
Range Load	8,000 VA
Net Calculated Load (with ranges)	11,~~882 VA~~ 588 VA

Size of Each Feeder

(see 215.4)

For 120/240-V, 3-wire system (without ranges)

Net calculated load of ~~3882 VA~~ 3588 VA ÷ 240 V = ~~16 A~~ 15 A

For 120/240-V, 3-wire system (with ranges)

Net calculated load, 11,~~882 VA~~ 588 VA ÷ 240 V = ~~50 A~~ 48 A

Feeder Neutral

Lighting and Small-Appliance Load	3,~~882 VA~~ 588 VA
Range Load: 8000 VA at 70% *(see 120.61)*	5,600 VA
(only for apartments with electric range)	5,600 VA
Net Calculated Load (neutral)	9,~~482 VA~~ 188 VA

Calculated Load for Neutral

~~9482 VA~~ 9188 VA ÷ 240 V= ~~39.5 A~~ 38 A

Minimum Size Feeders Required from Service Equipment to Meter Bank (For 20 Dwelling Units — 10 with Ranges)

Total Calculated Load:	-
Lighting and Small Appliance	-
20 units × ~~5520 V~~ 4680 V	~~110~~ 93 ,~~400 VA~~ 600 VA
Application of Demand Factor	-
First 3000 VA at 100%	3,000 VA
~~110~~ 93 ,~~400 VA~~ 600 VA - 3000 VA = ~~107~~ 90 ,~~400 VA~~ 600 VA at 35%	~~37~~ 31 ,~~590 VA~~ 710 VA
Net Calculated Load	~~40~~ 34 ,~~590 VA~~ 710 VA
Range Load: 10 ranges (not over 12 kVA) *(see Col. C, Table 120.55,25 kW)*	25,000 VA
Net Calculated Load (with ranges)	~~65~~ 59 ,~~590 VA~~ 710 VA

Net calculated load for 120/240-V, 3-wire system,

~~65~~ 59 ,~~590 VA~~ 710 VA ÷ 240 V = ~~273 A~~ 249 A

Feeder Neutral

Lighting and Small-Appliance Load	~~40~~ 34 ,~~590 VA~~ 710 VA
Range Load: 25,000 VA at 70% *[see 120.61(B)]*	17,500 VA
Calculated Load (neutral)	~~58~~ 52 ,~~090 VA~~ 210 VA

Calculated Load for Neutral

~~58~~ 52 ,~~090 VA~~ 210 VA ÷ 240 V = ~~242 A~~ 218 A

Further Demand Factor

[120.61(B)]

200 A at 100%	200 A
~~242 A~~ 218 A - 200 A = ~~42 A~~ 18 A at 70%	~~29 A~~ 13 A
Net Calculated Load (neutral)	~~229 A~~ 213 A

Minimum Size Main Feeders (or Service Conductors) Required (Less House Load) (For 40 Dwelling Units — 20 with Ranges)

Total Calculated Load:	-
Lighting and Small-Appliance Load	-
40 units × ~~5520 V~~ 4680 V	~~220~~ 187 ,~~800 VA~~ 200 VA

Application of Demand Factor

(from Table 120.45)

First 3000 VA at 100%	3,000 VA
Next 120,000 VA - 3000 VA = 117,000 VA at 35%	40,950 VA
Remainder ~~220~~ 187 ,~~800 VA~~ 200 VA - 120,000 VA = ~~100~~ 67 ,~~800 VA~~ 200 VA at 25%	~~25~~ 16 ,~~200 VA~~ 800 VA
Net Calculated Load	~~69~~ 60 ,~~150 VA~~ 750 VA
Range Load: 20 ranges (less than 12 kVA)	-
(see Col. C, Table 120.55)	35,000 VA
Net Calculated Load	~~104~~ 95 ,~~150 VA~~ 750 VA
For 120/240-V, 3-wire system	-

Net calculated load of ~~104~~ 95 ,~~150 VA~~ 750 VA ÷ 240 V = ~~434 A~~ 399 A

Feeder Neutral

Lighting and Small-Appliance Load	~~69~~ 60 ,~~150 VA~~ 750 VA
Range: 35,000 VA at 70% *[see 120.61(B)]*	24,500 VA
Calculated Load (neutral)	~~93~~ 85 ,~~650 VA~~ 250 VA

~~93~~ 85 ,~~650 VA~~ 250 VA ÷ 240 V = ~~390 A~~ 355 A

Further Demand Factor

[see 120.61(B)]

200 A at 100%	200 A
~~390 A~~ 355 A − 200 A = ~~190 A~~ 155 A at 70%	~~133 A~~ 109 A
Net Calculated Load (neutral)	~~333 A~~ 309 A

[See Table 310.16 through Table 310.21, and 310.15(B), (C), and (E).]

Supplemental Information

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70_CMP2_AnnexD_ExD4_a_SR7972.docx		

Submitter Information Verification

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Committee Statement

Committee Statement: Example D4(a) is revised to reflect the revisions in Article 120.
Response Message: SR-7972-NFPA 70-2024

Example D4(a) Multifamily Dwelling

A multifamily dwelling has 40 dwelling units.

Meters are in two banks of 20 each with individual feeders to each dwelling unit.

