



Public Comment No. 979-NFPA 70-2018 [Global Input]

This Global Public Comment requests that each CMP review all products under their purview and determine whether reconditioning should be permitted. This public comment is submitted by a task group assigned by the NEC Correlating Committee. This task group was charged with reviewing Public Input 2935 which was resolved by CMP-1 during the first draft stage. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
NEMA-Position_Refubishing_on_ElecEquip.pdf	

Statement of Problem and Substantiation for Public Comment

This Public Comment is submitted on behalf of a task group appointed by the NEC® Correlating Committee. This Task Group was appointed to review the use of refurbished equipment throughout the NEC®. Task Group members are Jim Dollard, Robert Osborne, Jim Pierce, and David Williams. This task group has been charged with reviewing Public Input (PI) 2935 which was resolved by CMP-1 during the first draft stage. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

Task group members noted that some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

The "NEMA Policy on Reconditioned Electrical Equipment" details the following aspects of Reconditioning of Electrical Equipment:

- Fundamental Tenets for Reconditioning Electrical Equipment
- Electrical Infrastructure and Worker Safety
- Integrity of Reconditioned Equipment
- Listing or Certification Marks
- UL Guidance on the UL Mark
- Components or Assemblies Not Suitable For Reconditioning (Appendix A)
- Components or Assemblies Which May Be Reconditioned (Appendix B)

A PDF copy of this NEMA policy is attached and may also be found on the internet at the following URL:

https://www.nema.org/Policy/Documents/NEMA-Position_Refubishing%20on%20ElecEquip.pdf

NEC® section 110.21(A)(2), which was new for the 2017 Edition of the NEC®, included marking requirements for "Reconditioned Equipment". PI 2935 would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". CMP 1 resolved this PI. Due to the global nature of PI 2935 this Task Group, appointed by the NEC® Correlating Committee, has developed a number of Public Comments, based on the products identified in the referenced NEMA document, to determine whether or not equipment can be reconditioned, and if reconditioned, what additional requirements apply.

While several Public Comments were developed for specific equipment by this task group, not all equipment was addressed (neither was all the equipment noted in the NEMA Policy document addressed). This Global Public

Comment requests each CMP to review the products required to be listed under their purview and determine whether reconditioning should be permitted. It is recommended that the NEMA Policy document be used as one of the guidelines in making this determination. It is also recommended that one of the following options/examples be chosen for listed equipment:

Option 1 - Equipment NOT suitable for Reconditioning (EXAMPLE):

695.10 Listed Equipment. Diesel engine fire pump controllers, electric fire pump controllers, electric motors, fire pump power transfer switches, foam pump controllers, and limited service controllers shall be listed for fire pump service. [20:9.5.1.1, 10.1.2.1, 12.1.3.1]

Fire pump controllers and transfer switches shall not be permitted to be reconditioned.

Option 2 - Equipment which MAY BE suitable for Reconditioning (EXAMPLE):

408.8 Reconditioned Equipment.

(A) Panelboards. The use of reconditioned panelboards shall comply with (1) and (2):

(1) Industrial and commercial panelboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.

(2) Panelboards installed in dwelling units shall not be permitted to be reconditioned.

(B) Switchboards and Switchgear. Low voltage switchgear, medium voltage switchgear and switchboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.

Note that equipment where no specific guidance is provided would be permitted to be reconditioned and would only be required to meet the marking requirements in 110.21(A)(2).

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 980-NFPA 70-2018 [New Section after 240.87(B)]	
Public Comment No. 981-NFPA 70-2018 [New Section after 240.61]	
Public Comment No. 982-NFPA 70-2018 [New Section after 240.101(B)]	
Public Comment No. 983-NFPA 70-2018 [Section No. 695.10]	
Public Comment No. 984-NFPA 70-2018 [Section No. 700.5(C)]	
Public Comment No. 985-NFPA 70-2018 [Section No. 701.5(C)]	
Public Comment No. 986-NFPA 70-2018 [Section No. 702.5]	
Public Comment No. 987-NFPA 70-2018 [New Section after 408.7]	

Related Item

- PI 2935

Submitter Information Verification

Submitter Full Name: James Dollard

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Zip:**Submittal Date:** Tue Aug 21 08:08:39 EDT 2018**Committee:** NEC-AAC**Copyright Assignment**

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NEMA Policy on Reconditioned Electrical Equipment

Executive Summary:

The option of reconditioning existing equipment (instead of purchasing new equipment) exists today. Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity in some cases to update installed equipment with the latest performance and safety features. However, not all components of the electrical infrastructure are candidates for reconditioning.

There are a number of precautions that must be adhered to when reconditioning electrical equipment if that equipment is to operate safely and with acceptable performance. Those precautions are discussed below and include the use of design qualified parts, testing to industry-recognized safety standards, original manufacturer specification and/or recommendations, when possible, and reconditioning performed by qualified personnel. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement has not compromised the manufacturer's original specifications and accepted industry standards.

The third party certification mark must be removed or obliterated from reconditioned electrical products to indicate that an evaluation of the reconditioning process or reconditioned product has not been conducted by the original third party.

As guidance, Appendix B provides a list of electrical products and components that are considered by NEMA suitable for reconditioning and Appendix A provides a list of electrical products considered not suitable for reconditioning. Medical Imaging Equipment is specifically not addressed by this policy (reference MITA 1, Good Refurbishment Practices for Medical Imaging Equipment).

Introduction:

The U.S. electrical industry includes discussions on implementing new technologies to enhance existing electrical infrastructure. Further, sustainability and safeguarding the environment are growing in importance. In the midst of this is the option for reconditioning existing equipment. Paramount in all this is the fundamental priority that all electrical systems operate while safe-guarding personnel and infrastructure from potential hazards (electrical, mechanical, fire, etc.). This forms the basis for the NEMA position on reconditioning electrical products.

Given that electrical systems are diverse in design, function, and application, not all components of the electrical infrastructure are candidates for reconditioning.

Definition:

Reconditioning: the process of restoring electromechanical systems, equipment, apparatus or components to operating conditions as recommended by the

manufacturer's instructions, using only design qualified parts. Reverse engineered parts (designs copied from existing parts by other manufacturers) are not considered to be "design qualified parts" unless specifically design verified under applicable Standards. Electrical industry practitioners and other organizations may also use the following terms/words to describe the process of reconditioning: remanufacturing, refurbishing, recycling, repairing, restoring, rebuilding, reengineering, and reusing.

In addition to design considerations, it is often impossible to obtain the service records, application environment, and operation parameters of all electrical components. Not having access to such information could have an adverse impact on the final safety and reliability of refurbished or reconditioned equipment. While NEMA supports the reconditioning of some electrical equipment, the components listed in Appendix A are not recommended for reconditioning, unless otherwise indicated by the original manufacturer. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing. For electrical components suitable for reconditioning listed in Appendix B, the following fundamental tenets have been established.

Fundamental Tenets for Reconditioning Electrical Equipment

- Reconditioning electrical equipment may be a viable option for extending operational lifetime of equipment and enhancing equipment with additional features.
- Electrical equipment reconditioning activity must be based on available guidance documentation from the Original Equipment Manufacturer, or industry-developed standards. Where any conflict in guidance is noted between the OEM and industry standards, the OEM guidance should take precedence.
- Electrical equipment must be reconditioned and qualified to an industry-developed standard that ensures equipment is in a usable and safe operating condition. An industry-developed standard is a widely agreed upon rule, set of rules, procedures or requirements for a product, assembly or process which are developed by members or organizations of an aggregate of manufacturing and technically productive enterprises in a particular field. Products deemed to be candidates for reconditioning must be reconditioned and qualified to industry standards containing the most relevant and critical design aspects, testing criteria and manufacturing specifications when the item was built.
- Reconditioning work must be performed by qualified personnel.
- Electrical equipment that has been exposed to adverse conditions, such as fire, water damage, etc., may not be suitable for reconditioning.
- A comprehensive assessment of the electrical equipment being considered for reconditioning with service records, application, environment, service life, and operating parameters is critical before deciding to pursue reconditioning of the electrical equipment and system. Trained, skilled technicians should be able to assess whether a device or system is suitable for reconditioning through physical inspection and test.
- Appendix A provides guidance on which components or assemblies of the electrical system are not suitable for reconditioning because they may pose a

hazard. Appendix B provides guidance on the components or assemblies are suitable for reconditioning.

- Reconditioning electrical equipment must utilize electrical product safety standards as they contain design aspects, testing criteria and manufacturing specifications to ensure a given product will function as intended. These requirements are established to deliver a usable and safe operating condition as a key component of intended product functionality.

Electrical Infrastructure and Worker Safety

Electrical equipment that is properly installed, tested, maintained, and operated will provide reliable power as well as protect the electrical infrastructure. The reconditioning of electrical equipment requires the electrical industry, in collaboration with manufacturers, to establish performance specifications and accepted industry standards to help ensure safe and reliable equipment that help protect our electrical infrastructure so workers and users can continue to benefit from a safe and effective electrical system. Reconditioning standards must include prescriptive actions and performance requirements that result in equipment that complies with standards that include but are not limited to CSA, IEC, IEEE, NEC, OSHA, NFPA 70E, NFPA 70B, NETA ATS, NETA MTS, and EASA AR100 for example. Qualified personnel must possess the knowledge of how to assess equipment condition, potential hazards, and specifications to accurately determine the suitability for reconditioning. A safe and reliable electrical infrastructure that can be safely maintained is dependent on compliance with manufacturers' instructions, qualified workers, proper maintenance, and accepted industry standards for reconditioning activities.

Electrical Equipment Reliability, Performance and Safety

Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity to update installed equipment with the latest performance and safety features. Establishing well defined guidelines for those performing the reconditioning activity, based on original manufacturer's requirements, creates a solid foundation for the electrical industry and users. It is paramount that reconditioned electrical equipment be reliable in not only providing power, but also in safely performing its intended function as part of a safe operating electrical system. Understanding the environment, electrical load characteristics and historical maintenance performed on equipment being considered for reconditioning are all important parts of an assessment for reconditioning that can have a significant bearing on reliability, performance and safety. The electrical equipment manufacturer is the foremost authority on the design, performance and intended safe application of their product. Reconditioned electrical equipment must not compromise the reliability, performance, safe operation, or maintenance of the electrical system.

Integrity of Reconditioned Equipment

Reconditioned electrical equipment must comply with all applicable standards at the time the equipment was initially built as a minimum as well as the original manufacturer's performance requirements in accordance with the nameplate markings and ratings. Replacement parts shall meet the design criteria (form, fit, and function) for the device to perform its intended function and provide safe operation. Replacement parts shall not include counterfeit parts (i.e., parts that have been misrepresented to be an authorized item of the legally authorized source.) Equipment shall operate safely in its intended application after reconditioning occurs. Care must be taken to ensure specific operations such as timing, sequencing, control, transfer, etc. continue to function in the manner originally intended, unless changes are specified during the reconditioning process. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement and performance changes have not compromised the manufacturer's specifications and accepted industry standards.

Listing or Certification Marks

NEMA members manufacture products that are more than likely to be evaluated as part of a third party certification program to nationally recognized safety standards. These products can be marked with a listing or certification mark when the products are manufactured and shipped from the factory. The organization that reconditions the product is responsible for adhering to the guidelines from the issuing agency authorizing the mark to determine if the mark can remain on the product after reconditioning. The organization that reconditions is responsible for any actions necessary for the mark to remain on the product (analysis, testing, etc.). Otherwise, reconditioned electrical products must have their mark removed or obliterated to indicate that an evaluation of the reconditioning process has not been conducted by the original third party.

The organization that reconditions the product is additionally responsible for applying a mark or seal that indicates that the equipment has been reconditioned. This mark must provide traceability to the reconditioning organization in the event that it is necessary to determine the details of who reconditioned the equipment and the report on what was completed during this process.

There are a number of NEMA products that are not allowed to be reconditioned due to the inherent safety characteristics and requirements for those products to be evaluated according to a regular follow up program to evaluate the safety performance requirements as a condition of maintaining the listing or certification mark. This process cannot be applied to reconditioned electrical products since these are normally destructive tests and sample sets of reconditioned products are not possible due to limited quantities or ratings of specific devices.

UL Guidance on the UL Mark

When the manufacturer places the UL Mark on the product at the factory, it is their attestation that the product complies with the applicable requirements. Unless there is further oversight or review/inspection (field inspection) UL cannot ascertain that the

product continues to comply with all requirements should field repairs, modifications or component replacements be made to the product.

Obviously there is little control over what manufacturers will or can do to equipment which left the factory with a certification mark. UL has created rebuilt categories where the reconditioning of product is done in an organized consistent manner under the supervision of UL's FUS (Follow-Up Services) field representatives. In these cases the first action conducted with equipment being rebuilt is the removal of the initial certification mark (if provided). Upon completion of the reconditioning, in accordance with the surveillance document, the manufacturer is permitted to affix a mark which clearly identifies the product as reconditioned.

Cases where a reconditioner is instructed to NOT remove any certification mark will result in confusion. Clearly such equipment in the field, which has undergone modification or reconditioning, is ineligible to bear a mark which designates a compliance with a certification standard.

APPENDIX A

COMPONENTS OR ASSEMBLIES NOT SUITABLE FOR RECONDITIONING*

Adjustable speed drives
Arc fault circuit breakers
Ballasts
Busway (mylar wrapped)
Busway (powder coated)
Cable tray
Cast resin transformers
Components containing semiconductors and transistors
Control transformers
Dry type transformers
Electrical Connectors
Electrical submetering equipment
Electrical vehicle supply equipment
Enclosed switches
Fire detectors, smoke alarms, co detectors
Fire pump controllers
Flexible and extension cords
Flexible conduit
Ground fault circuit breakers
High performance wire and cable
Lighting controls
Liquid filled transformers
Low and medium voltage fuse holders
Low and medium voltage non-renewable fuses
Low voltage power circuit breaker electronic trip units
Luminaires
Meters (electromechanical, electronic or digital)
Meter sockets
Molded case circuit breakers
Non-Metallic conduit, tubing, raceways and fittings
Non-metallic surface raceways and fittings
Outlet and junction boxes
Overload relays
Pin and sleeve plugs receptacles and connectors
Power and control cable
Protective relays (electronic or digital)
Residential panel boards
Solid state contactors and starters
Solid state drives
Strut type channel raceway
Surface metal raceways and fittings
Surge protective devices
Transfer switches
Wire or cable
Wireway
Wiring devices

*The components or products listed above are not recommended for reconditioning, unless otherwise indicated by the original manufacturer.

APPENDIX B

COMPONENTS OR ASSEMBLIES WHICH MAY BE RECONDITIONED

Electromechanical protective relays, and current transformers

High voltage circuit breakers

Industrial and commercial panel boards

Low and medium voltage power circuit breakers

Low and medium voltage replaceable link fuses

Low voltage switchgear

Manual and magnetic controllers

Medium voltage switchgear

Metallic conduit, tubing, raceways and fittings

Motor control centers

Motors

Switchboards

Uninterruptible Power Supply Equipment

**Public Comment No. 2207-NFPA 70-2018 [Global Input]**

The Correlating Committee directs Panel 2 to review all references to Article 310 under their purview. Article 310 has been divided into Article 310, Conductors for General Wiring, and Article 311, Medium Voltage Conductors and Cables for usability and clarity. Panel 2 shall appoint a task group to review all necessary references to verify their accuracy and submit Public Comments where necessary. This action instructs Panel 2 to submit a Public Comment(s) within the time frame required in the NEC schedule. This action shall be considered as a public comment.

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
CN_270.pdf	CN_270

Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 270 in the First Draft Report.

The Correlating Committee directs Panel 2 to review all references to Article 310 under their purview. Article 310 has been divided into Article 310, Conductors for General Wiring, and Article 311, Medium Voltage Conductors and Cables for usability and clarity. Panel 2 shall appoint a task group to review all necessary references to verify their accuracy and submit Public Comments where necessary. This action instructs Panel 2 to submit a Public Comment(s) within the time frame required in the NEC schedule.

This action shall be considered as a public comment.

Related Item

- Correlating Committee Note No. 270

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC

Organization: NEC Correlating Committee

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Submittal Date: Fri Sep 07 13:42:25 EDT 2018

Committee: NEC-P02

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**Correlating Committee Note No. 270-NFPA 70-2018 [Global Input]****Submitter Information Verification**

Submitter Full Name: Sarah Caldwell

Committee:

Submittal Date: Fri May 11 17:54:55 EDT 2018

Committee Statement and Meeting Notes

Committee Statement: The Correlating Committee directs all panels to review all references to Article 310 under their purview. Article 310 has been divided into Article 310, Conductors for General Wiring, and Article 311, Medium Voltage Conductors and Cables for usability and clarity. Each panel shall appoint a task group to review all necessary references to verify their accuracy and submit Public Comments where necessary. This action instructs the referenced panels to submit a Public Comment(s) within the time frame required in the NEC schedule.

This action shall be considered as a public comment.

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.

**Public Comment No. 2224-NFPA 70-2018 [Global Input]**

The Correlating Committee directs Panel 2 to review all Articles, within their purview, that supplement or modify (90.3) GFCI requirements in 210.8 for correlation, clarity, usability and standardized format. A Correlating Committee Task Group will be appointed and will submit comments where necessary.

This action shall be considered as a public comment.

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
CN_152.pdf	CN_152

Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 152 in the First Draft Report

The Correlating Committee directs Panel 2 to review all Articles, within their purview, that supplement or modify (90.3) GFCI requirements in 210.8 for correlation, clarity, usability and standardized format. A Correlating Committee Task Group will be appointed and will submit comments where necessary.

This action shall be considered as a public comment.

Related Item

- Correlating Committee Note No. 152

Submitter Information Verification

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Submittal Date: Fri Sep 07 14:36:35 EDT 2018

Committee: NEC-P02

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Correlating Committee Note No. 152-NFPA 70-2018 [Global Input]

Submitter Information Verification

Submitter Full Name: Erik Hohengasser

Committee:

Submittal Date: Thu May 10 18:00:52 EDT 2018

Committee Statement

Committee Statement: The Correlating Committee directs each panel to review all Articles, within their purview, that supplement or modify (90.3) GFCI requirements in 210.8 for correlation, clarity, usability and standardized format. A Correlating Committee Task Group will be appointed and will submit comments where necessary.

This action shall be considered as a public comment.

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.

**Public Comment No. 811-NFPA 70-2018 [Definition: Bathroom.]****Bathroom.**

An area including a sink (basin- (sink) -with- with one or more of the following: a toilet, a urinal, a tub, a shower, a bidet, or similar plumbing fixtures. (CMP-2)

Statement of Problem and Substantiation for Public Comment

Currently the term "sink" is used for Kitchen area and the term "basin" is used for bathroom area. Basin is also used to mean depressions in the earth for transformers (450.270), hazardous Locations (515.3) Marinas (555.1) and man made bodies of water (682.1 and 682.2). By changing sink to mean sink regardless of location will bring consistency and uniformity to the NEC.

Reference:

Sink - Art. 100 Kitchen, 210.8 (A)(7) & (B)(5), 210.52 (C)(1)(4), 422.16(B)(1), 550.13(B)(4)&(D)(1), 551.41 (B)(1)(3), 552.41 (B)(1)(3)

Basin (bathrooms) - Art. 100 Bathroom, 210.42(D), 517.21, 550.13(D)(9),

Related Item

- FR-7662 PI 1136

Submitter Information Verification

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Committee: NEC-P02

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**Public Comment No. 1250-NFPA 70-2018 [Definition: Ground-Fault Circuit Interrupter (GFCI).**

]

Ground-Fault Circuit Interrupter (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 to ground~~ exceeds the values established for a Class A device. (CMP-2)

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

Statement of Problem and Substantiation for Public Comment

I made this suggestion with PI 2158. In my substantiation, i stated that the current language in the definition does not align with UL 943. The panel stated that the definition is in alignment. Turns out, both statements are correct.

Clause 3.3 Class A, when applied to a ground-fault circuit-interrupter (GFCI), is an interrupter that will interrupt the circuit to the load when the ground-fault current is 6 mA or more but not when the ground-fault current is 4 mA or less.

Clause 3.11 GROUND-FAULT CIRCUIT-INTERRUPTER – In the US and Mexico, a device intended for the protection of personnel that functions to de-energize a circuit or portion of a circuit within an established period of time when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

Clause 3.3 uses "ground fault current" and Clause 3.11 uses "current to ground."

The UL standard states both, so which is correct? "ground fault current" is the more technically correct. "Current to ground" is not correct as the actual electrical current does not go to ground. It returns to the source through a path which is typically referred to as 'ground.'

I submit that the NEC should go with the more accurate of the two.

Related Item

• 2158-NFPA 70-2017

Submitter Information Verification

Submitter Full Name: Eric Stromberg

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Submittal Date: Fri Aug 24 14:55:30 EDT 2018

Committee: NEC-P02

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**Public Comment No. 1333-NFPA 70-2018 [Section No. 210.2]****210.2 Definition.**

Dormitory Unit. A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons ~~who are not members of the same family~~ in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.

Statement of Problem and Substantiation for Public Comment

It shouldn't matter whether people are related when defining a dormitory unit. Plus, this could be interpreted as a rule which are not allowed in a definition.

Related Item

- FR 7688

Submitter Information Verification

Submitter Full Name: Vince Baclawski

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Submittal Date: Mon Aug 27 10:43:12 EDT 2018

Committee: NEC-P02

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Public Comment No. 1375-NFPA 70-2018 [Section No. 210.2]

~~210.2~~ Definition.

~~**Dormitory Unit.** A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.~~

Statement of Problem and Substantiation for Public Comment

This term is used in at least 4 articles and should be moved to Article 100.

Related Item

- First Revision No. 7688-NFPA 70-2018

Submitter Information Verification

Submitter Full Name: Don Ganiere

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Submittal Date: Mon Aug 27 15:00:03 EDT 2018

Committee: NEC-P02

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Public Comment No. 2146-NFPA 70-2018 [Section No. 210.2]

210.2 Definition. The definition in this section shall apply only within this article.

Dormitory Unit. A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.

Statement of Problem and Substantiation for Public Comment

The proposed language will provide clear direction to the code user and correlate with actions taken elsewhere in the code. The proposed language is based on recommendations submitted in the Public Input stage by a Correlating Committee Task Group.

Related Item

- FR 8758

Submitter Information Verification

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Committee: NEC-P02

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Public Comment No. 379-NFPA 70-2018 [Section No. 210.2]

Relocate to Article 100

210.2 Definition.

Dormitory Unit. A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.

Statement of Problem and Substantiation for Public Comment

The term dormitory is used in Articles 210, 240, 406 and 550. Relocating this term to Article 100 will clear up so many questions! Great job guys.

Related Item

- FR-7688

Submitter Information Verification

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Submittal Date: Sat Aug 04 11:56:31 EDT 2018

Committee: NEC-P02

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**Public Comment No. 421-NFPA 70-2018 [Section No. 210.2]****210.2** ~~Definition.~~ Article 100

Dormitory Unit. A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.

Statement of Problem and Substantiation for Public Comment

The term Dormitory or dormitories is used in more than one article than 210. It is also used in Articles 240, 406, and 550. This term should be relocated to Article 100 as it is pertinent to these other articles.

Related Item

- FR 7688

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich

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Submittal Date: Mon Aug 06 11:31:43 EDT 2018

Committee: NEC-P02

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**Public Comment No. 528-NFPA 70-2018 [Section No. 210.2]****210.2** Definition.

Dormitory Unit. A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.

Statement of Problem and Substantiation for Public Comment

We are in support of the new proposed language. However, does this language correlate with the proposed language in 406.12 (7) referencing Dormitory Unit? For consistency in enforcing the NEC, the term should be defined for the entire code and moved to Article 100 or a reference made to include the 210.2 definition in 406.12(7) . We have also submitted a comment to CMP-18 to reference 210.2.

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 529-NFPA 70-2018 [Section No. 406.12]	
<u>Related Item</u>	
• FR 8368 • PI 2809	

Submitter Information Verification

Submitter Full Name: Dean Hunter
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Submittal Date: Fri Aug 10 12:07:03 EDT 2018
Committee: NEC-P02

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**Public Comment No. 583-NFPA 70-2018 [Section No. 210.4(B)]****(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. Common "trip" overcurrent protection devices shall be permitted but not required for this purpose.

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

Statement of Problem and Substantiation for Public Comment

There are those who believe "simultaneous disconnect" to be synonymous with "common trip" which we know is not the case but nonetheless it tends to preclude them from using single pole devices with listed handle-ties. The latter should actually be the preferred method especially so to obviously identify a "tripped" or "faulted" circuit as only the "tripped" device will indicate that state whereas a common-trip device would not.

Related Item

- 210.4(B)

Submitter Information Verification

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Submittal Date: Sun Aug 12 17:40:51 EDT 2018

Committee: NEC-P02

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**Public Comment No. 2-NFPA 70-2018 [Section No. 210.4(C)]****(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.

Exception No. 2: Where all ungrounded conductors of the multiwire branch circuit serving the same piece of equipment are opened simultaneously by the branch-circuit overcurrent device.

Statement of Problem and Substantiation for Public Comment

My proposal apparently requires further clarification. I do not propose any change to the requirement for simultaneous disconnecting means found in 210.4(B).

Rather, I propose amending 210.4(C) to allow, on a 3 phase wye system, a double pole breaker and single pole breaker to together serve two different loads via a single multiwire branch circuit. The present wording of 210.4(C) requires a three pole breaker with common internal trip. 210.4(B) would still require a handle tie to provide a simultaneous disconnecting means.

Related Item

- Public Input No. 780-NFPA 70-2017

Submitter Information Verification

Submitter Full Name: Wayne Whitney

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Affiliation: None

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Submission Date: Mon Jun 25 13:58:44 EDT 2018

Committee: NEC-P02

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**Public Comment No. 651-NFPA 70-2018 [New Section after 210.5(C)(1)]****"210.5(C)(1) Branch Circuits Supplied from More Than One Nominal Voltage System**

-

Change 210.5(C)(1) Exception to "210.5C1 Exception No. 1" then add "210.5(C)(1) Exception No. 2: The requirements of 210.5(C)(1) for posting of identification means for ungrounded conductors shall not be required at industrial installations where conditions of maintenance and supervision ensure only qualified persons service the equipment."

TITLE OF NEW CONTENT

Type your content here ...

Statement of Problem and Substantiation for Public Comment

This is similar to 110.24 and 392.18(H) exception. These environments are most likely to have qualified persons present to service electrical equipment. Note: I prefer 'at' industrial installations rather than 'in' as we read in 392.18(H).

Related Item

- 210.5C1

Submitter Information Verification**Submitter Full Name:** Norman Feck**Organization:** State of Colorado**Street Address:****City:****State:****Zip:****Submittal Date:** Tue Aug 14 15:11:31 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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Public Comment No. 447-NFPA 70-2018 [Section No. 210.5(C)(1)]

(1) Branch Circuits Supplied from More Than One Nominal Voltage System.

Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit shall be identified by phase or line and system at all termination, connection, and splice points in compliance with 210.5(C)(1)(a) and (b).

(a) *Means of Identification.* The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means.

(b) *Posting of Identification Means.* The method utilized for conductors originating within each branch-circuit panelboard or similar branch-circuit distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. The label shall be of sufficient durability to withstand the environment involved and shall not be handwritten.

Exception No. 1 : In existing installations where a voltage system(s) already exists and a different voltage system is being added, it shall be permissible to mark only the new system voltage. Existing unidentified systems shall not be required to be identified at each termination, connection, and splice point in compliance with 210.5(C)(1)(a) and (b). Labeling shall be required at each voltage system distribution equipment to identify that only one voltage system has been marked for a new system(s). The new system label(s) shall include the words "other unidentified systems exist on the premises."

Exception No. 2: Ungrounded conductors of three phase branch circuits serving line to line connected utilization equipment shall not be required to be identified by phase

Statement of Problem and Substantiation for Public Comment

While I agree with the panel comment on PI 1374, that you are permitted to change the rotation at the motor junction box, my problem is that where the wire insulation color has been used to identify the motor branch circuit conductors as to their phase and voltage, the current code requires that the rotation change be made at the motor junction box. This results in unnecessary expense of time and labor without any increase in the safety of the system.

First a brief history of the requirement to identify conductors by phase and system where there is more than one nominal voltage system in a building.

This rule first appeared in the 1990 NEC and was in section 210-4(d) and only applied to the ungrounded conductors of multiwire circuits. (proposal 2-8). The substantiation cited the hazard to the electrician, and the dangerous conditions that would result if the incorrect ungrounded conductor was used with the neutral of the multiwire circuit. It also said that this identification requirement would be helpful in maintaining load balance between the phases on the system.

The requirement remained essentially unchanged until the 2005 code where the requirement was moved to 210.5(C) and expanded to apply to all branch circuit conductors and not just the conductors of multiwire branch circuits. However in the 2005 code the ungrounded conductors were only required to be identified by system, but not by phase as previously required.

My proposal was accepted for the 2008 code to restore the requirement that the ungrounded conductors be identified by phase as well as by system. (so I actually created the issue that I am now trying to correct, but it was not actually an issue at that time, because Article 210 did not then apply to motor branch circuit conductors.)

This caused no problems until there was a change in the scope of Article 210 in the 2017 code. Prior to the 2017 code, the rules in Article 210 did not apply to motor branch circuits. In the 2017 code, the wording that exempted motor circuit conductors from the scope of Article 210 were removed, making the conductor identification requirements apply to the ungrounded conductors between the motor controller.

"(2014) 210.1 Scope

This article covers branch circuits except for branch circuits that supply only motor loads, which are covered in Article 430. Provisions of this article and Article 430 apply to branch circuits with combination loads."

"(2017) 210.1 Scope.

This article provides the general requirements for branch circuits."

This created a problem for industrial motors. The ungrounded conductors for these motors are very often identified by the insulation color, most often brown, orange and yellow for 3 phase 480 volt motors.

The typical installation would be for the motor circuit conductors to be installed from the motor controller and terminated at

the motor junction box. Around here the connection method is ring terminals, bolts and nuts, rubber tape followed by plastic tape.

Next the motor conductors would be connected to the motor controller and the motor would be "bumped" for rotation. Prior to motor circuit conductors coming under the scope of Article 210, the rotation would be changed at the motor controller, a very quick and simple process. With the requirement of 210.5(C) applying to motor circuits in the 2017 code, as a result of the scope change, the rotation must now be changed at the motor junction box because changing it at the controller would mean that the conductors would not be correctly identified by phase. The cost to make the rotation change at the motor is many times greater than the cost to change the rotation at the motor controller, especially where bolted and taped connections are used at the motor.

Related Item

- Public Input No. 1374-NFPA 70-2017

Submitter Information Verification

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Submittal Date: Tue Aug 07 15:43:15 EDT 2018

Committee: NEC-P02

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**Public Comment No. 454-NFPA 70-2018 [Section No. 210.5(C)(1)]****(1) Branch Circuits Supplied from More Than One Nominal Voltage System.**

Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit shall be identified by phase or line and

system

voltage at all termination, connection, and splice points in compliance with 210.5(C)(1)(a) and (b).

(a) *Means of Identification.* The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means.

(b) *Posting of Identification Means.* The method utilized for conductors originating within each branch-circuit panelboard or similar branch-circuit distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. The label shall be of sufficient durability to withstand the environment involved and shall not be handwritten.

Exception: In existing installations where a voltage system(s) already exists and a different voltage system is being added, it shall be permissible to mark only the new system voltage. Existing unidentified systems shall not be required to be identified at each termination, connection, and splice point in compliance with 210.5(C)(1)(a) and (b). Labeling shall be required at each voltage system distribution equipment to identify that only one voltage system has been marked for a new system(s). The new system label(s) shall include the words "other unidentified systems exist on the premises."

Statement of Problem and Substantiation for Public Comment

The submitter of PI 454 is correct. The the current code language requires each separately derived system to have identification that is unique from all other separately derived systems. even where the voltages of the systems are the same. In a large building there may be 10s or even hundreds of separate systems and would be almost impossible for anyone to comply with the rule as currently written. Permitting them to be identified by voltage and not be each individual system as the code now requires would be an improvement.

Related Item

- Public Input No. 454-NFPA 70-2017

Submitter Information Verification

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Committee: NEC-P02

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Public Comment No. 1313-NFPA 70-2018 [Section No. 210.6(C)]

(C) 277 Volts to Ground.

Circuits exceeding 120 volts, nominal, between conductors and not exceeding 277 volts, nominal, to ground shall be permitted to supply the following:

- (1) ~~Listed electric-discharge or listed light-emitting diode-type luminaires with integral ballast or LED driver between the branch circuit and the lampholders~~
- (2) ~~Listed incandescent luminaires, equipped with medium-base or smaller screw-shell lampholders, where the lampholders are supplied at 120 volts or less from the output of a stepdown autotransformer that is an integral component of the luminaire and the outer shell terminal is electrically connected to a grounded conductor of the branch circuit~~
- (3) ~~Listed luminaires equipped with mogul-base screw-shell lampholders~~
- (4) ~~Listed luminaires equipped with lampholders, other than the screw-shell type, when used within their voltage ratings of their lampholders~~
- (5) ~~Listed luminaires without lampholders, such as luminaires with nonserviceable LEDs~~
- (6) Auxiliary equipment of electric-discharge or LED-type lamps
Informational Note: See 410.137 for auxiliary equipment limitations.
- (7) Cord-and-plug-connected or permanently connected utilization equipment
- (8) ~~Listed luminaires converted with a listed retrofit kit to accept LED lamps that also conforms with 210.6(C)(1), (C)(2), (C)(3), (C)(4), or (C)(5) or with integral LEDs~~

Statement of Problem and Substantiation for Public Comment

The list in this section of the code pre-dates the point in time when Listing was required for all luminaires. Therefore, it incorporated several construction requirements to assure that the lampholders/lamps used within the luminaires were compatible with the system voltage. That is no longer necessary since 1) luminaires are required to be listed (per 410.3), and 2) the luminaire listing standards assure compatibility of lampholder usage and ratings. Additionally, the UL standard requires the marking of electrical ratings on luminaires, so the supply voltage at which they are acceptable is well known. Section 110.4 should cover concerns regarding using a product at the incorrect supply voltage.

I support the addition of retrofit kits to this section, but I am very concerned that the other changes could result in significant unintended consequences and create a disallowance of currently accepted products. When you have a permissive list, items that aren't in the list are effectively prohibited.

At the most basic level, if you ask the question "What luminaires should be excluded from operation at 277v?" the answer is "No luminaire should be excluded (provided it is Listed and applied within its marked electrical ratings)". Rather than expand the permissive list to attempt to capture all luminaire types, it would be much simpler, and less error prone, to just change list item (1) to say "Listed luminaires" and eliminate list items (2),(3),(4) and new (5).

Specifically my concerns with the expanded text in the list items in 201.6(C) are shown below. The numbered comments correspond to the list item numbers in the First Revision Draft.

1. The addition of "with integral ballast or LED driver between the branch circuit and the lampholders" is a completely unnecessary change. If a luminaire is listed for the appropriate supply voltage it should not matter whether it has an integral ballast/driver or not. Additionally, with some products the AHJ will not be able to determine if it has an integral ballast/driver.
2. On list item (2), by now specifying that these luminaire must have screw-shell lampholders a number of popular low-voltage incandescent luminaires (such as those using MR-16 lamps) would be eliminated. The intent of list item (4) may be to include incandescent luminaire using MR-16 lamps, but there are errors with that item as well.
3. List item (3) is only needed for incandescent luminaires with mogul base. All others are covered by list item (1)
4. On list item (4), The subject of this sentence had been "lampholders", but it has been changed to "Luminaires". The low-voltage incandescent luminaire MR16 example would seem to fall into this category, but would still be excluded because "when used within their voltage ratings" would be applied to the subject (which is luminaires). This could be read to say that a 277v MR16 luminaire would not be allowed because 277v is greater than the rating of the lampholder (which is 250v). Note: in this example the product has an integral stepdown transformer from 227 to 12v, so the 250v lampholder is only operating at 12v, and the acceptability of the lampholder has been determined in the product listing investigation.
5. New list item (5) would not be needed if list item (1) simply said "Listed Luminaires"
8. Many listed retrofit kits have integral LEDs rather than "accepting" LED lamps. List item (8) should be modified to allow LED retrofit kits with integral LEDs

Related Item

• FR-7587

Submitter Information Verification

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Submittal Date: Sun Aug 26 18:03:38 EDT 2018

Committee: NEC-P02

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Public Comment No. 2088-NFPA 70-2018 [Section No. 210.6(C)]

(C) 277 Volts to Ground.

Circuits exceeding 120 volts, nominal, between conductors and not exceeding 277 volts, nominal, to ground shall be permitted to supply the following:

- (1) ~~Listed electric-discharge or listed light-emitting diode-type luminaires with integral ballast or LED driver between the branch circuit and the lampholders~~ luminaires
- (2) ~~Listed incandescent luminaires, equipped with medium-base or smaller screw shell lampholders, where the lampholders are~~ supplied at 120 volts or less from the output of a stepdown autotransformer that is an integral component of the luminaire and the outer shell terminal is electrically connected to a grounded conductor of the branch circuit
- (3) Listed luminaires equipped with mogul-base screw shell lampholders
- (4) ~~Listed luminaires equipped with lampholders~~ L ampholders, other than the screw shell type, when used within their voltage ratings ~~of their lampholders~~
- (5) ~~Listed luminaires without lampholders, such as luminaires with nonserviceable LEDs~~
- (6) Auxiliary equipment of electric-discharge lamps or LED ~~-type lamps~~ light sources

Informational Note: See 410.137 for auxiliary equipment limitations.

- (7) Cord-and-plug-connected or permanently connected utilization equipment
- (8) Listed luminaires converted with a listed retrofit kit to accept LED ~~lamps that also conforms with 210.6(C)(1), (C)(2), (C)(3), (C)(4), or (C)(5)~~ light sources

Statement of Problem and Substantiation for Public Comment

The 2017 language of 210.6(C) did not appear to create interpretive or enforcement issues, there were no public inputs stating this as a problem. The one point missing in the 2017 language concerned listed luminaires provided with listed LED retrofit kits.

While I applaud the panel the panel in their efforts to improve the usability of the code, I'm concerned that the first revision draft language could create unintended consequences, negatively impacting a range of available listed equipment. Especially since most of the additions made to the language in the first draft are already addressed by the product standards and equipment listings. Accordingly, I respectfully request that the Panel reconsider this major rewrite and instead focus on addressing the need to address listed LED retrofit kits. My suggested language is basically a simplification back to the 2017 language, with the addition specific revisions to add LED retrofit kits and some simple clarifications, while avoiding possible conflicts with presently listed equipment:

- Item 5 is not necessary since it is addressed by item 1.
- Adding the word "listed" to item 3, is not objectionable since it aligns with the language of items 1 and 3; it should be noted that adding "listed" is a reiteration of the listing requirement in 410.6 that requires both luminaires and retrofit kits to be listed.
- In item 4, replacing "applied" with "when used" adds clarity.
- Adding "or LED light sources" to the auxiliary equipment (item 6 in TerraViewTM) ** addresses both LED lamps & integrated LED luminaires.
- Adding an additional item (item 8 in TerraViewTM) ** to address listed luminaires with listed LED retrofits is needed since these are increasingly popular ways to improve energy efficiency.