One-half of the dwelling units are equipped with 120/240 volt electric ranges not exceeding 12 kW each. Assume range kW rating equivalent to kVA rating in accordance with 120.55. Other half of ranges are gas ranges.

Area of each dwelling unit is 840 ft^2.

Laundry facilities on premises are available to all tenants. Add no circuit to individual dwelling unit.

Calculated Load for Each Dwelling Unit
(see Article 120)

General Lighting: 840 ft^2 at ~~23~~ VA/ft^2 = 1680~~2520~~ VA

Special Appliance: Electric range *(see 120.55)* = 8000 VA

Minimum Number of Branch Circuits Required for Each Dwelling Unit
[see 210.11(A)]

General Lighting Load: 2520 VA ÷ 120 V = 21 A or two 15-A, 2-wire circuits; or two 20-A, 2-wire circuits

Small-Appliance Load: Two 2-wire circuits of 12 AWG wire *[see 210.11(C)(1)]*

Range Circuit: 8000 VA ÷ 240 V = 33 A or a circuit of two 8 AWG conductors and one 10 AWG conductor in accordance with 210.19(C)

Minimum Size Feeder Required for Each Dwelling Unit
(see 215.4)

Calculated Load *(see Article 120)*:

General Lighting	~~2,520~~1,680 VA
Small Appliance (two 20-ampere circuits)	3,000 VA
Subtotal Calculated Load (without ranges)	~~5,520~~4,680 VA

Application of Demand Factor
(see Table 120.45)

First 3000 VA at 100%	3,000 VA
~~5520~~ 4680 VA - 3000 VA = ~~2520~~ 1680 VA at 35%	588~~882~~ VA
Net Calculated Load (without ranges)	3,~~882~~ 588 VA
Range Load	8,000 VA
Net Calculated Load (with ranges)	11,~~882~~ 588 VA

Size of Each Feeder
(see 215.4)

For 120/240-V, 3-wire system (without ranges)

Net calculated load of ~~3882~~ 3588 VA ÷ 240 V = ~~16~~ 15 A

For 120/240-V, 3-wire system (with ranges)

Net calculated load, 11,~~882~~ 588 VA ÷ 240 V = ~~50~~ 48 A

Feeder Neutral

Lighting and Small-Appliance Load	~~3,882~~3588 VA
Range Load: 8000 VA at 70% *(see 120.61)*	5,600 VA
(only for apartments with electric range)	5,600 VA
Net Calculated Load (neutral)	~~9,482~~9,188 VA

Calculated Load for Neutral

~~9482~~ 9188 VA ÷ 240 V= ~~39.5~~38 A

Minimum Size Feeders Required from Service Equipment to Meter Bank (For 20 Dwelling Units — 10 with Ranges)

Total Calculated Load:	
Lighting and Small Appliance	
20 units × ~~5520~~ 4680 V	~~110,400~~93,600 VA
Application of Demand Factor	
First 3000 VA at 100%	3,000 VA
~~110,400~~93,600 VA - 3000 VA = ~~107,400~~90,600 VA at 35%	~~37,590~~31,710 VA
Net Calculated Load	~~40,590~~34,710 VA
Range Load: 10 ranges (not over 12 kVA) *(see Col. C, Table 120.55,25 kW)*	25,000 VA
Net Calculated Load (with ranges)	~~65,590~~59,710 VA

Net calculated load for 120/240-V, 3-wire system,

~~65,590~~59,710 VA ÷ 240 V = ~~273~~ 249 A

Feeder Neutral

Lighting and Small-Appliance Load	~~40,590~~34,710 VA
Range Load: 25,000 VA at 70% *[see 120.61(B)]*	17,500 VA
Calculated Load (neutral)	~~58,090~~52,210 VA

Calculated Load for Neutral

~~58,090~~52,210 VA ÷ 240 V = ~~242~~ 218 A

Further Demand Factor
[120.61(B)]

200 A at 100%	200 A
~~242~~ 218 A - 200 A = ~~42~~ 18 A at 70%	~~29~~ 13 A
Net Calculated Load (neutral)	~~229~~ 213 A

Minimum Size Main Feeders (or Service Conductors) Required (Less House Load) (For 40 Dwelling Units — 20 with Ranges)

Total Calculated Load:	
Lighting and Small-Appliance Load	
40 units × ~~5520~~ 4680 V	~~220,800~~187,200 VA

Application of Demand Factor
(from Table 120.45)

First 3000 VA at 100%	3,000 VA

Next 120,000 VA - 3000 VA = 117,000 VA at 35%	40,950 VA
Remainder ~~220,800~~187,200 VA - 120,000 VA = ~~100,800~~67,200 VA at 25%	~~25,200~~16,800 VA
Net Calculated Load	~~69,150~~60,750 VA
Range Load: 20 ranges (less than 12 kVA)	
(see Col. C, Table 120.55)	35,000 VA
Net Calculated Load	~~104,150~~95,750 VA

For 120/240-V, 3-wire system

Net calculated load of ~~104,150~~95,750 VA ÷ 240 V = ~~434~~ 399 A

Feeder Neutral

Lighting and Small-Appliance Load	~~69,150~~60,750 VA
Range: 35,000 VA at 70% *[see 120.61(B)]*	24,500 VA
Calculated Load (neutral)	~~93,650~~85,250 VA

~~93,650~~85,250 VA ÷ 240 V = ~~390~~ 355 A

Further Demand Factor
[see 120.61(B)]

200 A at 100%	200 A
~~390~~ 355 A − 200 A = ~~190~~ 155 A at 70%	~~133~~ 109 A
Net Calculated Load (neutral)	~~333~~ 309 A

[See Table 310.16 through Table 310.21, and 310.15(B), (C), and (E).]

Second Revision No. 7975-NFPA 70-2024 [Definition: Example D4(b) Optional Calculation for Multifam...]

[See attached Word document for revisions to Example D4(b)]

Example D4(b) Optional Calculation for Multifamily Dwelling

A multifamily dwelling equipped with electric cooking and space heating or air conditioning has 40 dwelling units.

Meters are in two banks of 20 each plus house metering and individual feeders to each dwelling unit.

Each dwelling unit is equipped with an electric range of 8-kW, 120/240 volt nameplate rating, four 1.5-kW separately controlled 240 volt electric space heaters, and a 2.5-kW, 240 volt electric water heater. Assume range, space heater, and water heater kW ratings equivalent to kVA. Calculate the load for the individual dwelling unit by the standard calculation (Article 120, Part III).

A common laundry facility is available to all tenants *[see 210.52(F) Exception No. 1]*.

Area of each dwelling unit is 840 ft^2.

Calculated Load for Each Dwelling Unit

(see Part II and Part III of Article 120)

General Lighting Load:	
840 ft^2 at ~~3 VA~~ 2 VA /ft^2	~~2~~ 1 ,~~520 VA~~ 680 VA
Electric range	8,000 VA
Electric heat: 6 kVA (or air conditioning if larger)	6,000 VA
Electric water heater	2,500 VA

Minimum Number of Branch Circuits Required for Each Dwelling Unit

General Lighting Load: 2520 VA ÷ 120 V = 21 A or two 15-A, 2-wire circuits, or two 20-A, 2-wire circuits

Small-Appliance Load: Two 2-wire circuits of 12 AWG *[see 210.11(C)(1)]*

Range Circuit *(See Table 120.55, Column B)*:

8000 VA × 80% ÷ 240 V = 27 A on a circuit of three

10 AWG conductors in accordance with 210.19(C)

Space Heating: 6000 VA ÷ 240 V = 25 A Number of circuits *(see 210.11)*

Minimum Size Feeder Required for Each Dwelling Unit

(see 215.4)

Calculated Load *(see Article 120):*	-
General Lighting	~~2~~ 1 ,~~520 VA~~ 680 VA
Small Appliance (two 20-A circuits)	3,000 VA
Subtotal Calculated Load (without range and space heating)	~~5~~ 4 ,~~520 VA~~ 680 VA

Application of Demand Factor

First 3000 VA at 100%	3,000 VA
~~5520 VA~~ 4680 VA - 3000 VA = ~~2520 VA~~ 1680 VA at 35%	~~882 VA~~ 588 VA
Net Calculated Load (without range and space heating)	3,~~882 VA~~ 588 VA
Range	-
	6,400 VA
-	-
Space Heating *(see 120.51)*	6,000 VA
Water Heater	2,500 VA
Net Calculated Load (for individual dwelling unit)	18,~~782 VA~~ 488 VA

Size of Each Feeder

For 120/240-V, 3-wire system,

Net calculated load of 18,~~782 VA~~ 488 VA ÷ 240 V = ~~78 A~~ 77 A

Feeder Neutral

(see 120.61)

Lighting and Small Appliance	3,~~882 VA~~ 588 VA
Range Load: 6400 VA at 70% *[see 120.61(B)]*	4,480 VA
Space and Water Heating (no neutral): 240 V	0 VA
Net Calculated Load (neutral)	8,~~362 VA~~ 068 VA

Calculated Load for Neutral

~~8362 VA~~ 8068 VA ÷ 240 V = ~~35 A~~ 34 A

Minimum Size Feeder Required from Service Equipment to Meter Bank (For 20 Dwelling Units)

Total Calculated Load:	-
Lighting and Small-Appliance Load	-
20 units × ~~5520 V~~ 4680 V	~~110~~ 93 ,~~400 VA~~ 600 VA
Water and Space Heating Load	-
20 units × 8500 V	170,000 VA
Range Load: 20 × 8000 V	160,000 VA
Net Calculated Load (20 dwelling units)	~~440~~ 423 ,~~400 VA~~ 600 VA
Net Calculated Load Using Optional Calculation *(see Table 120.84(B))*	-
~~440,400 VA~~ 423,600 VA × 0.38	~~167~~ 160 ,~~352 VA~~ 968 VA

~~167~~ 160 ,~~352 VA~~ 968 VA ÷ 240 V = ~~697 A~~ 671 A

Minimum Size Main Feeder Required (Less House Load) (For 40 Dwelling Units)

Calculated Load:	-
Lighting and Small-Appliance Load	-
40 units × ~~5520 V~~ 4680 V	~~220~~ 187 ,~~800 VA~~ 200 VA
Water and Space Heating Load	340,000 VA
40 units × 8500 V	
Range: 40 ranges × 8000 V	320,000 VA
Net Calculated Load (40 dwelling units)	~~880~~ 847 ,~~800 VA~~ 200 VA