** Note: TerraViewTM did not renumber the list when item 5 was removed and this needs to be done manually.

Related Item

- FR7587 • PI2900

Submitter Information Verification

Submitter Full Name: Michael o'boyle

Organization: Philips Lightolier

Street Address:

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Submission Date: Thu Aug 30 16:45:13 EDT 2018
Committee: NEC-P02

Copyright Assignment

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**Public Comment No. 446-NFPA 70-2018 [Section No. 210.6(C)]****(C) 277 Volts to Ground.**

Circuits exceeding 120 volts, nominal, between conductors and not exceeding 277 volts, nominal, to ground shall be permitted to supply the following:

- (1) Listed electric-discharge or listed light-emitting diode-type luminaires with integral ballast or LED driver between the branch circuit and the lampholders
- (2) Listed incandescent luminaires, equipped with medium-base or smaller screw shell lampholders, where the lampholders are supplied at 120 volts or less from the output of a stepdown autotransformer that is an integral component of the luminaire and the outer shell terminal is electrically connected to a grounded conductor of the branch circuit
- (3) Listed luminaires equipped with mogul-base or medium-base screw shell lampholders used within the voltage rating of the lampholders
- (4) Listed luminaires equipped with lampholders, other than the screw shell type, when used within their voltage ratings of their lampholders
- (5) Listed luminaires without lampholders, such as luminaires with nonserviceable LEDs
- (6) Auxiliary equipment of electric-discharge or LED-type lamps

Informational Note: See 410.137 for auxiliary equipment limitations.

- (7) Cord-and-plug-connected or permanently connected utilization equipment
- (8) Listed luminaires converted with a listed retrofit kit to accept LED lamps that also conforms with 210.6(C)(1), (C)(2), (C)(3), (C)(4), or (C)(5)

Statement of Problem and Substantiation for Public Comment

Many LED lamps are being produced and sold today with medium bases (E26) and a voltage rating of 120-277 that are intended to retrofit existing HID luminaires. The sockets within the luminaires have voltage ratings that exceed 277V and are supplied with 277V. The listing requirements for the retrofit kit include a label that indicates the luminaire has been retrofitted. It is a problem for an installer to be expected to supply a different voltage to a luminaire when the lamp and socket are both listed and within their voltage rating. This is compounded when multiple luminaires are on a single 277V circuit, retrofitting one of them would require retrofitting all of them.

Energy Star allows for up to 277V with medium bases and currently has almost 8000 approved medium base lamps. The electrical code should allow for the safe use of these lamps.

The main safety standard used for listing of self-ballasted lamps allows for 277V with medium bases. The electrical code should allow for the safe use of these lamps.

The current proposed revision allows for 277V to be applied to mogul sockets including retrofits, and due to the changing technology and availability and use of products already in the marketplace should allow for 277V to be applied to medium sockets when they are within their voltage rating.

Related Item

- 210.6(c)

Submitter Information Verification

Submitter Full Name: Richard Campbell

Organization: LIGHT EFFICIENT DESIGN

Street Address:

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Submittal Date: Tue Aug 07 14:57:09 EDT 2018

Committee: NEC-P02

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Public Comment No. 463-NFPA 70-2018 [Section No. 210.6(C)]

(C) 277 Volts to Ground.

Circuits exceeding 120 volts, nominal, between conductors and not exceeding 277 volts, nominal, to ground shall be permitted to supply the following:

- (1) Listed electric-discharge with integral ballast or listed light-emitting diode-type luminaires with integral ballast ~~or the~~ LED driver between the branch circuit and the lampholders
- (2) Listed incandescent luminaires, equipped with medium-base or smaller screw shell lampholders, where the lampholders are supplied at 120 volts or less from the output of a stepdown autotransformer that is an integral component of the luminaire and the outer shell terminal is electrically connected to a grounded conductor of the branch circuit
- (3) Listed luminaires equipped with mogul-base screw shell lampholders
- (4) Listed luminaires equipped with lampholders, other than the screw shell type, when used within their voltage ratings of their lampholders
- (5) Listed luminaires without lampholders, such as luminaires with nonserviceable LEDs
Auxiliary
(6) that may include a stepdown autotransformer
- (7) Listed auxiliary equipment of electric-discharge or LED-type lamps
Informational Note: See 410.137 for auxiliary equipment limitations.
- (8) ~~Cord~~ Listed cord -and-plug-connected or permanently connected utilization equipment
- (9) Listed luminaires converted with a listed retrofit kit to accept LED lamps that also conforms with 210.6(C)(1), (C)(2), (C)(3), (C)(4), or (C)(5)

Statement of Problem and Substantiation for Public Comment

The changes in (1) do not change the intent of this section but modify to add clarity.

The changes in (5) add the words "that may include a stepdown autotransformer" to further identify the hazards and add clarity to this requirement.

In (6) and (7) the word "listed" is added. Including the word "listed" identifies the equipment category as well as installation and use requirements for manufacturers and installers. In addition, it allows the equipment to be identified via the NRTL listing databases reducing field installation questions and delays. For component/assemblies that do not have a specific applicable standard, a manufacturer can work with a NRTL to create a safe assembly of components by addressing the various safety needs including temperature limits, moisture exposure (i.e. wet/damp/dry), loading (pull), etc. In lighting, there are multiple categories including fixture fittings (IFFX), portable luminaires (QOVZ and QOWZ which are cord and plug), and energy management equipment (PAZX) that can be utilized to address any assembly that does not have an applicable standard covering its use.

Related Item

- FR 7587

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich

Organization: Eaton Corporation

Street Address:

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Submittal Date: Wed Aug 08 15:58:28 EDT 2018

Committee: NEC-P02

Copyright Assignment

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**Public Comment No. 1014-NFPA 70-2018 [Section No. 210.8]****210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.**

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

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

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use****(3) Outdoors**

Exception to (3): 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.

(4) Crawl spaces — at or below grade level**(5) Finished and unfinished areas of basements**

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces**(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink****(8) Boathouses****(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(10) Laundry areas**

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking****(3) Rooftops**

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B)(1), GFCI protection shall not be required.

(6) Indoor wet locations**(7) Locker rooms with associated showering facilities****(8) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms****(9) Crawl spaces — at or below grade level****(10) Unfinished areas of basements**

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas**(12) Bathtubs and shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(C) Boat Hoists.**

GFCI protection shall be provided for outlets not exceeding 240 volts that supply boat hoists installed in dwelling unit locations.

(D) Crawl Space Lighting Outlets.

GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

(E) Specific Appliances.

Unless GFCI protection is provided in accordance with 422.5(B)(3) through (B)(5), the outlets supplying the appliances specified in 422.5(A) shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

Statement of Problem and Substantiation for Public Comment

FR-7705: Expansion of coverage where GFCI protected outlets are required.

It is the opinion of the EEI-EL&P task group that the expansion of GFCI requirements without technical substantiation of a safety issue or shock incident nor products readily available in the market should not be supported by the Code Making Panel.

Related Item

- FR-7705

Submitter Information Verification

Submitter Full Name: Christopher Pavese

Organization: Duke Energy

Affiliation: EEI-EL&P

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Submission Date: Tue Aug 21 13:32:48 EDT 2018

Committee: NEC-P02

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**Public Comment No. 521-NFPA 70-2018 [Section No. 210.8]****210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.**

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

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

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use****(3) Outdoors**

Exception to (3): 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.

(4) Crawl spaces — at or below grade level**(5) Finished and unfinished areas of basements**

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces**(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink****(8) Boathouses****(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(10) Laundry areas**

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking****(3) Rooftops**

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B) (1), GFCI protection shall not be required.

(6) Indoor wet locations**(7) Locker rooms with associated showering facilities****(8) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms****(9) Crawl spaces — at or below grade level****(10) Unfinished areas of basements**

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas**(12) Bathtubs and shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(C) Boat Hoists.**

GFCI protection shall be provided for outlets not exceeding 240 volts that supply boat hoists installed in dwelling unit locations.

(D) Crawl Space Lighting Outlets.

GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

(E) Specific Appliances.

Unless GFCI protection is provided in accordance with 422.5(B)(3) through (B)(5), the outlets supplying the appliances specified in 422.5(A) shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

(F) Outside Branch Circuits.

GFCI protection shall be provided for branch circuit conductors installed outside of a building. The ground fault circuit interrupter shall be installed in the circuit before the conductors leave the building from which they are supplied. This does not apply to outlets, luminaires, and devices mounted on exterior walls of a building as long as the circuit conductors are installed inside of the walls of the building.

Additional Proposed Changes**File Name****Description****Approved**

Incident_Location.png

Picture of the incident location

Passage_Between_Houses.pdf

Picture of the incident location

Statement of Problem and Substantiation for Public Comment

This public comment is submitted to urge CMP-2 to reconsider a resolved PI-1206 that requested GFCI protection for branch circuits installed outside of a building in light of this unfortunate incident:

"An electrical fire occurred in the basement of defendant Miller's residence at 7259 S. Seeley Ave., Chicago, on August 15, 2005. General contractor Service Construction Co. was retained to repair the property damage, and deft Chicago Edison Electrical & Lighting Co. was hired as the electrical subcontractor. As part of the contracted work, Chicago Edison installed an electrical disconnect box that provided power to the home's outdoor air-conditioning condenser unit. The repairs were completed on April 10, 2006.

On August 3, 2007, 12-year-old Vontrell Pargo jumped over a fence onto Miller's property and landed on the AC condenser unit. However, the condenser had an electrical ground fault which caused the unit's outer metal housing to become electrified. Vontrell was fatally electrocuted when he simultaneously came into contact with both the condenser and the fence.

The child was survived by his parents and one sibling. The estate contended Chicago Edison Electrical was negligent for failing to properly ground the disconnect box, improperly hooking up power to a non-functional air-conditioning unit, failing to turn the power off, an failing to inspect their work. The defense asserted the electrical work was properly performed, Chicago Edison had left the power to the AC unit off, and evidence indicated untrained third-parties had attempted repairs and created the dangerous condition."

Source: <http://www.juryverdictreporters.com/LBPC/Files/JVR/Awards2015/files/assets/basic-html/page14.html>

Related Item

- PI-1206

Submitter Information Verification

Submitter Full Name: Nehad El-Sherif

Organization: [Not Specified]

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Submittal Date: Fri Aug 10 03:20:45 EDT 2018

Committee: NEC-P02

Copyright Assignment

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Disconnect

Air Conditioning Condenser Unit



**Public Comment No. 747-NFPA 70-2018 [Section No. 210.8]****210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.**

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F E). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

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

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

- (1) Bathrooms
- (2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use
- (3) Outdoors

Exception to (3): 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.

- (4) Crawl spaces — at or below grade level
- (5) Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

- (6) Kitchens — where the receptacles are installed to serve the countertop surfaces
- (7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink
- (8) Boathouses
- (9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall
- (10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

- (11) Indoor damp and wet locations

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking****(3) Rooftops**

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B) (1), GFCI protection shall not be required.

(6) Indoor wet locations**(7) Locker rooms with associated showering facilities****(8) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms****(9) Crawl spaces — at or below grade level****(10) Unfinished areas of basements**

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas**(12) Bathtubs and shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(C) Boat Hoists.**

GFCI protection shall be provided for outlets not exceeding 240 volts that supply boat hoists installed in dwelling unit locations.

(D) Crawl Space Lighting Outlets.

GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

(E) Specific Appliances.

Unless GFCI protection is provided in accordance with 422.5(B)(3) through (B)(5), the outlets supplying the appliances specified in 422.5(A) shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

Statement of Problem and Substantiation for Public Comment

I find no Section 210.8(F) in the First Draft Report as presented.

Related Item

- FR7863 seems to be where the numbering was changed from "A through E" to "A through F," without any 2108(F) being present in the first draft as shown.

Submitter Information Verification

Submitter Full Name: David Shapiro

Organization: Safety First Electrical

Street Address:

City:

State:

Zip:

Submittal Date: Thu Aug 16 17:15:21 EDT 2018

Committee: NEC-P02

Copyright Assignment

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**Public Comment No. 845-NFPA 70-2018 [Section No. 210.8]****210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.**

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

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

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use****(3) Outdoors**

Exception to (3): 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.

(4) Crawl spaces — at or below grade level**(5) Finished and unfinished areas of basements**

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces**(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink****(8) Boathouses****(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(10) Laundry areas**

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking****(3) Rooftops**

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B)(1), GFCI protection shall not be required.

(6) Indoor wet locations**(7) Locker rooms with associated showering facilities****(8) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms****(9) Crawl spaces — at or below grade level****(10) Unfinished areas of basements**

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas**(12) Bathtubs and shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(C) Boat Hoists.**

GFCI protection shall be provided for outlets not exceeding 240 volts that supply boat hoists installed in dwelling unit locations.

(D) Crawl Space Lighting Outlets.

GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

(E) Specific Appliances.

Unless GFCI protection is provided in accordance with 422.5(B)(3) through (B)(5), the outlets supplying the appliances specified in 422.5(A) shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
CN_154.pdf	70_CN 154

Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 154 in the First Draft Report on First Revision No. 7863.

The Correlating Committee directs that the panel review the references in the parent text for correlation with the existing first level subdivisions.

This action will be considered as a public comment.

Related Item

- FR 7863

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC

Organization: NEC Correlating Committee

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 20 11:53:16 EDT 2018

Committee: NEC-P02

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Correlating Committee Note No. 154-NFPA 70-2018 [Section No. 210.8 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name: Erik Hohengasser

Committee:

Submittal Date: Fri May 11 09:14:23 EDT 2018

Committee Statement and Meeting Notes

Committee Statement: The Correlating Committee directs that the panel review the references in the parent text for correlation with the existing first level subdivisions.

This action will be considered as a public comment.

First Revision No. 7863-NFPA 70-2018 [Section No. 210.8 [Excluding any Sub-Sections]]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.



Public Comment No. 1299-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel. Where required, GFCI protection shall have the GFCI protective device located in the room or area protected.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
210.8_A_Dwelling_Units_record_of_actual_desired_changes_SGRood.docx	210.8 (A) Dwelling units record of actual desired changes everywhere GFCI is required	
Clear_Path_for_Veterans.pdf	Clear Path for Veterans support point of use in all areas that require GFCI	
Triangle_Inc_NEC_Letter.pdf	Triangle, Inc's support point of use in all areas that require GFCI	
Building_Homes_for_Heroes_NEC_letter-signed.pdf	Building Homes for Heroes support point of use in all areas that require GFCI	

NortheastArc_NFPA_NEC_letter.pdf

Northeast Arc support point
of use in all areas that require
GFCI

Comments_on_GFCI_Accessibility.pdf

Comments on GFCI
Accessibility

Statement of Problem and Substantiation for Public Comment

Why Point of Use Everywhere is Needed? As used in this substantiation, "point of use" means located in the room or area being protected. In those areas that also have requirements for AFCI protection, from information available, there are more reported nuisance tripping issues. Due to the nuisance tripping issue, the requirement having the GFCI protection to be located at the point of use is added (local devices that are easily accessible). Typical examples of "point of use protection" could include a receptacle, dead-front device or a local subpanel. The point of use is helpful to accommodate those with disabilities, therefore device location needs to be considered for monthly testing and trip resetting with all these devices.

Why is Point of Use Important? As noted in the Panel Statement to resolve PI 3104, it is agreed that there are several methods to provide GFCI protection. However, not every method ensures that every member of the public can conveniently access the GFCI device for the monthly testing and the re-setting, as needed. Considering the end user, the GFCI device should be located conveniently accessible in the room or area as opposed to the more common panelboard location typically in the garage or in the basement which may not be conveniently accessible to everyone. In the First Draft meeting, the Panel heard Jo Ann Simons of Northeast Arc testify how the special needs (age, developmental disabilities, temporary or permanent physical disabilities, etc.) community needs point of use protection. Point of use is also relevant for the aging population. There are other testimonials provided where those with special needs need to have consideration for accessibility consistent with their physical or mental limitations. Point of use can also be critical to mitigate hazards from resetting a remote device where the load, such as an appliance, automatically restarts which may present an additional hazard to persons nearby.

AFCI Expansion Resulting in Less GFCIs Located at the Point of Use. Many on the panel advocated for expanding the AFCIs throughout the dwelling unit. In view of the issues with nuisance tripping of AFCI or dual function AFCI/GFCI devices, accessibility for required monthly testing and to reset now becomes a very important safety factor to assure continued personnel protection. As such, the Panel is respectfully requested to thoroughly account for those with special needs when considering the "point of use" discussion for these requirements. The element of accessibility for all affected parties should be required as a national minimal standard and not left to local amendments, preferences or due to ease of installation. The needs of the dwelling occupants are addressed with this revised text, which truly encompasses us all as opposed to excluding those most affected as noted here.

Organizational Support. The following organizations representing those with physical or mental disabilities and the aging population support this public comment on behalf of their constituency:

- Building Homes for Heroes, Inc.
- Clear Path for Veterans
- Northeast Arc
- Triangle, Inc.

Please see specific attached comments and testimonials.

Related Item

- Public Input No. 3104-NFPA 70-2017 [Section No. 210.8(A)]

Submitter Information Verification

Submitter Full Name: Stephen Rood

Organization: Legrand North America

Street Address:

City:

State:

Zip:

Submittal Date: Sun Aug 26 12:24:57 EDT 2018

Committee: NEC-P02

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1. Bathrooms

2. Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

3. Outdoors

Exception to (3): 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.

4. Crawl spaces — at or below grade level

5. Finished and unfinished areas of basements

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8. Boathouses

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

10. Laundry areas

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11. Indoor damp and wet locations



1223 Salt Springs Road
Chittenango, NY 13037
(315) 687-3300
ClearPathForVets.com

December 29, 2017

**Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471**

**Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894**

Dear Mr. Hilbert/Earley

I understand that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. I wanted to ask you to reject any code change proposal which would result in this move.

As the Director of Facilities at Clear Path for Veterans, and a New York State Certified Code Enforcement Officer since 1989, I strongly oppose these proposed changes. We believe that by allowing for the removal of the point of use functionality, it will create an unnecessary and potentially costly burden that our Veterans will be forced to deal with. For the elderly, parents watching small children and veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far-removed panel could be an issue.

Clear Path for Veterans is a community-based resource center that connects service members and their families to the resources they need and provides them with in-house non-clinical programs to ensure that our Veterans are holistically supported in all of their physical and emotional needs. Clear Path exists to serve veterans and their families and it is for that reason that we are urging you to reject these proposals. Please do not hesitate to contact me if you have questions.

Due to the support of our friends and family we are able to provide a center for services that is unlike anything else in the country and gives us the opportunity to touch the lives of more than 30,000 veterans per year.

Sincerely,

**Ron Dean
Director of Facilities Management
Clear Path for Veterans**



420 Pearl Street
Malden, MA 02148

December 11, 2017

Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894

Dear Mr. Hilbert/Earley

I am writing to you today in regards to the development of the 2020 National Electrical Code, with a specific concern related to the proposed changes that pose a threat to the safety, accessibility and mobility of those with disabilities within their homes. We here at Triangle, Inc., where we help those with disabilities and their families lead rich, fulfilling lives, recently became aware of requests by manufacturers that would result in the movement of the "Test/Reset" buttons from electrical outlets in homes and move the functionality to the breaker panel, which in many homes is in the basement or garage. This change is of particular concern to us as we aim to empower transition-age youth and adults with disabilities to meet their personal and professional goals and ultimately achieve independence. We believe that by allowing for the relocation of the point-of-use functionality to the breaker panel, it will create another barrier to independence for the people we serve. We want our members to feel safe in their homes and asking them to go to an inconvenient, and for some unsafe, location just to troubleshoot a simple household problem is wrong when a much easier push of a button is a better fix.

In its early days, Triangle, Inc. represented a place for those who did not feel appreciated or comfortable in their communities to be welcomed and serve alongside their peers in sheltered workshops and on-site day programs. Now, 46 years later, our organization stands as an entry point into the community for our participants to gain employment, establish residency, and learn effective self-advocacy skills.

As you consider these proposed code changes, please keep in the mind the people that need to be able to reach these outlets for their everyday needs for cooking, cleaning and medical equipment. It would be a shame for the business interests of some to supersede the safety of so many.

Please keep safety accessible in the home and reject these proposals.