Net Calculated Load Using Optional Calculation *(see Table 120.84(B))*

~~880~~ 847 ,~~800 VA~~ 200 VA × 0.28 = ~~246~~ 237 ,~~624 VA~~ 216 VA

~~246~~ 237 ,~~624 VA~~ 216 VA ÷ 240 V = ~~1028 A~~ 988 A

Feeder Neutral Load for Feeder from Service Equipment to Meter Bank (For 20 Dwelling Units)

Lighting and Small-Appliance Load	-
20 units × ~~5520 V~~ 4680 V	~~110~~ 93 ,~~400 VA~~ 600 VA
First 3000 VA at 100%	3,000 VA
~~110~~ 93 ,~~400 VA~~ 600 VA - 3000 VA = ~~107~~ 90 ,~~400 VA~~ 600 VA	
at 35%	~~37~~ 31 ,~~590 VA~~ 710 VA
Net Calculated Load	~~40~~ 34 ,~~590 VA~~ 710 VA
20 ranges: 35,000 VA at 70% *[see Table 120.55 and 120.61(B)]*	24,500 VA
Total	~~65~~ 59 ,~~090 VA~~ 210 VA

~~65~~ 59 ,~~090 VA~~ 210 VA ÷ 240 V = ~~271 A~~ 247 A

Further Demand Factor

[see 120.61(B)]

First 200 A at 100%	200 A
Balance: ~~271 A~~ 247 A - 200 A = ~~71 A~~ 47 A at 70%	~~50 A~~ 33 A
Total~~250 A~~	233 A

Feeder Neutral Load of Main Feeder (Less House Load)(For 40 Dwelling Units)

Lighting and Small-Appliance Load	-
40 units × ~~5520 V~~ 4680 V	~~220~~ 187 ,~~800 VA~~ 200 VA
First 3000 VA at 100%	3,000 VA
Next 120,000 VA - 3000 VA = 117,000 VA at 35%	40,950 VA
Remainder ~~220~~ 187 ,~~800 VA~~ 200 VA - 120,000 VA = ~~100~~ 67 ,~~800 VA~~ 200 VA at 25%	~~25~~ 16 ,~~200 VA~~ 800 VA
Net Calculated Load	~~69~~ 60 ,~~150 VA~~ 750 VA
40 ranges: 55,000 VA at 70% *[see Table 120.55 and 120.61(B)]*	38,500 VA
Total	~~107~~ 99 ,~~650 VA~~

~~107,650 VA~~

250 VA

99.250 VA ÷ 240 V = ~~449 A~~ 414 A

Further Demand Factor

[see 120.61(B)]

First 200 A at 100%	200 A
Balance: ~~449~~ 414 - 200 A = ~~249 A~~ 214 A at 70%	~~174 A~~ 150 A
Total~~374 A~~	350 A

Supplemental Information

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Committee Statement

Committee Statement: Example D4(b) is revised to reflect the revisions in Article 120.
Response Message: SR-7975-NFPA 70-2024

Example D4(b) Optional Calculation for Multifamily Dwelling

A multifamily dwelling equipped with electric cooking and space heating or air conditioning has 40 dwelling units.

Meters are in two banks of 20 each plus house metering and individual feeders to each dwelling unit.

Each dwelling unit is equipped with an electric range of 8-kW, 120/240 volt nameplate rating, four 1.5-kW separately controlled 240 volt electric space heaters, and a 2.5-kW, 240 volt electric water heater.

Assume range, space heater, and water heater kW ratings equivalent to kVA. Calculate the load for the individual dwelling unit by the standard calculation (Article 120, Part III).

A common laundry facility is available to all tenants *[see 210.52(F) Exception No. 1]*.

Area of each dwelling unit is 840 ft^2.

Calculated Load for Each Dwelling Unit
(see Part II and Part III of Article 120)

General Lighting Load:	
840 ft^2 at ~~3~~2 VA/ft^2	~~2,520~~1,680 VA
Electric range	8,000 VA
Electric heat: 6 kVA (or air conditioning if larger)	6,000 VA
Electric water heater	2,500 VA

Minimum Number of Branch Circuits Required for Each Dwelling Unit

General Lighting Load: 2520 VA ÷ 120 V = 21 A or two 15-A, 2-wire circuits, or two 20-A, 2-wire circuits

Small-Appliance Load: Two 2-wire circuits of 12 AWG *[see 210.11(C)(1)]*

Range Circuit *(See Table 120.55, Column B)*:
8000 VA × 80% ÷ 240 V = 27 A on a circuit of three
10 AWG conductors in accordance with 210.19(C)

Space Heating: 6000 VA ÷ 240 V = 25 A Number of circuits *(see 210.11)*

Minimum Size Feeder Required for Each Dwelling Unit
(see 215.4)

Calculated Load *(see Article 120):*	
General Lighting	~~2,520~~1,680 VA
Small Appliance (two 20-A circuits)	3,000 VA
Subtotal Calculated Load (without range and space heating)	~~5,520~~4,680 VA
Application of Demand Factor	
First 3000 VA at 100%	3,000 VA
~~5520~~4680 VA - 3000 VA = ~~2520~~ 1680 VA at 35%	~~882~~ 588 VA
Net Calculated Load (without range and space heating)	~~3,882~~ 3,588 VA
Range	6,400 VA

Space Heating *(see 120.51)*	6,000 VA
Water Heater	2,500 VA
Net Calculated Load (for individual dwelling unit)	~~18,782~~18,488 VA

Size of Each Feeder
For 120/240-V, 3-wire system,
Net calculated load of ~~18,782~~18,488 VA ÷ 240 V = ~~78~~ 77 A
Feeder Neutral
(see 120.61)

Lighting and Small Appliance	~~3,882~~3,588 VA
Range Load: 6400 VA at 70% *[see 120.61(B)]*	4,480 VA
Space and Water Heating (no neutral): 240 V	0 VA
Net Calculated Load (neutral)	~~8,362~~8,068 VA

Calculated Load for Neutral
~~8362~~ 8068 VA ÷ 240 V = ~~35~~ 34 A
Minimum Size Feeder Required from Service Equipment to Meter Bank (For 20 Dwelling Units)

Total Calculated Load:	
Lighting and Small-Appliance Load	
20 units × ~~5520~~ 4680 V	~~110,400~~93,600 VA
Water and Space Heating Load	
20 units × 8500 V	170,000 VA
Range Load: 20 × 8000 V	160,000 VA
Net Calculated Load (20 dwelling units)	~~440,400~~423,600 VA
Net Calculated Load Using Optional Calculation *(see Table 120.84(B))*	
~~440,400~~423,600 VA × 0.38	~~167,352~~160,968 VA

~~167,352~~160,968 VA ÷ 240 V = ~~697~~ 671 A
Minimum Size Main Feeder Required (Less House Load) (For 40 Dwelling Units)

Calculated Load:	
Lighting and Small-Appliance Load	
40 units × ~~5520~~ 4680 V	~~220,800~~187,200 VA
Water and Space Heating Load . 40 units × 8500 V	340,000 VA
Range: 40 ranges × 8000 V	320,000 VA
Net Calculated Load (40 dwelling units)	~~880,800~~847,200 VA

Net Calculated Load Using Optional Calculation *(see Table 120.84(B))*
~~880,800~~847,200 VA × 0.28 = ~~246,624~~237,216 VA
~~246,624~~237,216 VA ÷ 240 V = ~~1028~~ 988 A
Feeder Neutral Load for Feeder from Service Equipment to Meter Bank (For 20 Dwelling Units)

Lighting and Small-Appliance Load	
20 units × ~~5520~~ 4680 V	~~110,400~~93,600 VA

First 3000 VA at 100%		3,000 VA
~~110,400~~93,600 VA - 3000 VA = ~~107,400~~90,600 VA . at 35%		~~37,590~~31,710 VA
	Net Calculated Load	~~40,590~~34,710 VA
20 ranges: 35,000 VA at 70% . *[see Table 120.55 and 120.61(B)]*		24,500 VA
	Total	~~65,090~~59,210 VA

~~65,090~~59,210 VA ÷ 240 V = ~~271~~247 A

Further Demand Factor
[see 120.61(B)]

First 200 A at 100%		200 A
Balance: ~~271~~247 A - 200 A = ~~71~~ 47 A at 70%		~~50~~ 33 A
	Total	~~250~~ 233 A

Feeder Neutral Load of Main Feeder (Less House Load)(For 40 Dwelling Units)

Lighting and Small-Appliance Load		
40 units × ~~5520~~ 4680 V		~~220,800~~187,200 VA
First 3000 VA at 100%		3,000 VA
Next 120,000 VA - 3000 VA = 117,000 VA at 35%		40,950 VA
Remainder ~~220,800~~187,200 VA - 120,000 VA = ~~100,800~~67,200 VA at 25%		~~25,200~~16,800 VA
	Net Calculated Load	~~69,150~~60,750 VA
40 ranges: 55,000 VA at 70% *[see Table 120.55 and 120.61(B)]*		38,500 VA
	Total	~~107,650~~99,250 VA

~~107,650~~99,250 VA ÷ 240 V = ~~449~~ 414 A

Further Demand Factor
[see 120.61(B)]

First 200 A at 100%		200 A
Balance: ~~449~~ 414 - 200 A = ~~249~~ 214 A at 70%		~~174~~ 150 A
	Total	~~374~~ 350 A

Second Revision No. 7976-NFPA 70-2024 [Definition: Example D5(a) Multifamily Dwelling Served at208...]

[See attached Word document for revisions to Example D5(a)]

Example D5(a) Multifamily Dwelling Served at208Y/120 Volts, Three Phase

All conditions and calculations are the same as for the multifamily dwelling [Example D4(a)] served at 120/240 V, single phase except as follows:

Service to each dwelling unit would be two phase legs and neutral.

Minimum Number of Branch Circuits Required for Each Dwelling Unit

(see 210.11)

Range Circuit: 8000 VA ÷ 208 V = 38 A or a circuit of two 8 AWG conductors and one 10 AWG conductor in accordance with 210.19(C)

Minimum Size Feeder Required for Each Dwelling Unit

(see 215.4)

For 120/208-V, 3-wire system (without ranges),

Net calculated load of ~~3882 VA~~ 3588 VA ÷ 2 legs ÷ 120 V/leg = ~~16 A~~ 15 A

For 120/208-V, 3-wire system (with ranges),

Net calculated load (range) of 8000 VA ÷ 208 V = 39 A

Total load (range + lighting) = 39 A + ~~16 A~~ 15 A = ~~55 A~~ 54 A

Reducing the neutral load on the feeder to each dwelling unit is not permitted *[see 120.61(C)(1)].*

Minimum Size Feeders Required from Service Equipment to Meter Bank (For 20 Dwelling Units — 10 with Ranges)

For 208Y/120-V, 3-phase, 4-wire system,

Ranges: Maximum number between any two phase legs = 4

2 × 4 = 8.