Sincerely,

A handwritten signature in blue ink, appearing to read "Coleman Nee", with a long, sweeping horizontal line extending to the right.

Coleman Nee
CEO
Triangle, Inc.

December 20, 2017

Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471



Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894

Dear Mr. Hilbert/Earley

It has come to my attention that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. If the National Fire Protection Association were to accept these proposals, it would directly impact the lives of the brave men and women who were injured while serving this country.

Started in 2006, Building Homes for Heroes is a national non-profit that has been at the forefront of making a significant difference in the lives of wounded American service members and their families. The organization gifts mortgage-free homes that meet the needs of the men and women who have selflessly served our country. These homes not only help to remove the family's financial burden, they help to restore the individual's freedom, and enable the veteran to lead a more independent and productive civilian life.

As the National Director of Construction Development, I strongly oppose these proposed changes because it will create an unnecessary and potentially costly burden that our Veterans will be forced to deal with. For the elderly, parents watching small children and veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far removed panel could be an issue.

It is for these reasons that I urge you to reject these proposals. Please do not hesitate to contact me if you have questions.

Sincerely,

A handwritten signature in cursive script, reading 'Chad Gottlieb', is positioned above the printed name.

Chad Gottlieb

Director of Construction Development, National
Building Homes for Heroes, Inc.
Phone: (516) 395-2440

www.BuildingHomesforHeroes.org

NortheastArc

Lifelong support for people with disabilities

November 29, 2017

Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894

Dear Mr. Hilbert,

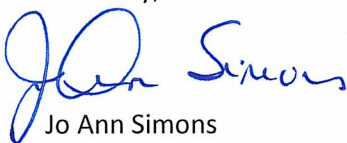
I recently became aware that proposed changes to the upcoming National Electrical Code pose a threat to the safety, accessibility and mobility of those with intellectual and physical disabilities within their homes. Our organization has become aware of requests by manufacturers that would remove the "Test/Reset" buttons from many outlets in homes and move the functionality to the breaker panel which in many homes is in the basement or garage. For many people we serve, resetting a circuit on a circuit breaker may be overwhelming while simply pushing a button on an outlet is far easier. I fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently.

As CEO of the Northeast ARC, I am fully aware of the challenges posed every day to the members we serve. At the Northeast Arc our mission is to help people with disabilities become full participants in the community; choosing for themselves how to live, learn, work, socialize and play. It is however, in my role of an adult son with Down syndrome, that I raise my highest objections. Jon Lives independently and in his own home. While he can confidently navigate most of his daily life, he is uncomfortable with the workings of his circuit breaker. In addition to being in his basement, it is confusing to him.

As you consider these proposed code changes, please keep in the mind the people that need to be able to reach these outlets for their everyday needs for cooking, cleaning and medical equipment.

Please keep safety accessible in the home and reject these proposals and if I can provide any additional information please contact me.

Sincerely,



Jo Ann Simons
President and CEO
Northeast Arc
JAS@ne-arc.org
978-624-2408

TESTIMONIALS ON GFCI POINT OF USE

GFCI receptacles have been pivotal in reducing the number of electrocutions since their introduction into homes. A GFCI receptacle's indicator light makes it easy for the homeowner to determine why they lost power, while point of use functionality makes it easier for everyone to reset the receptacle, especially the elderly and disabled. If a GFCI is located remotely in the service panel, a homeowner may not notice that it has tripped and that they have lost power to their AC condensate pump, sump pump or freezer. This could result in extensive property damage.

In a September 2017 study conducted by The Farnsworth Group, more than 200 contractors who were surveyed expressed serious concerns with nuisance tripping on remotely located devices:

- 88% of contractors say that it is easier to reset power at the point-of-use when using a GFCI receptacle.
- 47% of electrical contractors have received complaints from homeowners not wanting to go to a remote service panel to reset power.
- 85% say that DF Breaker nuisance tripping has resulted in call back.

The following are a collection of testimonials detailing the instances of real-world issues within the home that exemplify the value and the need to retain point of use GFCIs:

Comments on Accessibility

"Here at Able SC, we believe that if AFCI protection were required throughout dwellings, it would pose a serious threat to the safety, accessibility and mobility of those with intellectual and physical disabilities within their homes. Specifically, we are concerned that by mandating AFCI protection, GFCI point-of-use will be relocated to the circuit breaker. This relocation of the familiar "Test/Reset" buttons from the outlet to the breaker panel in a basement and garage will severely impact the independence of the people we serve."

Kimberly Tissot

Executive Director, Able South Carolina

"For the elderly, parents watching small children and Veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far removed panel could be an issue."

Ron Dean

Director of Facilities Management, Clear Path for Veterans

“As CEO of the Northeast ARC, I am fully aware of the challenges posed every day to the members we serve. At the Northeast Arc our mission is to help people with disabilities become full participants in the community; choosing for themselves how to live, learn, work, socialize and play. For many people we serve, resetting a circuit on a circuit breaker may be overwhelming while simply pushing a button on an outlet is far easier. I fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently.”

Jo Ann Simons
CEO, Northeast Arc

“Triangle, Inc. recently became aware of requests by manufacturers that could remove the “Test/Reset” buttons from many outlets in homes and move the functionality to the breaker panel, which in many homes is in the basement or garage. This change is of particular concern to as us we aim to empower transition-age youth and adults with disabilities to meet their personal and professional goals and ultimately achieve independence. We believe that by allowing for the relocation of the point-of-use functionality to the breaker panel, it will create another barrier to independence for the people we serve.”

Coleman Nee
CEO, Triangle, Inc.

“It has come to my attention that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. If the National Fire Protection Association were to accept these proposals, it would directly impact the lives of the brave men and women who were injured while serving this country.”

Chad Gottlieb
National Director of Construction Development, Building Homes for Heroes



Public Comment No. 1350-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel. As required in 210.8 (A)(6), (10) and (11), the GFCI protective device shall be located in the room or area protected.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
210.8_A_Dwelling_Units_specific_area_point_of_use_record_of_actual_desired_changes_SGRood.docx	210.8 (A) Dwelling units specific GFCI point of use area record of actual desired changes
Clear_Path_for_Veterans.pdf	Clear Path for Veterans support point of use in all areas that require AFCI and

Triangle_Inc_NEC_Letter.pdf

GFCI
Triangle,
Inc. support
point of use
in all areas
that require
AFCI and
GFCI

Building_Homes_for_Heroes_NEC_letter-signed.pdf

Building
Homes for
Heroes
support
point of use
in all areas
that require
AFCI and
GFCI

NortheastArc_NFPA_NEC_letter.pdf

Northeast
Arc support
point of use
in all areas
that require
AFCI and
GFCI

Comments_on_GFCI_Accessibility.pdf

Comments
on GFCI
Accessibility

Statement of Problem and Substantiation for Public Comment

Why Point of Use in these Areas? As used in this substantiation, “point of use” means located in the room or area being protected. These areas that are proposed for point of use GFCI protection also have requirements for AFCI protection and therefore, from information available, are more likely to have reported nuisance tripping. Due to the nuisance tripping issue, the requirement having the GFCI protection to be located at the point of use is added (local devices that are easily accessible). Typical examples of “point of use protection” could include a receptacle, dead-front device or a local subpanel.

Why is Point of Use Important? As noted in the Panel Statement to resolve PI 3104, it is agreed that there are several methods to provide GFCI protection. However, not every method ensures that every member of the public can conveniently access the GFCI device for the monthly testing and the re-setting, as needed. Considering the end user, the GFCI device should be located conveniently accessible in the room or area as opposed to the more common panelboard location typically in the garage or in the basement which may not be conveniently accessible to everyone. In the First Draft meeting, the Panel heard Jo Ann Simons of Northeast Arc testify how the special needs (age, developmental disabilities, temporary or permanent physical disabilities, etc.) community needs point of use protection. Point of use is also relevant for the aging population. There are other testimonials provided where those with special needs need to have consideration for accessibility consistent with their physical or mental limitations. Point of use can also be critical to mitigate hazards from resetting a remote device where the load, such as an appliance, automatically restarts which may present an additional hazard to persons nearby.

AFCI Expansion Resulting in Less GFCIs Located at the Point of Use. Many on the panel advocated for expanding the AFCIs throughout the dwelling unit. In view of the issues with nuisance tripping of AFCI or dual function AFCI/GFCI devices, accessibility for required monthly testing and to reset now becomes a very important safety factor to assure continued personnel protection. As such, the Panel is respectfully requested to thoroughly account for those with special needs when considering the “point of use” discussion for these requirements. The element of accessibility for all affected parties should be required as a national minimal standard and not left to local amendments, preferences or due to ease of installation. The needs of the dwelling occupants are addressed with this revised text, which truly encompasses us all as opposed to excluding those most affected as noted here.

Organizational Support. The following organizations representing those with physical or mental disabilities and the aging population support this public comment on behalf of their constituency:

- Building Homes for Heroes, Inc.
- Clear Path for Veterans
- Northeast Arc
- Triangle, Inc.

Please see specific attached comments and testimonials.

Related Item

- Public Input No. 3104-NFPA 70-2017 [Section No. 210.8(A)]

Submitter Information Verification

Submitter Full Name: Stephen Rood

Organization: Legrand North America

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 27 12:24:07 EDT 2018

Committee: NEC-P02

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☒ By checking this box I affirm that I am Stephen Rood, and I agree to be legally bound by the above Copyright Assignment and the terms and conditions contained therein. I understand and intend that, by checking this box, I am creating an electronic signature that will, upon my submission of this form, have the same legal force and effect as a handwritten signature

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel. As required in 210.8 (A)(6), (10) and (11), the GFCI protective device shall be located in the room or area protected.

1. Bathrooms

2. Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

3. Outdoors

Exception to (3): 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.

4. Crawl spaces — at or below grade level

5. Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

6. Kitchens — where the receptacles are installed to serve the countertop surfaces

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

8. Boathouses

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

10. Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

11. Indoor damp and wet locations



1223 Salt Springs Road
Chittenango, NY 13037
(315) 687-3300
ClearPathForVets.com

December 29, 2017

**Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471**

**Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894**

Dear Mr. Hilbert/Earley

I understand that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. I wanted to ask you to reject any code change proposal which would result in this move.

As the Director of Facilities at Clear Path for Veterans, and a New York State Certified Code Enforcement Officer since 1989, I strongly oppose these proposed changes. We believe that by allowing for the removal of the point of use functionality, it will create an unnecessary and potentially costly burden that our Veterans will be forced to deal with. For the elderly, parents watching small children and veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far-removed panel could be an issue.

Clear Path for Veterans is a community-based resource center that connects service members and their families to the resources they need and provides them with in-house non-clinical programs to ensure that our Veterans are holistically supported in all of their physical and emotional needs. Clear Path exists to serve veterans and their families and it is for that reason that we are urging you to reject these proposals. Please do not hesitate to contact me if you have questions.

Due to the support of our friends and family we are able to provide a center for services that is unlike anything else in the country and gives us the opportunity to touch the lives of more than 30,000 veterans per year.

Sincerely,

**Ron Dean
Director of Facilities Management
Clear Path for Veterans**



December 11, 2017

Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894

Dear Mr. Hilbert/Earley

I am writing to you today in regards to the development of the 2020 National Electrical Code, with a specific concern related to the proposed changes that pose a threat to the safety, accessibility and mobility of those with disabilities within their homes. We here at Triangle, Inc., where we help those with disabilities and their families lead rich, fulfilling lives, recently became aware of requests by manufacturers that would result in the movement of the "Test/Reset" buttons from electrical outlets in homes and move the functionality to the breaker panel, which in many homes is in the basement or garage. This change is of particular concern to us as we aim to empower transition-age youth and adults with disabilities to meet their personal and professional goals and ultimately achieve independence. We believe that by allowing for the relocation of the point-of-use functionality to the breaker panel, it will create another barrier to independence for the people we serve. We want our members to feel safe in their homes and asking them to go to an inconvenient, and for some unsafe, location just to troubleshoot a simple household problem is wrong when a much easier push of a button is a better fix.

In its early days, Triangle, Inc. represented a place for those who did not feel appreciated or comfortable in their communities to be welcomed and serve alongside their peers in sheltered workshops and on-site day programs. Now, 46 years later, our organization stands as an entry point into the community for our participants to gain employment, establish residency, and learn effective self-advocacy skills.

As you consider these proposed code changes, please keep in the mind the people that need to be able to reach these outlets for their everyday needs for cooking, cleaning and medical equipment. It would be a shame for the business interests of some to supersede the safety of so many.

Please keep safety accessible in the home and reject these proposals.

Sincerely,

A handwritten signature in blue ink, appearing to read "Coleman Nee", is written over a horizontal line.

Coleman Nee
CEO
Triangle, Inc.

December 20, 2017

Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471



Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894

Dear Mr. Hilbert/Earley

It has come to my attention that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. If the National Fire Protection Association were to accept these proposals, it would directly impact the lives of the brave men and women who were injured while serving this country.

Started in 2006, Building Homes for Heroes is a national non-profit that has been at the forefront of making a significant difference in the lives of wounded American service members and their families. The organization gifts mortgage-free homes that meet the needs of the men and women who have selflessly served our country. These homes not only help to remove the family's financial burden, they help to restore the individual's freedom, and enable the veteran to lead a more independent and productive civilian life.

As the National Director of Construction Development, I strongly oppose these proposed changes because it will create an unnecessary and potentially costly burden that our Veterans will be forced to deal with. For the elderly, parents watching small children and veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far removed panel could be an issue.

It is for these reasons that I urge you to reject these proposals. Please do not hesitate to contact me if you have questions.

Sincerely,

A handwritten signature in cursive script, reading 'Chad Gottlieb', is positioned above the printed name.

Chad Gottlieb

Director of Construction Development, National
Building Homes for Heroes, Inc.
Phone: (516) 395-2440

www.BuildingHomesforHeroes.org

NortheastArc

Lifelong support for people with disabilities

November 29, 2017

Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894

Dear Mr. Hilbert,

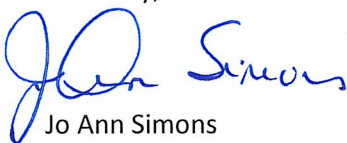
I recently became aware that proposed changes to the upcoming National Electrical Code pose a threat to the safety, accessibility and mobility of those with intellectual and physical disabilities within their homes. Our organization has become aware of requests by manufacturers that would remove the "Test/Reset" buttons from many outlets in homes and move the functionality to the breaker panel which in many homes is in the basement or garage. For many people we serve, resetting a circuit on a circuit breaker may be overwhelming while simply pushing a button on an outlet is far easier. I fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently.

As CEO of the Northeast ARC, I am fully aware of the challenges posed every day to the members we serve. At the Northeast Arc our mission is to help people with disabilities become full participants in the community; choosing for themselves how to live, learn, work, socialize and play. It is however, in my role of an adult son with Down syndrome, that I raise my highest objections. Jon Lives independently and in his own home. While he can confidently navigate most of his daily life, he is uncomfortable with the workings of his circuit breaker. In addition to being in his basement, it is confusing to him.

As you consider these proposed code changes, please keep in the mind the people that need to be able to reach these outlets for their everyday needs for cooking, cleaning and medical equipment.

Please keep safety accessible in the home and reject these proposals and if I can provide any additional information please contact me.

Sincerely,



Jo Ann Simons
President and CEO
Northeast Arc
JAS@ne-arc.org
978-624-2408

TESTIMONIALS ON GFCI POINT OF USE

GFCI receptacles have been pivotal in reducing the number of electrocutions since their introduction into homes. A GFCI receptacle's indicator light makes it easy for the homeowner to determine why they lost power, while point of use functionality makes it easier for everyone to reset the receptacle, especially the elderly and disabled. If a GFCI is located remotely in the service panel, a homeowner may not notice that it has tripped and that they have lost power to their AC condensate pump, sump pump or freezer. This could result in extensive property damage.

In a September 2017 study conducted by The Farnsworth Group, more than 200 contractors who were surveyed expressed serious concerns with nuisance tripping on remotely located devices:

- 88% of contractors say that it is easier to reset power at the point-of-use when using a GFCI receptacle.
- 47% of electrical contractors have received complaints from homeowners not wanting to go to a remote service panel to reset power.
- 85% say that DF Breaker nuisance tripping has resulted in call back.

The following are a collection of testimonials detailing the instances of real-world issues within the home that exemplify the value and the need to retain point of use GFCIs:

Comments on Accessibility

"Here at Able SC, we believe that if AFCI protection were required throughout dwellings, it would pose a serious threat to the safety, accessibility and mobility of those with intellectual and physical disabilities within their homes. Specifically, we are concerned that by mandating AFCI protection, GFCI point-of-use will be relocated to the circuit breaker. This relocation of the familiar "Test/Reset" buttons from the outlet to the breaker panel in a basement and garage will severely impact the independence of the people we serve."

Kimberly Tissot

Executive Director, Able South Carolina

"For the elderly, parents watching small children and Veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far removed panel could be an issue."

Ron Dean

Director of Facilities Management, Clear Path for Veterans

“As CEO of the Northeast ARC, I am fully aware of the challenges posed every day to the members we serve. At the Northeast Arc our mission is to help people with disabilities become full participants in the community; choosing for themselves how to live, learn, work, socialize and play. For many people we serve, resetting a circuit on a circuit breaker may be overwhelming while simply pushing a button on an outlet is far easier. I fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently.”

Jo Ann Simons
CEO, Northeast Arc

“Triangle, Inc. recently became aware of requests by manufacturers that could remove the “Test/Reset” buttons from many outlets in homes and move the functionality to the breaker panel, which in many homes is in the basement or garage. This change is of particular concern to us as we aim to empower transition-age youth and adults with disabilities to meet their personal and professional goals and ultimately achieve independence. We believe that by allowing for the relocation of the point-of-use functionality to the breaker panel, it will create another barrier to independence for the people we serve.”

Coleman Nee
CEO, Triangle, Inc.

“It has come to my attention that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. If the National Fire Protection Association were to accept these proposals, it would directly impact the lives of the brave men and women who were injured while serving this country.”

Chad Gottlieb
National Director of Construction Development, Building Homes for Heroes



Public Comment No. 1384-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) ~~Finished and unfinished~~ Unfinished areas of basements not intended as habitable rooms.

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

Accept the clarification of “areas” of basements but return back to the 2017 text for the remainder of the requirement. During the 2018 First draft meeting in Hilton Head, SC, a CMP-2 member made a motion to change this language so that finished areas of basements would require GFCI protection. This change was not associated with a Public Input.

The argument was made that finished areas of basements (bedrooms, living rooms, kitchens, etc.) “could” flood during a storm, leakage of ground water, or loss of a sump pump. There was no substantiation brought forward to justify this change. The same argument could be made for GFCI protection for rooms or areas at grade as a water leak from a burst water pipe, flooding due to dishwasher or washing machine, or floods from heavy rains “could” occur and flood a bedroom, living room, dining room, etc.

Substantiation of actual problems in finished basements was not provided to support expanding this requirement to include finished basements. There are many types of finished basements that would not present conductive floor surfaces such as a wood framed floor over a concrete surface. There are also many basements that are not prone to excessive moisture or flooding.

Conductive floor surfaces can exist in other areas of a structure other than basements. There can also be other locations where there are concrete floor surfaces that would present the same situation such as high rise multifamily dwellings and buildings where there is enough wall exposure above grade to be considered a first floor and not a basement. These locations would not be covered by this change.

Related Item

- FR8120

Submitter Information Verification

Submitter Full Name: David Clements

Organization: Intl Assoc Elec Insp

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 27 16:59:51 EDT 2018

Committee: NEC-P02

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Public Comment No. 1437-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) ~~Finished and unfinished~~ Unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

No substantiation was given to support requiring GFCI protection in finished basements. Expanding GFCI coverage to all areas of finished basements even where no water is to be expected is not justified. Concrete floors are not as dangerous as bathrooms or kitchens where people use small appliances near sinks and tubs, and no data was presented to prove otherwise. GFCI receptacles were first required in the 1987 edition of the code, and expanded to the entire unfinished area of basements based on Public Input 2-49 (1989). There has been no reason to expand coverage to all basements since then, which shows that there is no known benefit to requiring finished basements to be covered by GFCIs.