Table 120.55 demand = 23,000 VA

Per phase demand = 23,000 VA ÷ 2 = 11,500 VA

Equivalent 3-phase load = 34,500 VA

Net Calculated Load (total):

~~40~~ 34 ,~~590 VA~~ 710 VA + 34,500 VA = ~~75~~ 69 ,~~090 VA~~ 210 VA

~~75~~ 69 ,~~090 VA~~ 210 VA ÷ (208 V×1.732) = ~~208 A~~ 192 A

Feeder Neutral Size

Net Calculated Lighting and Appliance Load & Equivalent Range Load:

~~40~~ 34 ,~~590 VA~~ 710 VA + (34,500 VA at 70%) = ~~64~~ 58 ,~~700 VA~~ 860 VA

Net Calculated Neutral Load:

~~64~~ 58 ,~~700 VA~~ 860 VA ÷ (208 V×1.732) = ~~180 A~~ 163 A

Minimum Size Main Feeder (Less House Load) (For 40 Dwelling Units — 20 with Ranges)

For 208Y/120-V, 3-phase, 4-wire system,

Ranges:

Maximum number between any two phase legs = 7

2 × 7 = 14.

Table 120.55 demand = 29,000 VA

Per phase demand = 29,000 VA ÷ 2 = 14,500 VA

Equivalent 3-phase load = 43,500 VA

Net Calculated Load (total):

~~69~~ 60 ,~~150 VA~~ 750 VA + 43,500 VA = ~~112~~ 104 ,~~650 VA~~ 250 VA

~~112~~ 104 ,~~650 VA~~ 250 VA ÷ (208 V×1.732) = ~~313 A~~ 289 A

Main Feeder Neutral Size:

~~69~~ 60 ,~~150 VA~~ 750 VA + (43,500 VA at 70%) =- ~~99~~ 91 ,~~600 VA~~ 200 VA

~~99~~ 91 ,~~600 VA~~ 200 VA ÷ (208 V×1.732) = ~~277 A~~ 253 A

Further Demand Factor

(see 120.61)

200 A at 100%		200 ~~.0 A~~ A
~~277 A~~ 253 A - 200 A = ~~77 A~~ 53 A at 70%		~~54 A~~ 37 A
	Net Calculated Load (neutral)	~~254 A~~ 237 A

Supplemental Information

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Committee Statement: Example D5(a) is revised to reflect the revisions in Article 120.
Response Message: SR-7976-NFPA 70-2024

Example D5(a) Multifamily Dwelling Served at208Y/120 Volts, Three Phase

All conditions and calculations are the same as for the multifamily dwelling [Example D4(a)] served at 120/240 V, single phase except as follows:

Service to each dwelling unit would be two phase legs and neutral.

Minimum Number of Branch Circuits Required for Each Dwelling Unit
(see 210.11)

Range Circuit: 8000 VA ÷ 208 V = 38 A or a circuit of two 8 AWG conductors and one 10 AWG conductor in accordance with 210.19(C)

Minimum Size Feeder Required for Each Dwelling Unit
(see 215.4)

For 120/208-V, 3-wire system (without ranges),
Net calculated load of ~~3882~~ 3588 VA ÷ 2 legs ÷ 120 V/leg = ~~16~~ 15 A
For 120/208-V, 3-wire system (with ranges),
Net calculated load (range) of 8000 VA ÷ 208 V = 39 A
Total load (range + lighting) = 39 A + ~~16~~ 15 A = ~~55~~ 54 A
Reducing the neutral load on the feeder to each dwelling unit is not permitted *[see 120.61(C)(1)].*

Minimum Size Feeders Required from Service Equipment to Meter Bank (For 20 Dwelling Units — 10 with Ranges)

For 208Y/120-V, 3-phase, 4-wire system,
Ranges: Maximum number between any two phase legs = 4
2 × 4 = 8.
Table 120.55 demand = 23,000 VA
Per phase demand = 23,000 VA ÷ 2 = 11,500 VA
Equivalent 3-phase load = 34,500 VA
Net Calculated Load (total):
~~40,590~~34,710 VA + 34,500 VA = ~~75,090~~69,210 VA
~~75,090~~69,210 VA ÷ (208 V×1.732) = ~~208~~ 192 A

Feeder Neutral Size

Net Calculated Lighting and Appliance Load & Equivalent Range Load:
~~40,590~~34,710 VA + (34,500 VA at 70%) = ~~64,700~~58,860 VA
Net Calculated Neutral Load:
~~64,700~~58,860 VA ÷ (208 V×1.732) = ~~180~~ 163 A

Minimum Size Main Feeder (Less House Load) (For 40 Dwelling Units — 20 with Ranges)