The committee statement claims that “basements whether finished or unfinished are prone to moisture including flooding”, but that best reflects conditions in older homes. As written, this would affect all new houses but only older homes which have their basement electrical systems updated or expanded. (Building codes have added requirements to address moisture in basements. Newer homes require drain tile and water proofing materials which go beyond the traditional parging mortar of the past.) If the concern is older homes then an expansion of GFCI protection should focus on such homes and not include new construction.

This wording mirrors that of 210.8(B) as modified by FR 8125, which was approved by ballot.

Related Item

- FR 8120

Submitter Information Verification

Submitter Full Name: Daniel Buuck

Organization: National Association of Home Builders

Street Address:

City:

State:

Zip:

Submittal Date: Tue Aug 28 15:09:41 EDT 2018

Committee: NEC-P02

Copyright Assignment

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☒ By checking this box I affirm that I am Daniel Buuck, and I agree to be legally bound by the above Copyright Assignment and the terms and conditions contained therein. I understand and intend that, by checking this box, I am creating an electronic signature that will, upon my submission of this form, have the same legal force and effect as a handwritten signature



Public Comment No. 1719-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle for supplying a portable appliance is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Additional Proposed Changes

File Name	Description	Approved
FanWithLightDrawingJuly2018.jpg	Shows ceiling fan with a portable appliance integral to the ceiling fan.	

Statement of Problem and Substantiation for Public Comment

Terra incorrectly underlined the entire Exception to (1) through (3), (5) through (8), and (10), but the only words added to this existing exception are in the last sentence adding the words "for supplying a portable appliance".

The concern of the Panel prompting them to add the last sentence in the exception was the potential to allow a corded product to be connected to a circuit using a standard "convenience" receptacle that was exempted from having GFCI protection. The modification in this comment would remove limitations for to design options, such as the addition of a light kit where a locking support and mounting receptacle and attachment fitting could be used, while still maintaining applicable safety requirements. Presently, there are cases where a ceiling fan could have a listed light kit attached to the bottom, or other listed accessory kit. The ceiling fan or luminaire may be using a locking support and mounting receptacle and attachment fitting for connection of the accessory light or other unit in addition to the locking support and mounting receptacle for the overall ceiling fan.

For this reason, the revised text is provided to clarify that a “receptacle” in the last sentence of this exception is not a “locking support and mounting receptacle”, but rather a “convenience receptacle” that could be used for a corded portable appliance (requiring a GFCI). It is understood the intent of this last sentence was not to consider a locking support and mounting receptacle as the receptacle requiring GFCI protection. If there is a receptacle for a corded portable appliance, it would be required to have GFCI protection. Attached is a drawing of the technology. See the following link to view a video of the technology: <https://www.dropbox.com/s/06thyu5zq1n88iw/click-in-fan-patty.mp4?dl=0>

Related Public Comments for This Document

Related Comment

[Public Comment No. 1720-NFPA 70-2018 \[Section No. 210.8\(B\)\]](#)

[Public Comment No. 1720-NFPA 70-2018 \[Section No. 210.8\(B\)\]](#)

Relationship

Same change in "other than dwelling units" section

Related Item

- FR 8122

Submitter Information Verification

Submitter Full Name: Amy Cronin

Organization: Strategic Code Solutions Llc

Affiliation: Sky Technologies (formerly Safety Quick Light)

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 29 17:45:57 EDT 2018

Committee: NEC-P02

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PLUG-IN

1-2-3 Easy Installation

Step 1
Install power
plug into ceiling
junction box.

Step 2
Plug fan motor
into receptacle.

Step 3
Attach blades.

Optional one-step
light kit installation.





Public Comment No. 1856-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel. Where required, GFCI protection shall have the GFCI protective device located in the room or area protected.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Clear_Path_for_Veterans.pdf	Copy of letter submitted during first draft stage.	

Statement of Problem and Substantiation for Public Comment

As the Chief Executive Officer at Clear Path For Veterans, I am formally submitting public comments related to the issue of nuisance tripping and how it impacts the population we serve. We believe that an expansion of AFCI requirements will likely result in the relocation of the Test and Reset functionality from many residential electrical outlets, moving it from an accessible location to the circuit breaker which might be in the basement or garage.

Clear Path For Veterans is a community-based resource center that connects service members and their families to the resources they need and provides them with in-house non-clinical programs to ensure that our Veterans are holistically supported in all of their physical and emotional needs. Clear Path exists to serve veterans and their families.

This possible change would have a disproportionate impact on vulnerable populations including the elderly, parents with young children and veterans with disabilities with whom we work. Removing the point of use functionality and instead resetting a circuit on a breaker panel in a remote location may be more difficult than simply pushing a button on a nearby

outlet. Our concern is this will create an unnecessary and potentially costly and harmful burden on our Veterans. Further, with increased nuisance trips occurring as a result of AFCIs, we fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently.

As you consider these public comments, we urge you to keep in mind the people that rely on the point of use functionality to lead independent lives. Please do not hesitate to contact me if you have questions.

Sincerely,

Melissa Spicer
Chief Executive Office
Clear Path For Veterans

Related Item

- PI 3104

Submitter Information Verification

Submitter Full Name: Bethany Frank

Organization: Clear Path for Veterans

Street Address:

City:

State:

Zip:

Submission Date: Thu Aug 30 10:34:15 EDT 2018

Committee: NEC-P02

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1223 Salt Springs Road
Chittenango, NY 13037
(315) 687-3300
ClearPathForVets.com

December 29, 2017

**Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471**

**Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894**

Dear Mr. Hilbert/Earley

I understand that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. I wanted to ask you to reject any code change proposal which would result in this move.

As the Director of Facilities at Clear Path for Veterans, and a New York State Certified Code Enforcement Officer since 1989, I strongly oppose these proposed changes. We believe that by allowing for the removal of the point of use functionality, it will create an unnecessary and potentially costly burden that our Veterans will be forced to deal with. For the elderly, parents watching small children and veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far-removed panel could be an issue.

Clear Path for Veterans is a community-based resource center that connects service members and their families to the resources they need and provides them with in-house non-clinical programs to ensure that our Veterans are holistically supported in all of their physical and emotional needs. Clear Path exists to serve veterans and their families and it is for that reason that we are urging you to reject these proposals. Please do not hesitate to contact me if you have questions.

Due to the support of our friends and family we are able to provide a center for services that is unlike anything else in the country and gives us the opportunity to touch the lives of more than 30,000 veterans per year.

Sincerely,

**Ron Dean
Director of Facilities Management
Clear Path for Veterans**



Public Comment No. 1859-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel. As required in 210.8 (A)(6), (10) and (11), the GFCI protective device shall be located in the room or area protected.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Clear_Path_for_Veterans.pdf	Copy of letter submitted during the first draft stage.	

Statement of Problem and Substantiation for Public Comment

As the Chief Executive Officer at Clear Path For Veterans, I am formally submitting public comments related to the issue of nuisance tripping and how it impacts the population we serve. We believe that an expansion of AFCI requirements will likely result in the relocation of the Test and Reset functionality from many residential electrical outlets, moving it from an accessible location to the circuit breaker which might be in the basement or garage.

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This possible change would have a disproportionate impact on vulnerable populations including the elderly, parents with young children and veterans with disabilities with whom we work. Removing the point of use functionality and instead resetting a circuit on a breaker panel in a remote location may be more difficult than simply pushing a button on a nearby

outlet. Our concern is this will create an unnecessary and potentially costly and harmful burden on our Veterans. Further, with increased nuisance trips occurring as a result of AFCIs, we fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently.

As you consider these public comments, we urge you to keep in mind the people that rely on the point of use functionality to lead independent lives. Please do not hesitate to contact me if you have questions.

Sincerely,

Melissa Spicer
Chief Executive Office
Clear Path For Veterans

Related Item

- PI 3104

Submitter Information Verification

Submitter Full Name: Bethany Frank

Organization: Clear Path For Veterans

Street Address:

City:

State:

Zip:

Submission Date: Thu Aug 30 10:37:59 EDT 2018

Committee: NEC-P02

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1223 Salt Springs Road
Chittenango, NY 13037
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December 29, 2017

**Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471**

**Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894**

Dear Mr. Hilbert/Earley

I understand that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. I wanted to ask you to reject any code change proposal which would result in this move.

As the Director of Facilities at Clear Path for Veterans, and a New York State Certified Code Enforcement Officer since 1989, I strongly oppose these proposed changes. We believe that by allowing for the removal of the point of use functionality, it will create an unnecessary and potentially costly burden that our Veterans will be forced to deal with. For the elderly, parents watching small children and veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far-removed panel could be an issue.

Clear Path for Veterans is a community-based resource center that connects service members and their families to the resources they need and provides them with in-house non-clinical programs to ensure that our Veterans are holistically supported in all of their physical and emotional needs. Clear Path exists to serve veterans and their families and it is for that reason that we are urging you to reject these proposals. Please do not hesitate to contact me if you have questions.

Due to the support of our friends and family we are able to provide a center for services that is unlike anything else in the country and gives us the opportunity to touch the lives of more than 30,000 veterans per year.

Sincerely,

**Ron Dean
Director of Facilities Management
Clear Path for Veterans**

**Public Comment No. 2020-NFPA 70-2018 [Section No. 210.8(A)]****(A) Dwelling Units.**

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts or less to ground ~~or less~~ shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level**(5) Finished and unfinished areas of basements**

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces**(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink****(8) Boathouses****(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(10) Laundry areas**

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations**Statement of Problem and Substantiation for Public Comment**

READABILITY of the Code. EDITORIAL.

"250 volts to ground or less" is problematic and ambiguous. What is LESS than GROUND in "GROUND or LESS" ? Either change to "250 volts or less to ground", or hyphenate as "250 volts-to-ground or less" to convey that volts-to-ground is the unit-of-measure.

NOTE: Revisions were made on this Public Comment to the charging text of 210.8(A). Any spurious underlining or renumbering in the list items were provided by the gremlins infecting TerraView™.

(Hey, I nailed the "2020" Public Comment for the 2020 Code! Do I win the table's centerpiece?)

Related Public Comments for This Document**Related Comment**

[Public Comment No. 2051-NFPA 70-2018 \[Section No. 210.8\(B\)\]](#)

[Public Comment No. 1959-NFPA 70-2018 \[Section No. 680.21\(C\)\]](#)

Relationship

Similar specification of Class A voltage to ground

Similar specification of Class A voltage to ground

[Public Comment No. 1959-NFPA 70-2018 \[Section No. 680.21\(C\)\]](#)

[Public Comment No. 2051-NFPA 70-2018 \[Section No. 210.8\(B\)\]](#)

Related Item

- First Revision No. 7705-NFPA 70-2018 [Section No. 210.8(A)]

Submitter Information Verification

Submitter Full Name: Brian Rock

Organization: Hubbell Incorporated

Street Address:

City:

State:

Zip:

Submittal Date: Thu Aug 30 14:53:38 EDT 2018

Committee: NEC-P02

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Public Comment No. 247-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) ~~Finished and unfinished~~ Unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

The requirement to have all dwelling unit basement receptacles to be GFCI protected is unnecessary. The finished portions of dwelling units basements would be protected by AFCI protection where required in 210.12(A) and the requirements in 210.8(A)(1),(6),(7),(9), and (10) would provide adequate GFCI protection to those areas of finished dwelling unit basements. If flooding is a concern, why doesn't the requirement exist in 210.8(B)(10) for commercial buildings where the same safety concerns would exist, or apply to the first floor spaces of dwelling units without basements?

Related Item

- First Revision No.-7705 NFPA 70-2018

Submitter Information Verification

Submitter Full Name: Brian Baughman

Organization: Generac Power Systems Inc

Street Address:

City:

State:**Zip:****Submittal Date:** Fri Jul 20 11:52:04 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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**Public Comment No. 376-NFPA 70-2018 [Section No. 210.8(A)]****(A) Dwelling Units.**

All 125-volt through 250-volt receptacles

installed in the locations specified in 210.8(A) (1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

- Bathrooms
- Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use
- Outdoors—Exception to (3)
Exception 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.
- Crawl spaces — at or below grade level
Finished and unfinished areas of basements—Exception to (5)
Exception 2 : A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.
Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.
Receptacles installed under the exception to 210.8(A) (5) shall not be considered as meeting the requirements of 210.52(G).
- Kitchens — where the receptacles are installed to serve the countertop surfaces
- Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink
- Boathouses
- Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall
Laundry areas—Exception to (1) through (3), (5) through (8), and (10)
Exception 3 : Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.
- Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

This 'list' of areas contained in 210.8 where GFCI is required is an accumulation of rules added over the past 40+ years. GFCI's have proven to add safety and to continue with a list makes it more difficult for the industry to know where GFCI is required and where not.

I understand that there are special interest groups represented on code panel 2 that don't want to expand GFCIs and I understand that I have no 'technical' reason to make this rule simpler and clear. GFCI protection for 'all' receptacle outlets in a dwelling unit will one day will be required, so let's just have it happen now.

Related Item

- FR-7705

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Sat Aug 04 11:28:17 EDT 2018

Committee: NEC-P02

Copyright Assignment

I, Mike Holt, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Comment (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Comment in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this copyright assignment.

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Public Comment No. 401-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by ~~single-phase~~ branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) ~~Finished and unfinished areas of basements~~ Basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — ~~where the~~ receptacles are installed to serve the countertop or similar work surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

The words "single-phase" must be removed for clarity. It really makes no difference if the subject branch circuit conductors are from a 120/240-volt, single phase system or from a 208Y/120-volt, three phase system. The hazard is identical. In addition, a lot of larger dwellings are being supplied from three-phase systems. This will avoid the debate as to whether two ungrounded conductors having a voltage between them from a three-phase system are indeed a single phase extension or are simply are two ungrounded conductors and thus do not require GFCI protection.

"Or similar work surfaces" is added to coordinate with the addition of the work surfaces throughout 210.52.

The words "finished or unfinished" need to be removed when describing basements. It seems all areas of a basement are either finished or unfinished! The extra words are superfluous.

The several words that are shown to be deleted are unnecessary for clarity of the requirements.

Related Item

- FR 7705

Submitter Information Verification

Submitter Full Name: Phil Simmons

Organization: Simmons Electrical Services

Street Address:**City:****State:****Zip:****Submittal Date:** Sat Aug 04 18:13:25 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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**Public Comment No. 507-NFPA 70-2018 [Section No. 210.8(A)]****(A) Dwelling Units.**

All 125-volt- through 250-volt receptacles, single phase, 15 and 20 ampere receptacles installed in the locations specified in 210.8(A)(1) through (11) ~~and supplied by single-phase branch circuits rated 150 volts to ground or less shall~~ shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use****(3) Outdoors**

Exception to (3): 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.

(4) Crawl spaces — at or below grade level**(5) Finished and unfinished areas of basements**

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces**(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink****(8) Boathouses****(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(10) Laundry areas**

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations**Statement of Problem and Substantiation for Public Comment**

Our department has preformed over 100,000 electrical inspections per year for decades in our state. We not in support of the expansion of GFCI protection for personnel. We have not observed any personal injuries or deaths to warrant such change. We not in support of such proposed change to

Related Item

- 210.8(A)

Submitter Information Verification

Submitter Full Name: Marty Kumm

Organization: CCLD State Of MN

Street Address:

City:

State:

Zip:

Submittal Date: Thu Aug 09 15:53:44 EDT 2018

Committee: NEC-P02

Copyright Assignment

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Public Comment No. 543-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — ~~at or below grade level~~ all levels including those "crawl" spaces that may be between or above floors of all occupancy types.

(5) Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

(12) Attic Space(s) --- In attic spaces where the receptacle required by 210.63 is installed.

Statement of Problem and Substantiation for Public Comment

If ANY crawlspace required a general use receptacle for maintenance or service of equipment, requiring GFCI protection would certainly add an extra level of safety for the servicing personnel especially since such spaces are obscure, not subject to public view or traffic and usually serviced by only one person who, if an accident were to occur, may not be discovered for some time. In this instance, GFCI protection could possibly save a life! The same would hold true for an attic space.

Related Item

- 210.8(A)

Submitter Information Verification

Submitter Full Name: Dan Haruch

Organization: Brightwood Career Institute

Street Address:

City:

State:**Zip:****Submittal Date:** Fri Aug 10 17:30:19 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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Public Comment No. 563-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) ~~Finished and~~ Eash unfinished portion or unfinished areas of ~~basements~~ a basement not intended as a habitable room

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

When one has a "finished" basement, is that not Grandma's bedroom? Isn't a "finished" basement now Jody's Man Cave? Once you have a "finished" basement (opposed to an unfinished basement), is it not a habitable room that would now require wall spacing receptacles, switched lighting outlet, smoke alarm, etc. If this now "finished" basement is now a bedroom or a game room, does CMP-2 now expect GFCI protection for all receptacle outlets in this new bedroom? Can CMP-2 point the user of the Code toward the substantiation for demanding GFCI protection in a bedroom other than one man's opinion (submitter of PI 46).

This proposed text would basically bring back the Code language of 210.8(A)(5) of the 2017 NEC. The term "habitable room" is being proposed to be defined in Article 100 (by CMP-2).

Related Item

• FR 7705 • Detail FR 8120 • PI 46 • 210.8(A)(5)

Submitter Information Verification

Submitter Full Name: L. Keith Lofland

Organization: IAEE

Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 11 04:10:46 EDT 2018
Committee: NEC-P02

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Public Comment No. 676-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt ~~through 250-volt~~, 15- and 20-ampere receptacles installed in the locations specified in 210.8(A)(1) through (11) and ~~supplied by single-phase branch circuits rated 150 volts to ground or less~~ shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

The expansion of GFCI protection to include 250 volt installation has not been substantiated. It is going to be a very expensive and hard to enforce this requirement when the hardwired cooktop or double oven are in close proximity to the GFCI protected range within 6' of the kitchen sink. Users of the NEC will start getting creative in working around these requirements in order to get the job, and reduce cost. Please review Mr. Bucks negative comment to the first revision. "As I recall from the discussion in the panel meeting, we were told that the tragic incident mentioned in the reason statement was caused by an appliance manufacturing error and that GFCI protection on all 250 volt receptacles was needed to protect against the possibility of such incidents happening in the future. After reviewing the NFPA article referenced in the PI (www.nfpa.org/News-and-Research/Publications/NFPA-Journal/2017/January-February-2017/In-Compliance/NFPA-70), it's clear that there was an installation error as well. Requiring GFCI protection for 250 volt appliances goes beyond belt and suspenders safety provisions."

Related Item

- FR 7705

Submitter Information Verification

Submitter Full Name: Dean Hunter

Organization: Minnesota Department of Labor

Street Address:**City:****State:****Zip:****Submittal Date:** Wed Aug 15 10:58:34 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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Public Comment No. 684-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A) (1) through (11) and dwelling units and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

- Bathrooms
- Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use
- Outdoors

Exception to (3): 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.

- Crawl spaces — at or below grade level
- Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A) (5) shall not be considered as meeting the requirements of 210.52(G) :

- Kitchens — where the receptacles are installed to serve the countertop surfaces
- Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink
- Boathouses
- Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall
- Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

- Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

There is no reason for people to be shocked or electrocuted in their homes today given the technologies available. In a typical home, the list of 11 items exclude bedrooms and living rooms. Dining areas can be GFCI protected as a consequence of sharing the small appliance branch circuit. Bedrooms and living rooms can be served by just a few GFCI devices. In previous code cycles substantiation for GFCI has been requested and a very persuasive form involves tragedy. This led to receptacles up to 250 volts in dwellings being protected, but only after the death of an individual. The handling of damaged cords, plugging and unplugging equipment anywhere in a home can lead to injury. Eliminate the itemization and protect the entire dwelling unit.

Related Item

- FR 7705 • PI 1496

Submitter Information Verification

Submitter Full Name: John McCamish

Organization: NECA IBEW Electrical Training

Street Address:**City:****State:****Zip:****Submittal Date:** Wed Aug 15 12:43:39 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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Public Comment No. 686-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt ~~through 250-volt~~ receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) Finished and unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

The only change this public comment makes is removing the text "through 250 volt" in the first line.

As I recall from the discussion in the panel meeting, we were told that the tragic incident mentioned in the reason statement was caused by an appliance manufacturing error and that GFCI protection on all 250 volt receptacles was needed to protect against the possibility of such incidents happening in the future. After reviewing the NFPA article referenced in the PI (www.nfpa.org/News-and-Research/Publications/NFPA-Journal/2017/January-February-2017/In-Compliance/NFPA-70), it's clear that there was an installation error as well. Requiring GFCI protection for 250 volt appliances goes beyond belt and suspenders safety provisions. Those were already in place, and it took both to fail for the incident to occur. Let's step back and think what the panel is considering here. According to the article the appliance in question was "an older installation, one predating today's requirement to install an equipment grounding conductor in the branch circuit to the range". It sounds like the tragedy was only possible with older wiring. This is another example that new construction and updated electrical systems do not constitute the same dangers as those systems in older homes. The proposed requirement of GFCI protection for all 250 volt receptacles was too broad and not supported by the provided substantiation.

Related Item

- FR 7705

Submitter Information Verification

Submitter Full Name: Daniel Buuck

Organization: National Association of Home Builders

Street Address:

City:

State: I, Daniel Buuck, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Comment (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Comment in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this copyright assignment.

Zip:

Submital Date: Wed Aug 15 13:56:11 EDT 2018
Committee: NEC-P02
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**Public Comment No. 696-NFPA 70-2018 [Section No. 210.8(A)]****(A) Dwelling Units.**

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use****(3) Outdoors**

Exception to (3): 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.

(4) Crawl spaces — at or below grade level**(5) ~~Finished and unfinished areas of basements~~ Basements**

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces**(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink****(8) Boathouses****(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(10) Laundry areas**

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations**Statement of Problem and Substantiation for Public Comment**

Section 210.8(A)(5) should just say Basements. That would include both Finished and Unfinished basements.

Related Item

• FR-7705

Submitter Information Verification

Submitter Full Name: David Hittinger

Organization: IEC

Affiliation: Independent Electrical Contractors Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 15 18:25:08 EDT 2018

Committee: NEC-P02

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**Public Comment No. 790-NFPA 70-2018 [Section No. 210.8(A)]****(A) Dwelling Units.**

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use****(3) Outdoors**

Exception to (3): 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.

(4) Crawl spaces — at or below grade level**(5) Finished and unfinished areas of basements**

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces**(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink****(8) Boathouses****(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(10) Laundry areas**

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations**Statement of Problem and Substantiation for Public Comment**

The submitter of PI-1889 only addressed "Indoor Wet Location" to be consistent with Section 210.8(B)(6). Please remove "Damp" from new Section 210.8(A)(11).

This comment is on list item #11 only. Terra has underlined text that is not part of this public comment.

Related Item

• FR-7705

Submitter Information Verification

Submitter Full Name: David Hittinger

Organization: IEC

Affiliation: Independent Electrical Contractors

Street Address:

City:

State:

Zip:**Submittal Date:** Fri Aug 17 14:32:05 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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**Public Comment No. 854-NFPA 70-2018 [Section No. 210.8(A)]****(A) Dwelling Units.**

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms**(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use****(3) Outdoors**

Exception to (3): 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.

(4) Crawl spaces — at or below grade level**(5) Finished and unfinished areas of basements**

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces**(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink****(8) Boathouses****(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall****(10) Laundry areas**

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations**Additional Proposed Changes**

<u>File Name</u>	<u>Description Approved</u>
CN_173.pdf	70_CN173

Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 173 in the First Draft Report on First Revision No. 8119.

The Correlating Committee directs that the panel correlate 210.8(A)(11) with 210.8(B)(6) for clarity. This action will be considered as a public comment.

Related Item

- First Revision No. 8119

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC

Organization: NEC Correlating Committee

Street Address:

City:**State:****Zip:****Submittal Date:** Mon Aug 20 12:05:47 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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**Correlating Committee Note No. 173-NFPA 70-2018 [Detail]****Submitter Information Verification**

Submitter Full Name: Erik Hohengasser

Committee:

Submittal Date: Fri May 11 09:57:54 EDT 2018

Committee Statement and Meeting Notes

Committee Statement: The Correlating Committee directs that the panel correlate 210.8(A)(11) with 210.8(B)(6) for clarity.

This action will be considered as a public comment.

[First Revision No. 8119-NFPA 70-2018 \[Detail\]](#)

Ballot Results

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.



Public Comment No. 901-NFPA 70-2018 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in 210.8(A)(1) through (11) and supplied by single-phase branch circuits rated 150 volts to ground or less shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): 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.

(4) Crawl spaces — at or below grade level

(5) ~~Finished and unfinished~~ Unfinished areas of basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

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

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

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

(8) Boathouses

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

(10) Laundry areas

Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Indoor damp and wet locations

Statement of Problem and Substantiation for Public Comment

Substantiation: There was no technical or other substantiation to include all finished basements in the requirements of GFCI protection. Not all basements are subject to flooding and in fact there are many dwellings that have basements that are not prone to flooding. This change will address the concerns of PI 599. PI 46 has a valid concern regarding conductive floors, but these types of floors can be installed throughout a residence not just a basement.

Substantiation: No technical substantiation has been provided to include 250-volt receptacles in this requirement. 2017 code cycle second revision 316 took out 250-volt for this very same reason. No additional data was provided this cycle to warrant adding 250-volt to this section. The unfortunate death listed in the PI was a dishwasher circuit that the code now requires to be GFCI. The committee statement states that 250-volt receptacles present similar hazards and this is not true. 250-volt receptacles are installed behind the range or dryer with no readily access to the consumer and are plugged in and left for the operation of the appliance. A situation where a customer might plug and unplug a 250-volt appliance is an electric vehicle charger, however Section 625.54 now requires GFCI protection for this case. 120-volt receptacles are generally accessible to the consumer and if the consumer chose to they could use the receptacle for extension cords or other appliance use whereas the 250-volt is specific to that appliance. If the intent is for the appliance plugged into the plug to be GFCI protected, then the branch circuit should be GFCI protected because the appliances can, and many times are hard wired with no plug.

Related Item

- FR 8120 • FR 7705

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz

Organization: NECA

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 20 15:18:34 EDT 2018

Committee: NEC-P02

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Public Comment No. 1295-NFPA 70-2018 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking

(3) Rooftops

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5):

~~For~~

See 517.21 for receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities

~~other than those covered under 210~~

~~:~~

~~8(B)(1), GFCI protection shall not be required.~~

(6) Indoor wet locations

(7) Locker rooms with associated showering facilities

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

(9) Crawl spaces — at or below grade level

(10) Unfinished areas of basements

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas

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

Statement of Problem and Substantiation for Public Comment

Based on CCN 152, CMP 15 will consider revising 517.21 to accurately reflect the information in this exception. Moving the language of this Exception to 517.21 will allow code users to find relevant installation information relating to Category 1 and Category 2 spaces in 517 and not risk missing something located in other sections of the code. This requirement

should be under jurisdiction of CMP 15. The proposed section change to 517.21 follows.

517.21 Ground-Fault Circuit-Interrupter Protection for Personnel in Category 2 (Basic Care) and Category 1 (Critical Care) Space.

Receptacles shall not be required in bathrooms and toilet rooms. [99:6.3.2.2.6.2] Any receptacle(s) located in patient bathrooms in Category 2 (general care) spaces shall have ground-fault circuit interrupter protection as per 201.8(B)(1). Ground-fault circuit-interrupter protection for personnel shall not be required for receptacles installed in Category 2 (general care) and Category 1 (critical care) spaces where a basin, sink, or other similar plumbing fixtures are installed within the patient bed location.

Informational Note: UL 943-2016, Ground-Fault Circuit-Interrupters, Annex E, indicates that listed ground-fault circuit interrupters should not be used on circuits connected to life-support equipment.

Related Item

- CCN-152

Submitter Information Verification

Submitter Full Name: Gary Beckstrand

Organization: Utah Electrical JATC

Street Address:

City:

State:

Zip:

Submittal Date: Sun Aug 26 10:45:26 EDT 2018

Committee: NEC-P02

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Public Comment No. 1331-NFPA 70-2018 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated ~~150 volts to ground or less~~ 125-volt through 250-volt , 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking

(3) Rooftops

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B) (1), GFCI protection shall not be required.

(6) Indoor wet locations

(7) Locker rooms with associated showering facilities

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

(9) Crawl spaces — at or below grade level

(10) Unfinished areas of basements

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas

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

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
210.8_B_5pp_rev-8_22_18.docx	210.8(B) examples of substantiation information	

Statement of Problem and Substantiation for Public Comment

CMP-2 should align 210.8(B) with 210.8 (A) & (B) language to include GFCI expansion to 250V receptacles in 210.8 (B). NEMA would like to add additional substantiation for the need of this expansion by including the tragedy detailed below.

<https://www.cbs17.com/news/south/autopsy-boy-who-hid-in-dryer-died-of-electrocution/1153144731>
Autopsy: Boy who hid in dryer died of electrocution

Related Item

• FR 7791

Submitter Information Verification

Submitter Full Name: Vince Baclawski

Organization: Nema

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 27 10:34:36 EDT 2018

Committee: NEC-P02

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NFPA Public Comment Form

(For Proposing Revisions to the First Draft)

NOTE: All Public Comments must be received by 5:00 pm EST/EDST on the published Public Comment Closing Date.

For further information on the standards-making process, please contact the Codes and Standards Administration at 617-984-7249 or visit www.nfpa.org/codes.

For technical assistance, please call NFPA at 1-800-344-3555

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Log #: _____

Date Rec'd: _____

Date 06/28/2018 Name Vince Baclawski Tel. No. 703-841-3236
Company National Electrical Manufacturers Association (NEMA) Email vin_baclawski@nema.org
Street Address 1300 North 17th Street, Suite 900 City Rosslyn State VA Zip 22209
Please indicate organization represented (if any) NEMA

1. (a) NFPA Document Title National Electrical Code NFPA No. & Year 70-2020

(b) Section/Paragraph Section No. 210.8 (B)

2. Identify First Revision and/or Input to which Comment relates: FR 7791
No(s).

2. Public Comment Recommends (check one): ☐ new text ☒ revised text ☐ deleted text

3. Proposed Text of Public Comment (include proposed new or revised wording, or identification of wording to be deleted):

[Note: Proposed text should be in legislative format showing proposed changes to the First Draft; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).]

(B) Other Than Dwelling Units. All receptacles supplied by single-phase branch circuits rated ~~150 volts to ground or less~~ 125-volt through 250-volt, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

4. Statement of Problem and Substantiation for Public Comment: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Public Comment, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

CMP-2 should align 210.8(B) with 210.8 (A) & (B) language to include GFCI expansion to 250V receptacles in 210.8 (B). NEMA would like to add additional substantiation for the need of this expansion by including the tragedy detailed below.

<https://www.cbs17.com/news/south/autopsy-boy-who-hid-in-dryer-died-of-electrocution/1153144731>

Autopsy: Boy who hid in dryer died of electrocution



HOUSTON (KTRK/CNN) – The autopsy for a Texas boy found in a dryer during a game of hide-and-seek revealed the 10-year-old was electrocuted, which an appliance technician says was likely due to faulty wiring.

Medical examiners in Houston released an autopsy report Monday for third grader Fernando Hernandez Jr., known to family and friends as Junior.

Junior, 10, was electrocuted Friday night while playing hide-and-seek with his best friend and 9-year-old brother.

"I don't know what happened. I was just inside cooking, and my little son came inside and told me my son was dead on the floor," said the boys' mother, Christina Rodriguez, in an interview.

Appliance technician Donald Schatte says all the accidents he's seen where someone got electrocuted by a dryer have something in common: faulty wiring.

"There are so many safety features. It has to be something to do with the wiring," Schatte said. "Some people don't repair their dryer properly – like a door switch goes bad, and when they open the dryer, as long as the timer is on, the machine is going to keep running."

Schatte recommends getting rid of your metal belts and watches and putting on some shoes. That way, if something goes wrong, the electric current won't be able to go through you to the ground.

"You should always wear rubber-soled shoes or flip flops, as long as it's rubber," he said.

The laundry room at the apartment complex has been closed and locked shut.

Grief counselors were on campus at Junior's school, Harris Elementary, Monday. The boy attended the school with his three siblings.

"We try to stay strong for one another. The teachers do a really good job of that and give them the encouragement that we can," said Trent Johnson, the school's assistant principal.

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<http://www.foxnews.com/us/2018/07/10/texas-girl-10-electrocuted-to-death-reaching-behind-clothing-dryer-for-kittens.html>

Texas girl, 10, electrocuted to death reaching behind clothing dryer for kittens

A 10-year-old Texas girl died Saturday after she was reportedly electrocuted reaching for her kittens that were hiding behind a dryer.

Authorities are still working to determine the exact cause of Greenlee Buckley's electrocution, [KSLA-TV reported](#).

It's "too early right now to go ahead and place blame and responsibility until the investigation is over," New Boston police Chief Garry McCrary told the station.

In the meantime, Greenlee's body has been sent to Dallas -- roughly 150 miles away -- for an autopsy. New Boston Police Department spokesperson Katie Jiminez told Fox News that further information will be available after the autopsy report and fire marshal's report are released.

"She loved her babies. And she would do anything for them," Shelby Roos told KSLA-TV of her daughter and her kittens.

On Facebook, Roos wrote that Greenlee was "such a light in this world and everyone she ever met couldn't help but fall in love with her. She had more compassion for everything living at 10 years old than most will have in a lifetime."

"Please pray for us as we try to find sense in the senseless," she continued, encouraging others to "take peace in the fact that she is in heaven getting love from all the animals she loved with her whole heart."

Roos was not immediately available for comment when contacted by Fox News.

The Associated Press contributed to this report.

5. Copyright Assignment

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- (b) ☒ Some or all of the text or other material proposed in this Public Comment was not authored by me. Its source is as follows: (please identify which material and provide complete information on its source)

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Signature (Required)

PLEASE USE SEPARATE FORM FOR EACH PUBLIC COMMENT

To: Secretary, Standards Council National Fire Protection Association
1 Batterymarch Park · Quincy, MA 02169-7471 OR

Fax to: (617) 770-3500 OR Email to: publicinput_comments@nfpa.org

9/4/2018



Public Comment No. 1385-NFPA 70-2018 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking

(3) Rooftops

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B) (1), GFCI protection shall not be required.

(6) Indoor wet locations

(7) Locker rooms with associated showering facilities

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

(9) Crawl spaces — at or below grade level

(10) Unfinished areas of basements not intended as habitable rooms.

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas

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

Statement of Problem and Substantiation for Public Comment

Accept the clarification of “areas” of basements but return back to the 2017 text for the remainder of the requirement. During the 2018 First draft meeting in Hilton Head, SC, a CMP-2 member made a motion to change this language so that finished areas of basements would require GFCI protection. This change was not associated with a Public Input.

The argument was made that finished areas of basements “could” flood during a storm, leakage of ground water, or loss of a sump pump. There was no substantiation brought forward to justify this change. The same argument could be made for GFCI protection for rooms or areas at grade as a water leak from a burst water pipe, flooding due to dishwasher or washing machine, or floods from heavy rains “could” occur and flood those portions of the building.

Substantiation of actual problems in finished basements was not provided to support expanding this requirement to include finished basements. There are many types of finished basements that would not present conductive floor surfaces such as

a wood framed floor over a concrete surface. There are also many basements that are not prone to excessive moisture or flooding.

Conductive floor surfaces can exist in other areas of a structure other than basements. There can also be other locations where there are concrete floor surfaces that would present the same situation such as high rise multifamily dwellings and buildings where there is enough wall exposure above grade to be considered a first floor and not a basement. These locations would not be covered by this change.

Related Item

- FR 8125

Submitter Information Verification

Submitter Full Name: David Clements

Organization: Intl Assoc Elec Insp

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 27 17:12:28 EDT 2018

Committee: NEC-P02

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Public Comment No. 1720-NFPA 70-2018 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking

(3) Rooftops

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B) (1), GFCI protection shall not be required.

(6) Indoor wet locations

(7) Locker rooms with associated showering facilities

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

(9) Crawl spaces — at or below grade level

(10) Unfinished areas of basements

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle for supplying a portable appliance is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas

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

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
FanWithLightDrawingJuly2018.jpg	Shows ceiling fan with a portable appliance integral to the ceiling fan.	

Statement of Problem and Substantiation for Public Comment

Terra incorrectly underlined Exception 2 to (5), yet I submitted no changes to this exception. Also, Terra incorrectly underlined the entire Exception to (1) through (3), (5) through (8), and (10), but the only words added to this existing exception are in the last sentence adding the words "for supplying a portable appliance".

The concern of the Panel prompting them to add the last sentence in the exception was the potential to allow a corded

product to be connected to a circuit using a standard “convenience” receptacle that was exempted from having GFCI protection. The modification in this comment would remove limitations for to design options, such as the addition of a light kit where a locking support and mounting receptacle and attachment fitting could be used, while still maintaining applicable safety requirements. Presently, there are cases where a ceiling fan could have a listed light kit attached or other listed accessory kit. The ceiling fan or luminaire may be using a locking support and mounting receptacle and attachment fitting for connection of the accessory light or other unit in addition to the locking support and mounting receptacle for the overall ceiling fan.

For this reason, the revised text is provided to clarify that a “receptacle” in the last sentence of this exception is not a “locking support and mounting receptacle”, but rather a “convenience receptacle” that could be used for a corded portable appliance (requiring a GFCI). It is understood the intent of this last sentence was not to consider a locking support and mounting receptacle as the receptacle requiring GFCI protection. If there is a receptacle for a corded portable appliance, it would be required to have GFCI protection. Attached is a drawing of the technology. See the following link to view a video of the technology: <https://www.dropbox.com/s/06thyu5zq1n88iw/click-in-fan-patty.mp4?dl=0>

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 1719-NFPA 70-2018 [Section No. 210.8(A)]	Same change for dwelling units section
Public Comment No. 1719-NFPA 70-2018 [Section No. 210.8(A)]	
<u>Related Item</u>	
• FR 8128	

Submitter Information Verification

Submitter Full Name: Amy Cronin
Organization: Strategic Code Solutions Llc
Affiliation: Sky Technologies (formerly Safety Quick Light)
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City:
State:
Zip:
Submittal Date: Wed Aug 29 17:51:18 EDT 2018
Committee: NEC-P02

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PLUG-IN

1-2-3 Easy Installation

Step 1

Install power
plug into ceiling
junction box.