For 208Y/120-V, 3-phase, 4-wire system,
Ranges:
Maximum number between any two phase legs = 7
2 × 7 = 14.
Table 120.55 demand = 29,000 VA
Per phase demand = 29,000 VA ÷ 2 = 14,500 VA
Equivalent 3-phase load = 43,500 VA
Net Calculated Load (total):
~~69,150~~60,750 VA + 43,500 VA = ~~112,650~~104,250 VA
~~112,650~~104,250 VA ÷ (208 V×1.732) = ~~313~~ 289 A
Main Feeder Neutral Size:
~~69,150~~60,750 VA + (43,500 VA at 70%) = ~~99,600~~91,200 VA
~~99,600~~91,200 VA ÷ (208 V×1.732) = ~~277~~ 253 A

Further Demand Factor
(see 120.61)

200 A at 100%	200~~.0~~ A
~~277~~ 253 A - 200 A = ~~77~~ 53 A at 70%	~~54~~ 37 A
Net Calculated Load (neutral)	~~254~~ 237 A

Second Revision No. 7978-NFPA 70-2024 [Definition: Example D5(b) Optional Calculation for Multifam...]

[See attached Word file for revisions to Example D5(b)]

Example D5(b) Optional Calculation for Multifamily Dwelling Served at 208Y/120 Volts, Three Phase

All conditions and calculations are the same as for Optional Calculation for the Multifamily Dwelling [Example D4(b)] served at 120/240 V, single phase except as follows:

Service to each dwelling unit would be two phase legs and neutral.

Minimum Number of Branch Circuits Required for Each Dwelling Unit

(see 210.11)

Range Circuit *(see Table 120.55, Column B):* 8000 VA at 80%÷ 208 V = 31 A or a circuit of two 8 AWG conductors and one 10 AWG conductor in accordance with 210.19(C)

Space Heating: 6000 VA ÷ 208 V = 29 A

Two 20-ampere, 2-pole circuits required, 12 AWG conductors

Minimum Size Feeder Required for Each Dwelling Unit

120/208-V, 3-wire circuit

Net calculated load of 18,782 VA ÷ 208 V = 90 A

Net calculated load (lighting line to neutral):

3882 VA ÷ 2 legs ÷ 120 V per leg = 16.2 A

Line to line = 14,900 VA ÷ 208 V = 71.6 A

Total load = 16.2 A + 71.6 A = 88 A

Minimum Size Feeder Required for Service Equipment to Meter Bank (for 20 Dwelling Units)

Net Calculated Load

167,352 VA ÷ (208 V×1.732) = 465 A

Feeder Neutral

Load for Feeder from Service Equipment to Meter Bank (for 20 Dwelling Units)

Lighting and Small-Appliance Load

20 units × 5520 VA = 110,400 VA first 3000 VA at 100% = 3000 VA

110,400 VA − 3000 VA = 107,400 VA at 35% = 37,590 VA

Net Calculated Load: 40,590 VA

Minimum Size Main Feeder (Less House Load) (for 20 Dwelling Units – 20 Ranges) for 208Y/120-V, 3-Phase, 4-Wire System

Ranges:

Maximum number between any two phase legs = 7

2 × 7 = 14

Table 120.55 demand = 29,000 VA

Per phase demand = 29,000 VA ÷ 2 = 14,500 VA

Equivalent 3-phase load = 43,500 VA

Net Calculated Neutral Load (total): 40,590 VA + 43,500 VA = 84,090 VA

84,090 VA ÷ (208 V×1.732) = 234 A

Minimum Size Service Required (Less House Load) (for 40 Dwelling Units) (Assume Balanced Load)

Net Calculated Load:

246,624 VA ÷ (208 V×1.732) = 685 A

Feeder Neutral Load for Feeder from Service Equipment to Meter Bank (for 40 Dwelling Units)

Lighting and Small-Appliance Load

40 units × 5520 VA = 220,800 VA

First 3000 VA at 100% = 3000 VA

Next 120,000 VA − 3000 VA = 117,000 VA

117,000 VA at 35% = 40,950 VA

Remainder 220,800 VA − 120,000 VA = 100,800 VA at 25% = 25,200 VA

Net Calculated Load: 69,150 VA

Minimum Size Main Feeder (Less House Load) (for 40 Dwelling Units — 40 with Ranges) for 208Y/120-V, 3-Phase, 4-Wire System

Ranges:

Maximum number between any two phase legs = 14

2 × 14 = 28

Table 120.55 demand = 15,000 VA + (1000 VA × 28) = 43,000 VA per phase

Demand = 43,000 VA ÷ 2 = 21,500 VA

Equivalent 3-phase load = 21,500 VA × 3 = 64,500 VA

Neutral Load = 64,500 VA at 70% [See Table 120.55 and 120.61(B)] Neutral Load = 45,150 VA

Net Calculated Neutral Load (total): 69,150 VA + 45,150 VA = 114,300 VA

114,300 VA ÷ (208 V×1.732) = 317 A

Further Demand Factor

[see 120.61(B)]

200 A at 100%		200 A
317 A − 200 A = 117 A at 70%		82 A
	Net Calculated Load (neutral)	282 A

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Committee Statement

Committee Statement: Example D5(b) is revised to reflect the revisions in Article 120.

Based upon the revision in 120.84(A), the example was modified based on the maximum number of units connected between any two phases. Each phase conductor of the service serves 28 units, therefore 28 units is used to determine the demand factor for the calculation.

Response Message: SR-7978-NFPA 70-2024

Example D5(b) Optional Calculation for Multifamily Dwelling Served at 208Y/120 Volts, Three Phase

All conditions and calculations are the same as for Optional Calculation for the Multifamily Dwelling [Example D4(b)] served at 120/240 V, single phase except as follows:
Service to each dwelling unit would be two phase legs and neutral.
Twice the largest number of units between phases: 28 (14 x 2) (120.84(A)(2))

Total VA per phase: 28 units x 18,480 VA per unit = 517,440 VA; (2 times the maximum units per phase)
517,440 ÷ 2 = 258,720 VA per phase

Total VA: 258,720 VA x 3 = 776,160 VA

Demand: 776,160 VA X .33 (see Table 120.84(B)) = 256,133 VA

TOTAL Calculated Load: 256,133 ÷ (208 V×1.732) = 711 Amperes

~~*Minimum Number of Branch Circuits Required for Each Dwelling Unit (see 210.11)*~~
~~Range Circuit *(see Table 120.55, Column B):* 8000 VA at 80%÷ 208 V = 31 A or a circuit of two 8 AWG conductors and one 10 AWG conductor in accordance with 210.19(C)~~
~~Space Heating: 6000 VA ÷ 208 V = 29 A~~
~~Two 20-ampere, 2-pole circuits required, 12 AWG conductors~~
~~*Minimum Size Feeder Required for Each Dwelling Unit*~~
~~120/208-V, 3-wire circuit~~

~~Net calculated load per unit: of 18,782~~18,488 ~~VA ÷ 208 V = 90~~ 89 ~~A~~

~~Net calculated load (lighting line to neutral):~~
~~3882 VA ÷ 2 legs ÷ 120 V per leg = 16.2 A~~
~~Line to line = 14,900 VA ÷ 208 V = 71.6 A~~
~~Total load = 16.2 A + 71.6 A = 88 A~~
~~*Minimum Size Feeder Required for Service Equipment to Meter Bank (for 20 Dwelling Units)*~~
~~*Net Calculated Load*~~
~~167,352~~160,968 ~~VA ÷ (208 V×1.732) = 465~~ 447 ~~A~~2
~~*Feeder Neutral*~~
~~*Load for Feeder from Service Equipment to Meter Bank (for 20 Dwelling Units)*~~
~~*Lighting and Small-Appliance Load*~~
~~20 units × 5520~~ 4680 ~~VA = 110,400~~93,600 ~~VA first 3000 VA at 100% = 3000 VA~~
~~110,400~~93,600 ~~VA – 3000 VA = 107,400~~90,600 ~~VA at 35% = 37,590~~31,710 ~~VA~~
~~Net Calculated Load: 40,590~~34,710 ~~VA~~
~~*Minimum Size Main Feeder (Less House Load) (for 20 Dwelling Units – 20 Ranges) for 208Y/120-V, 3-Phase, 4-Wire System*~~
~~Ranges:~~
~~Maximum number between any two phase legs = 7~~
~~2 × 7 = 14~~
~~Table 120.55 demand = 29,000 VA~~
~~Per phase demand = 29,000 VA ÷ 2 = 14,500 VA~~
~~Equivalent 3-phase load = 43,500 VA~~

Net Calculated Neutral Load (total): 40,59034,710 VA + 43,500 VA = 84,09078,210 VA
84,09078,210 VA ÷ (208 V×1.732) = 234 217 A
Minimum Size Service Required (Less House Load) (for 40 Dwelling Units) (Assume Balanced Load)
Net Calculated Load:
246,624237,624 VA ÷ (208 V×1.732) = 685 A
Feeder Neutral Load for Feeder from Service Equipment to Meter Bank (for 40 Dwelling Units)
Lighting and Small-Appliance Load
40 units × 5520 4680 VA = 220,800187,200 VA
First 3000 VA at 100% = 3000 VA
Next 120,000 VA − 3000 VA = 117,000 VA
117,000 VA at 35% = 40,950 VA
Remainder 220,800187,200 VA − 120,000 VA = 100,80067,200 VA at 25% = 25,20016,800 VA
Net Calculated Load: 69,15060,750 VA
Minimum Size Main Feeder (Less House Load) (for 40 Dwelling Units — 40 with Ranges) for 208Y/120-V, 3-Phase, 4-Wire System
Ranges:
Maximum number between any two phase legs = 14
2 × 14 = 28
Table 120.55 demand = 15,000 VA + (1000 VA × 28) = 43,000 VA per phase
Demand = 43,000 VA ÷ 2 = 21,500 VA
Equivalent 3-phase load = 21,500 VA × 3 = 64,500 VA
Neutral Load = 64,500 VA at 70% [See Table 120.55 and 120.61(B)] Neutral Load = 45,150 VA
Net Calculated Neutral Load (total): 69,15060,750 VA + 45,150 VA = 114,300105,900 VA
114,300105,900 VA ÷ (208 V×1.732) = 317 294 A
Further Demand Factor
[see 120.61(B)]

200 A at 100%		200 A
317 294 A − 200 A = 117 94 A at 70%		82 66 A
	Net Calculated Load (neutral)	282 266 A