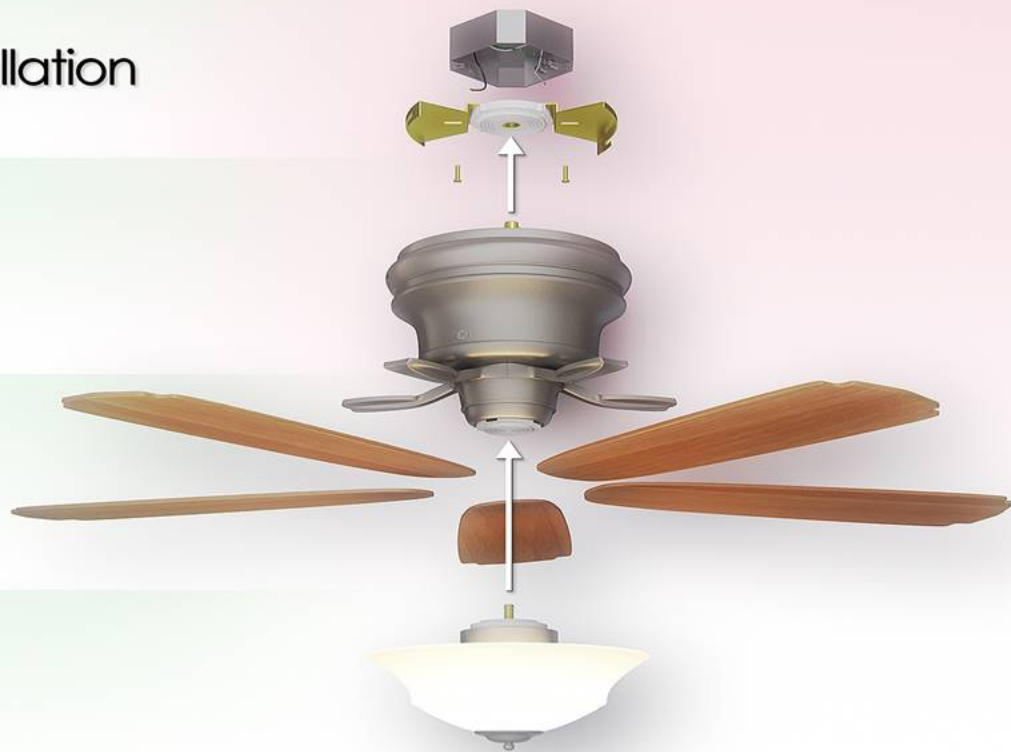
Step 2

Plug fan motor
into receptacle.

Step 3

Attach blades.

Optional one-step
light kit installation.





Public Comment No. 2051-NFPA 70-2018 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts or less to ground- ~~or less~~ , 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground- ~~or less~~ , 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking

(3) Rooftops

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B) (1), GFCI protection shall not be required.

(6) Indoor wet locations

(7) Locker rooms with associated showering facilities

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

(9) Crawl spaces — at or below grade level

(10) Unfinished areas of basements

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas

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

Statement of Problem and Substantiation for Public Comment

READABILITY of the Code. EDITORIAL.

"250 volts to ground or less" is problematic and ambiguous. What is LESS than GROUND in "GROUND or LESS" ? Either change to "250 volts or less to ground", or hyphenate as "250 volts-to-ground or less" to convey that volts-to-ground is the unit-of-measure.

NOTE: Revisions were made on this Public Comment to the charging text of 210.8(B). Any spurious underlining or renumbering in the list items were provided by the gremlins infecting TerraView™.

Related Public Comments for This Document

Related Comment

[Public Comment No. 2020-NFPA 70-2018 \[Section No. 210.8\(A\)\]](#)

[Public Comment No. 1959-NFPA 70-2018 \[Section No. 680.21\(C\)\]](#)

[Public Comment No. 1959-NFPA 70-2018 \[Section No. 680.21\(C\)\]](#)

[Public Comment No. 2020-NFPA 70-2018 \[Section No. 210.8\(A\)\]](#)

Relationship

Similar specification of Class A voltage to ground

Similar specification of Class A voltage to ground

Related Item

- First Revision No. 7791-NFPA 70-2018 [Section No. 210.8(B)]

Submitter Information Verification

Submitter Full Name: Brian Rock

Organization: Hubbell Incorporated

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Submittal Date: Thu Aug 30 15:40:23 EDT 2018

Committee: NEC-P02

Copyright Assignment

I, Brian Rock, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Comment (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Comment in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this copyright assignment.

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Public Comment No. 552-NFPA 70-2018 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking

(3) Rooftops

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B) (1), GFCI protection shall not be required.

(6) Indoor wet locations

(7) Locker rooms with associated showering facilities

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

(9) Crawl spaces — ~~at or below grade level~~ any level indoor or outdoor

(10) Unfinished areas of basements

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas

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

Statement of Problem and Substantiation for Public Comment

If ANY crawlspace required a general use receptacle for maintenance or service of equipment, requiring GFCI protection would certainly add an extra level of safety for the servicing personnel especially since such spaces are obscure, not subject to public view or traffic and usually serviced by only one person who, if an accident were to occur, may not be discovered for some time. In this instance, GFCI protection could possibly save a life!

Related Item

- 210.8(B)

Submitter Information Verification

Submitter Full Name: Dan Haruch

Organization: Brightwood Career Institute

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City:

State: I, Dan Haruch, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Comment (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Comment in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this copyright assignment.

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Committee:



Public Comment No. 791-NFPA 70-2018 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts to ground or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Kitchens- or areas with a sink and permanent provisions for either food preparation or cooking

(3) Rooftops

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

(4) Outdoors

Exception No. 1 to (3) and (4): 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 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B) (1), GFCI protection shall not be required.

(6) Indoor wet locations

(7) Locker rooms with associated showering facilities

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

(9) Crawl spaces — at or below grade level

(10) Unfinished areas of basements

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas

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

Statement of Problem and Substantiation for Public Comment

There was neither a Public Input nor Substantiation to support this change. The definition for the term "Kitchen" is sufficient for these locations in "other than dwelling units". Permanent provisions for food prep and cooking are included in the definition.

This comment only applies to list item # 2. Terra has underlined text that is not part of this public comment.

Related Item

• FR-7791

Submitter Information Verification

Submitter Full Name: David Hittinger**Organization:** IEC**Affiliation:** Independent Electrical Contractors**Copyright Assignment****Street Address:**

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Submission Date: Fri Aug 17 15:00:32 EDT 2018**Committee:** NEC-P02



Public Comment No. 943-NFPA 70-2018 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All receptacles supplied by single-phase branch circuits rated ~~150 volts to ground or less~~ 125-volt through 250-volt, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated ~~150 volts to ground~~ 125-volt through 250-volt or less, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking

(3) Rooftops

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Exception No. 2 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

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Exception No. 2 to (5): For receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities other than those covered under 210.8(B) (1), GFCI protection shall not be required.

(6) Indoor wet locations

(7) Locker rooms with associated showering facilities

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

(9) Crawl spaces — at or below grade level

(10) Unfinished areas of basements

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(11) Laundry areas

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

Statement of Problem and Substantiation for Public Comment

Code Panel 2 should align 210.8 (A) & (B) to include GFCI protection for up to 250V receptacles in 210.8(B), Other than dwelling units. The substantiation being that will prevent the loss of lives especially children as shown in the tragedies included.

<https://www.cbs17.com/news/south/autopsy-boy-who-hid-in-dryer-died-of-electrocution/1153144731>
Autopsy: Boy who hid in dryer died of electrocution

HOUSTON (KTRK/CNN) – The autopsy for a Texas boy found in a dryer during a game of hide-and-seek revealed the 10-year-old was electrocuted, which an appliance technician says was likely due to faulty wiring. Medical examiners in Houston released an autopsy report Monday for third grader Fernando Hernandez Jr., known to family and friends as Junior.

Junior, 10, was electrocuted Friday night while playing hide-and-seek with his best friend and 9-year-old brother. "I don't know what happened. I was just inside cooking, and my little son came inside and told me my son was dead on the floor," said the boys' mother, Christina Rodriguez, in an interview. Appliance technician Donald Schatte says all the accidents he's seen where someone got electrocuted by a dryer have something in common: faulty wiring. "There are so many safety features. It has to be something to do with the wiring," Schatte said. "Some people don't repair their dryer properly – like a door switch goes bad, and when they open the dryer, as long as the timer is on, the machine is going to keep running." Schatte recommends getting rid of your metal belts and watches and putting on some shoes. That way, if something goes wrong, the electric current won't be able to go through you to the ground. "You should always wear rubber-soled shoes or flip flops, as long as it's rubber," he said. The laundry room at the apartment complex has been closed and locked shut. Grief counselors were on campus at Junior's school, Harris Elementary, Monday. The boy attended the school with his three siblings. "We try to stay strong for one another. The teachers do a really good job of that and give them the encouragement that we can," said Trent Johnson, the school's assistant principal. Copyright 2018 KTRK, Family photos via CNN. All rights reserved.

<http://www.foxnews.com/us/2018/07/10/texas-girl-10-electrocuted-to-death-reaching-behind-clothing-dryer-for-kittens.html>
Texas girl, 10, electrocuted to death reaching behind clothing dryer for kittens

A 10-year-old Texas girl died Saturday after she was reportedly electrocuted reaching for her kittens that were hiding behind a dryer. Authorities are still working to determine the exact cause of Greenlee Buckley's electrocution, KSLA-TV reported. It's "too early right now to go ahead and place blame and responsibility until the investigation is over," New Boston police Chief Garry McCrary told the station. In the meantime, Greenlee's body has been sent to Dallas -- roughly 150 miles away -- for an autopsy. New Boston Police Department spokesperson Katie Jiminez told Fox News that further information will be available after the autopsy report and fire marshal's report are released. "She loved her babies. And she would do anything for them," Shelby Roos told KSLA-TV of her daughter and her kittens. On Facebook, Roos wrote that Greenlee was "such a light in this world and everyone she ever met couldn't help but fall in love with her. She had more compassion for everything living at 10 years old than most will have in a lifetime." "Please pray for us as we try to find sense in the senseless," she continued, encouraging others to "take peace in the fact that she is in heaven getting love from all the animals she loved with her whole heart." Roos was not immediately available for comment when contacted by Fox News. The Associated Press contributed to this report.

Related Item

• FR7791

Submitter Information Verification

Submitter Full Name: Keith Waters
Organization: Schneider Electric
Affiliation: Schneider Electric
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 20 17:20:52 EDT 2018
Committee: NEC-P02

Copyright Assignment

I, Keith Waters, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Comment (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Comment in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this copyright assignment.

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**Public Comment No. 843-NFPA 70-2018 [Section No. 210.8(D)]**

(D) Crawl Space Lighting Outlets.

GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
CN_155.pdf	70_CN 155

Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 155 in the First Draft Report on First Revision No. 7852.

The Correlating Committee directs that existing requirements in 210.8(C) be correlated with 555.9.

This action will be considered as a public comment.

The Correlating Committee directs that this first revision be sent to CMP-7 for information.

Related Item

- FR 7852

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC

Organization: NEC Correlating Committee

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 20 11:50:26 EDT 2018

Committee: NEC-P02

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Correlating Committee Note No. 155-NFPA 70-2018 [Section No. 210.8(D)]

Submitter Information Verification

Submitter Full Name: Erik Hohengasser

Committee:

Submittal Date: Fri May 11 09:15:39 EDT 2018

Committee Statement and Meeting Notes

Committee Statement: The Correlating Committee directs that existing requirements in 210.8(C) be correlated with 555.9.

This action will be considered as a public comment.

The Correlating Committee directs that this first revision be sent to CMP-7 for information.

First Revision No. 7852-NFPA 70-2018 [Section No. 210.8(D)]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.

**Public Comment No. 1494-NFPA 70-2018 [Section No. 210.8(E)]****(E) Specific Appliances.**

Unless

GFCI protection

~~is provided in accordance with 422.5(B)(3) through (B)(5), the outlets supplying the
shall be provided for all receptacles and outlets supplying the appliances specified in 422.5(A)
shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2)~~

.

Exception: Where a type of appliance is required by an applicable product standard to contain GFCI protection as an integral part of the attachment plug, within the supply cord not more than 300 mm (12 in.) from the attachment plug or factory installed within the appliance .

Statement of Problem and Substantiation for Public Comment

This public comment simply seeks "correlation". This public comment proposes text to make the installation of GFCI protection the general rule. An exception is included for appliances that are required to have GFCI protection installed by an applicable product standard. How can CMP-2 justify or substantiate anything short of that? There is no argument between CMP's 2 and 17 that all of the appliances listed in 422.5(A) require GFCI protection. Both CMP's have worked together to correlate these requirements in the NEC 2020 first draft stage. This is a correlation effort that has gone horribly wrong. The purpose of the NEC is the "practical safeguarding of persons and property from hazards arising from the use of electricity." There is no question that the most significant requirements placed in the NEC over the last 50 years are requirements for GFCI protection. We know that these devices have saved more lives than we can estimate. This revision as seen in the NEC 2020 first draft throws away GFCI protection for all appliances listed in 422.5(A). As written in the first draft, the combined requirements of 210.8(E) and 422.5 result in a carefully crafted and twisted play on words that will result in the complete loss of GFCI protection for the following reasons: (1) As written, an electrical contractor is not required to install a GFCI type receptacle or circuit breaker (2) As written, the product manufacturer is not required to install GFCI protection on the appliance (3) In most cases the electrical contractor does not install the appliances I have discussed this with many members of CMP's 2 and 17. I am told that the inspector will ensure this is done. That is impossible. The inspector has jurisdiction over the electrical installation which ends at the receptacle or outlet, nothing more. Venues of all types are regularly inspected before the installation of appliances. Electrical drawings regularly note appliances "by others" and in tens of thousands of jurisdictions the installation of those appliances occurs after the final electrical inspection. Appliances are replaced regularly without an electrical inspection. How many jurisdictions send an electrical inspector back into a venue to see what the owner plugged in? To claim that an electrical inspector will ensure the twisted requirements of the revised 210.8 and 422.5 are implemented exemplifies a complete lack of understanding with respect to electrical inspections "nationwide." Inspectors from areas with robust electrical inspections may proudly claim that in "my jurisdiction this will be enforced." It seems that CMP-2 believes just that. Unfortunately, in the real world, in tens of thousands of jurisdictions throughout 50 states, this will not be enforced. Not even close. In many areas we have combination inspectors. They will be taught to completely ignore looking for GFCI protection of the branch circuit or outlet because it is "not required." They will never look at an appliance. Snake oil salesmen teaching classes to update electrical contractors will proudly exploit this new hole in the NEC. They will teach installers to forget installing GFCI devices because they are "not required." They will be taught that GFCI protection of appliances is now a requirement for the person that buys the appliance, the owner. Installers will see nothing but savings \$\$\$!! The sad part is that those snake oil salesmen in this case will be right. Without a requirement placed on the installer of the branch circuit, GFCI protection will not exist in over 95% of these installations. Safety has been compromised. The purpose of the NEC has been ignored. The general public will suffer due to the loss of the most feasible and practical protection from shock. The NEC Correlating Committee should review this issue for correlation.

Related Item

- FR 7863

Submitter Information Verification

Submitter Full Name: Brian Myers

Organization: IBEW Local Union 98

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Zip:**Submittal Date:** Wed Aug 29 08:13:07 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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**Public Comment No. 2206-NFPA 70-2018 [Section No. 210.8(E)]****(E) Specific Appliances.**

Unless GFCI protection is provided in accordance with 422.5(B)(3) through (B)(5), the outlets supplying the appliances specified in 422.5(A) shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

Exception: Unless GFCI protection is provided in accordance with 422.5(B)(3) through (B)(4), the branch circuits supplying vending machines specified in 422.5(A) shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

Statement of Problem and Substantiation for Public Comment

The ground fault hazard identified for vending machines in 422.51 in prior editions was the connection method (supply cord or flexible raceway) being damaged and energizing the metal frame of the vending machines. Locating the GFCI within the appliance does not remedy that danger.

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 2204-NFPA 70-2018 [Section No. 422.5(B)]	
	<u>Related Item</u>
• First Revision No. 7689-NFPA 70-2018 [New Section after 210.8(E)]	• First Revision No. 8164-NFPA 70-2018 [Section No. 422.5(B)]
	• First Revision No. 8143-NFPA 70-2018 [Section No. 422.5(A)]

Submitter Information Verification

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Committee: NEC-P02

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**Public Comment No. 1640-NFPA 70-2018 [Section No. 210.8 [Excluding any Sub-Sections]]**

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

For the purposes of this section, when determining distance from receptacles the distance shall be measured as the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or the shortest path without passing through a door, doorway, or window.

Statement of Problem and Substantiation for Public Comment

The consequence of this change is that receptacles in adjacent rooms will need to have GFCI protection. Such receptacles may be on a separate circuit and only require protection for that one outlet. This adds cost and more chances for enforcement against installers for an unknown benefit. In addition, Article 400.12 already prohibits cords from being run through doorways.

Related Item

- FR 7863

Submitter Information Verification

Submitter Full Name: Daniel Buuck

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Submittal Date: Wed Aug 29 14:05:26 EDT 2018

Committee: NEC-P02

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**Public Comment No. 1884-NFPA 70-2018 [Section No. 210.8 [Excluding any Sub-Sections]]**

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

For the purposes of this section, when determining distance from receptacles the distance shall be measured as the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or the shortest path without passing through a door, doorway, or window.

Statement of Problem and Substantiation for Public Comment

The effect of the revision is to include receptacles for fixed appliances located underneath a sink. That will be extremely impractical, because the second sentence of the main rule requires ready access. That is incompatible with a receptacle on the back wall of virtually any under-cabinet space in my experience. It might be possible to place the receptacle on the cabinet wall near the door, but that will result in exposed wiring, usually NM cable, in areas where it will be repeatedly hit, surely a greater hazard. The only likely solution will be to use GFCI circuit protection instead, which presents its own issues regarding convenience. This change was never properly substantiated, and should be reversed.

Related Item

- FR7863

Submitter Information Verification

Submitter Full Name: Frederic Hartwell

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Affiliation: self

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Committee: NEC-P02

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**Public Comment No. 387-NFPA 70-2018 [Section No. 210.8 [Excluding any Sub-Sections]]**

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

For the purposes of this section, when determining the distance from receptacles, the distance shall be measured as the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, door, or fixed barrier, or the shortest path without passing through a window.

Statement of Problem and Substantiation for Public Comment

The word "the" needs to be added for the sentence to be correct grammatically.

The word "door" needs to be added to clarify that cabinet doors and well as personnel doors are indeed a barrier. This will end the speculation and debate on this issue.

Related Item

- FR 7863

Submitter Information Verification

Submitter Full Name: Phil Simmons

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Submittal Date: Sat Aug 04 15:31:37 EDT 2018

Committee: NEC-P02

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Public Comment No. 560-NFPA 70-2018 [Section No. 210.8 [Excluding any Sub-Sections]]

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

For the purposes of this section, when determining distance from receptacles the distance shall be measured as the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or the shortest path without passing through a personnel door, doorway, or window.

Informational Note: Cabinet doors such as cabinet doors under a kitchen sink are not considered a personnel door.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
210.8_2017_NEC_KL_IAEI.jpg	210.8 Measurement	

Statement of Problem and Substantiation for Public Comment

The GFCI requirements for a receptacle outlet located in the cabinet under a kitchen sink have shifted from "yes" to "no" for the past 3 Code cycles. 2011 NEC - No; 2014 NEC - Yes; 2017 NEC - No. 2020 NEC - (proposed) Yes. In CMP-2s attempt to settle this issue, it appears we have "thrown out the baby with the bath water!" By making the statement at the 2020 NEC First Draft meeting that kitchen cabinet doors were never intended to be included in the "...without passing through a door, doorway..." measurement requirement and that including a kitchen cabinet door in this requirement was a "misinterpretation of the Code" was judgmental at best. The Code needs to say what it means and mean what it says. If CMP-2 never intended for kitchen cabinet doors to be included in this requirement, then say that. Don't assume that the public and the user of the Code knows what was intended.

By throwing out "doors and doorways" just to make sure a kitchen cabinet door is not included in this measurement requirement leave other areas susceptible to GFCI requirements when no substantiation merits such GFCI protection. As proposed, a bedroom receptacle outlet on the opposite side of a wall from a utility room sink (but within 6 ft of said sink measuring through a doorway located beside the utility room sink) would now require GFCI protection. Prohibiting the need to take a measurement through a personnel entrance/egress door or doorway in order to determine the need for GFCI protection needs to remain in the Code. Retrieve the baby!

Related Item

• FR 7863 • 210.8

Submitter Information Verification

Submitter Full Name: L. Keith Lofland

Organization: IAEI

Affiliation: Self

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Submittal Date: Fri Aug 10 20:53:17 EDT 2018

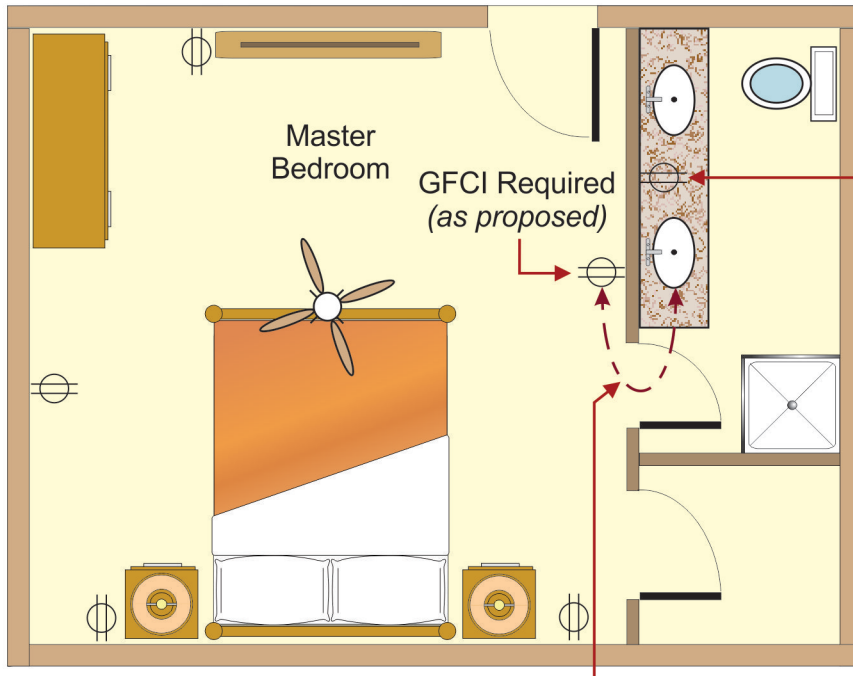
Committee: NEC-P02

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210.8 Measurements for GFCI Protection



All 125-volt, single-phase, 15- and 20-ampere receptacles installed **within 1.8 m (6 ft) from the top inside edge of the bowl of the sink** requires GFCI protection. [210.8(A)(7)]

For the purposes of this section, when determining distance from receptacles the distance shall be measured as the shortest path the cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or passing through a **door, doorway, or** window. [210.8]

**Public Comment No. 613-NFPA 70-2018 [Section No. 210.8 [Excluding any Sub-Sections]]**

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

For the purposes of this section, when determining distance from receptacles the distance shall be measured as the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or the shortest path without passing through a door, doorway, or window.

Informational note: A cabinet door is not considered a door or doorway.

Statement of Problem and Substantiation for Public Comment

The change that CMP 2 made in this area was to address the concerns of those that noted the GFCI requirements did not pertain to the receptacle under the sink. By removing the words door or doorway unintended consequences occur. This PC is offering another solution to add clarity and not change the previous parent text.

Related Item

- FR 7863

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich

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Submittal Date: Tue Aug 14 08:15:31 EDT 2018

Committee: NEC-P02

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**Public Comment No. 697-NFPA 70-2018 [Section No. 210.8 [Excluding any Sub-Sections]]**

Ground-fault circuit-interrupter protection for personnel shall be provided as required in 210.8(A) through (F). The ground-fault circuit interrupter shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for ground-fault circuit-interrupter protection for personnel on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

For the purposes of this section, when determining distance from receptacles the distance shall be measured as the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or the shortest path without passing through a door (other than cabinet doors), doorway, or window.

Statement of Problem and Substantiation for Public Comment

Passing through a door or doorway was not the focus of the discussion during the panel meeting, it was specifically a cabinet door. IEC does not agree that deleting the words "door" or doorway" clears up any confusion about "cabinet" doors. By deleting "door" and "doorway" in this section will create an issue with receptacle outlets installed in adjacent rooms with a door or doorway between the receptacle and within 6 feet of the top edge of a sink. By changing the section to read "doors (other than cabinet doors) and doorways" will provide clarity for the installer about receptacles installed in other rooms within 6 feet of a sink that are required to have GFCI protection.

Related Item

- FR-7863

Submitter Information Verification

Submitter Full Name: David Hittinger

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Submittal Date: Wed Aug 15 18:38:20 EDT 2018

Committee: NEC-P02

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**Public Comment No. 1016-NFPA 70-2018 [Section No. 210.12]****210.12 Arc-Fault Circuit-Interrupter Protection.**

Arc-fault circuit-interrupter protection shall be provided as required in 210.12(A), (B), (C), and (D). The arc-fault circuit interrupter shall be installed in a readily accessible location.

(A) Dwelling Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (4) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - d. The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.
- (5) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch-feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

(B) Dormitory Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets and devices installed in dormitory unit bedrooms, living rooms, hallways, closets, bathrooms, and similar rooms shall be protected by any of the means described in 210.12(A)(1) through (6).

(C) Guest Rooms, Guest Suites, and Patient Sleeping Rooms in Nursing Homes and Limited-Care Facilities.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets and devices installed in guest rooms and guest suites of hotels and motels and patient sleeping rooms in nursing homes and limited-care facilities shall be protected by any of the means described in 210.12(A)(1) through (6).

(D) Branch Circuit Extensions or Modifications — Dwelling Units, Dormitory Units, and Guest Rooms and Guest Suites.

Where branch circuit wiring for any of the areas specified in 210.12(A), (B), or (C) is modified, replaced, or extended, the branch circuit shall be protected by one of the following:

- (1) By any of the means described in 210.12(A)(1) through (A)(6)
- (2) A listed outlet branch-circuit-type AFCI located at the first receptacle outlet of the existing branch circuit

Exception: AFCI protection shall not be required where the extension of the existing branch circuit conductors is not more than 1.8 m (6 ft) and does not include any additional outlets or devices, other than splicing devices. This measurement shall not include the conductors inside an enclosure, cabinet, or junction box.

Statement of Problem and Substantiation for Public Comment

FR-7916: Expansion of coverage where AFCI protected outlets are required.

It is the opinion of the EEI-EL&P task group that the expansion of AFCI requirements without technical substantiation nor products readily available in the market should not be supported by the Code Making Panel.

Related Item

- FR-7916

Submitter Information Verification

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Committee: NEC-P02

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Public Comment No. 1082-NFPA 70-2018 [Section No. 210.12(A)]

(A) Dwelling Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of the entire branch circuit. In addition to this required combination-type arc-fault circuit interrupter, listed outlet branch-circuit type arc-fault circuit interrupters shall be permitted elsewhere on the same 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (7) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - (8) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (11) ~~The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.~~
- (12) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Informational Note No. 4: The installation of a listed combination-type arc-fault circuit interrupter to provide AFCI protection of the entire branch circuit, installed together with listed outlet branch-circuit type arc-fault circuit interrupters elsewhere on the same branch circuit to provide redundant AFCI protection, may be considered as also complying with 210.12(A)(1) but may not be considered as complying with 210.12(A)(2), (A)(3), or (A)(4) unless all conditions of 210.12(A)(2), (A)(3), or (A)(4) each are also met.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Eaton_AFCI_CB_OBC_AFCI_photo_1.jpg	Eaton AFCI CB and OBC AFCI Kit	
Eaton_AFCI_CB_photo_1.jpg	Eaton AFCI CB Photo 1	
Eaton_AFCI_CB_photo_2.jpg	Eaton AFCI CB Photo 2	
Eaton_AFCI_CB_photo_3.jpg	Eaton AFCI CB Photo 3	
Eaton_OBC_AFCI_photo_1.jpg	Eaton OBC AFCI	
Public_Comment_No._1082- NFPA_70-2018_Section_No._210.12_A_.docx	Public Comment No. 1082-NFPA 70-2018 [Section No. 210.12(A)] WITHOUT TerraView spontaneous underlining and renumbering	

Statement of Problem and Substantiation for Public Comment

CODE-MAKING PANEL 2 AND THE NEC® CORRELATING COMMITTEE NEED TO ANSWER TWO QUESTIONS:

Q1: HAS IT EVER BEEN AND IS IT NOW POSSIBLE TO COMPLY WITH 210.12(A)(4)(d), GIVEN THAT THERE'S ABSOLUTELY NO PUBLISHED "APPLICABLE PRODUCT STANDARDS RECOGNIZED" FOR THE SYSTEM COMBINATION-TYPE LISTING?

Q2: WAS WHAT WAS DEMONSTRATED BY ONE MANUFACTURER IN THE FIRST DRAFT MEETING FULLY CAPABLE OF PROVIDING AFCI PROTECTION WITHOUT THAT KIT'S OBC AFCI RECEPTACLE, THEREBY IN ACCORDANCE WITH 210.12(A)(1)?

IF THE ANSWERS TO THESE QUESTIONS ABOVE ARE "NO" AND "YES", RESPECTIVELY, THEN CODE-MAKING PANEL 2 AND THE NEC® CORRELATING COMMITTEE MUST MAKE THE PROPOSED REVISIONS IN ORDER TO ADDRESS THE FOLLOWING ISSUES AND TO REMOVE AN UNACHIEVEABLE REQUIREMENT 210.12(A)(4)(d) SERVING NOTHING MORE THAN AS AN ANTI-COMPETITIVE TRADE BARRIER TO A FULLY VIABLE AFCI PROTECTION METHOD OF 210.12(A)(4)(a) – (4)(c).

- **CORRELATION ISSUE:** No Product Standard has ever been published or recognized for the "system combination-type AFCI". UL Standard UL 1699C was never finalized, canvassed, or published, nor was any other recognized Product Standard. There is no definitive basis therefore to serve as a benchmark for "achieving equivalent and effective safety" AND COORDINATION to an unfinished and unpublished Standard.

110.3 Examination, Identification, Installation, Use, and Listing (Product Certification) of Equipment.

(C) Listing. Product testing, evaluation, and LISTING (product certification) shall be performed by recognized qualified electrical testing laboratories and shall be IN ACCORDANCE WITH APPLICABLE PRODUCT STANDARDS RECOGNIZED as achieving EQUIVALENT AND EFFECTIVE SAFETY for equipment installed to comply with this Code.

Accordingly, 210.12(A)(4)(d) is deleted as demonstrably unachievable in accordance with 110.3(C) and as an anti-competitive exclusion of a cost-effective alternative AFCI method in accordance with 210.12(A)(4)(a) through (4)(c).

- **ENFORCEABILITY ISSUE:** In three Code cycles (2014, 2017, 2020), no manufacturer has ever produced a "listed system combination-type AFCI" in accordance with 210.12(A)(4)(d), consisting of a listed branch circuit overcurrent device and a listed OBC AFCI. The sole supposed "listed system combination-type AFCI", demonstrated by one manufacturer during the CMP-2 First Draft meeting last January, was nothing more than a KIT consisting of a UL 1699-listed combination-type arc-fault circuit interrupter (CAFCI) fully compliant ONTO ITSELF with 210.12(A)(1), plus a REDUNDANT UL 1699A-listed OBC AFCI also provided and packaged together as a KIT. Compliance with 210.12(A)(1) nonetheless can be achieved WITH OR WITHOUT that REDUNDANT listed OBC AFCI also provided in that KIT. Furthermore, REDUNDANT compliance with 210.12(A)(1) can be also achieved with ANY manufacturer's REDUNDANT UL 1699A-listed OBC AFCI and NEED NOT be provided SOLELY by the SAME manufacturer as the UL 1699-listed combination-type arc-fault circuit interrupter (CAFCI). Such an installation of REDUNDANT UL 1699A-listed OBC AFCIs nonetheless is implicitly compliant with and EXCEEDING 210.12(A)(1). Indeed, this sole CAFCI + OBC AFCI KIT bore no certifier's Listing Marks to attest to the KIT'S LISTING as a "system combination-type AFCI", and bore solely that manufacturer's own branding labels implying "System Combination AFCI"; all actual Listing Marks were SOLELY to the KIT components' INDIVIDUAL listings (see accompanying photos). Our confirmed understanding is that this sole system-combination demonstrated during the CMP-2 First Draft meeting last January has been either COMMERCIALY DISCONTINUED or was NEVER ACTUALLY COMMERCIALY OFFERED to the electrical trade, having achieved its intended objective during the CMP-2 First Draft meeting and balloting.

To preclude consequent confusion or misrepresentation to the AHJ during enforcement and to the installer during specification, procurement, and installation, 210.12(A)(1) is revised to reflect the OPTIONAL PERMISSIVE INCLUSION of REDUNDANT listed OBC AFCIs in the SAME branch circuit as the listed combination-type arc-fault circuit interrupter (CAFCI) mandated per 210.12(A)(1). Further, to preclude confusion and misrepresentation to the AHJ and to the installer, an Informational Note No 4 is added to clarify that the OPTIONAL PERMISSIVE ALLOWANCE indicated in 210.12(A)(1) should not be construed as complying with the requirements of 210.12(A)(2) through 210.12(A)(4) UNLESS ALL CONDITIONS of each given list item are ALSO MET.

Compliance (or not) with 210.12(A)(5) and 210.12(A)(6) should be visually more evident to the AHJ, due to the obvious

surrounding of the conductors by metal wiring methods or by concrete, without similar risk of confusion or misrepresentation as the subtly of the Listing product categories of the AFCIs (CAFCI, OBC AFCI) or of an AFCI KIT (CAFCI + OBC AFCI). Therefore, 210.12(A)(5) and 210.12(A)(6) are NOT mentioned in Informational Note No 4.

NOTE WELL: Any revisions made by this Public Comment PC-1082 are solely to NEC® 210.12(A)(1), 210.12(A)(4)(d), and 210.12(A) Exception. Any underlining elsewhere in NEC® 210.12(A) and any renumbering of list items are spontaneously introduced by TerraView™ and consequently should be disregarded.

Related Item

- First Revision No. 8130-NFPA 70-2018 [Detail] • Public Input No. 4187-NFPA 70-2017 [Section No. 210.12(A)]

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Committee: NEC-P02

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Public Comment No. 1244-NFPA 70-2018 [Section No. 210.12(A)]

(A) Dwelling Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas units shall be protected by any of the means described in 210.12(A)(1) through (6) following means :

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (7) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - (8) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - (11) The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.
- (12) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Statement of Problem and Substantiation for Public Comment

There are very few areas in a dwelling unit that are not required to have AFCI protection. The AFCI protection provided by 210.12(A) does not just apply to "new branch circuit wiring" in dwellings. Article 406.4(D)(4) requires receptacle replacements in any areas specified in 210.12(A) to provide AFCI protection at least to the receptacle being replaced. This requirement is necessary to introduce AFCI protection in homes with older wiring. By not including the entire dwelling with this protection, important areas will be left out of AFCI protection for receptacle replacements.

Garages – Most garages can have the same hazards to wiring as Kitchens. One of the dangers for kitchens requiring AFCI protection is that when mounting cabinets, the installer will use a larger screw that can penetrate NM cable behind a wall. Homeowners frequently decide to mount shelving and cabinets using longer screws in the garage that could introduce the same hazard to NM cable. These areas are not currently protected by 210.12(A)

Bathrooms – The same hazards apply to bathrooms as far as mounting new vanities and cabinets. These areas are not currently protected by 210.12(A).

Attics and basements – There have been cases of AFCIs tripping in bedrooms caused by faulty wiring in the attic/basement areas. These particular branch circuits could have easily served attic/basement receptacles. These areas are not currently protected by 210.12(A).

AFCI protection should be expanded to all 120-volt single-phase 15- and 20-ampere branch circuits in a dwelling unit. Since 1999 CMP 2 has taken incremental steps to expand AFCI requirements. It only makes sense to AFCI protect all 120-volt single-phase 15- and 20-ampere branch circuits in a dwelling unit to make sure that any 15- and 20-ampere branch circuit installation or receptacle replacement has the proper protection that the homeowner deserves.

Related Item

- CI 7916

Submitter Information Verification

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Submittal Date: Fri Aug 24 14:26:42 EDT 2018

Committee: NEC-P02

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Public Comment No. 1306-NFPA 70-2018 [Section No. 210.12(A)]

(A) Dwelling Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (7) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - (8) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - (11) The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.
- (12) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.
- (14) A listed branch-circuit overcurrent protective device installed at the origin of the branch circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - d. The length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall be supported and secured by listed insulated staples, cable supports, standoff connectors or similar fittings.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
210.12_A_Dwelling_Units_record_of_actual_desired_changes_add_means_7_SGRood.docx	210.12 (A) Dwelling Units record of actual desired changes added means #7	
Updated_substantiation_regarding_added_installation_solutions_to_address_arc_fault_sources.pdf	Updated substantiation regarding added installation solutions to address arc fault sources	
UL_Report_Breaker_Migration_Run_Length_Pt_1.pdf	UL Part 1 Study on Evaluation of Run Length and Available Current on Breaker Ability to Mitigate Parallel Arcing Faults	
UL_Report_Breaker_Migration_Run_Length_Pt_2.pdf	UL Part 2 Study on Evaluation of Run Length and Available Current on Breaker Ability to Mitigate Parallel Arcing Faults	
UL_Report_Investigation_of_Damage_and_Degradation_of_NM_Cables.pdf	UL Study on Influence of Damage and Degradation on Breakdown Voltage of NM Cables (Final Report)	

Statement of Problem and Substantiation for Public Comment

Panel Statements from PI 3183 and PI 3813: The initial part of the panel statement to PI 3813 did not address either the proposed text to delete kitchens and laundry areas from the list of required rooms or the technical substantiation provided. The proposed text and substantiation for either of the public inputs, PI 3813 or 3183, did not include anything to do with 210.12(A)(4)(d). It is also noted the Panel Statement for PI 3813 appears to inadvertently include some text intended to be in response to PI 3183, stating that the securing and supporting methods are outside the scope of CMP 2.

Why insulated staples, cable supports, standoff connectors or similar fittings: With regard to the panel statement for PI 3183, it is agreed that the use of insulated staples, as well as non-insulated staples and the other identified devices, are not prohibited by the code. The suggested text is to provide for an installation where the AFCI device is located at the first outlet device, and to add specific provisions to further protect the perceived indicated hazards for the "home run". The requirements as provided in the new 210.12(A)(7) text are to further limit what is already allowed generally by Section 334.30, securing and supporting. This text aligns with similar existing requirements that establish specific limited wiring methods found in 210.12(A)(5) and (A)(6). Each of the proposed methods are means to mitigate the exposure for the allowed continuous length of cable from the initial installation or other subsequent perceived indicated hazards that may lead to an arc fault situation. See attached document on "updated substantiation regarding added installation solutions to address arc fault sources" for additional information.

NFPA Fire Research Protection Foundation Project. From the NFPA fire data available, the details of the perceived hazards have not been sufficiently identified for the origin of the fire (branch circuit home run) or other locations (extension or other cords) and causes, as well as the age of the dwelling. In response to this lack of data, there is a NFPA Fire Research Protection Foundation project titled, Analysis of Factors Contributing to Residential Electrical Fires, in progress. One of the several goals of this project to better identify the sources of actual fires for branch circuit wiring, and to what degree the "home run" is actually involved for the location arc-fault related fire. As of the writing of this comment, there has not been any research or other activities to provide data or information completed.

UL Fact Finding Studies:



Influence of Damage and Degradation on Breakdown Voltage of NM Cables Final Report, and...

Evaluation of Run Length and Available Current on Breaker Ability to Mitigate Parallel Arcing Faults

The UL fact findings studies on branch circuit wiring determined the lengths that are identified in proposed 210.12(A)(7)(b) and are consistent with the length limitations in existing NEC 210.12(A)(3) and (4) that would cause the trip of most standard thermal-magnetic circuit breakers for a parallel arcing condition in the majority of cases. It is also noted that one of the conclusions of the UL report is that direct hammer hits on the cable had minimal incidents creating arcing. In addition, when the limited number of cases had some arcing, the event did not continue for the minimal time required to trip an AFCI device. Adding the provision for listed insulated staples, cable supports, standoff connectors or similar fittings to be used for the "home run" further provides a greater degree of safety over presently allowed installation methods.

Viable Option Not Currently Listed. Where some of the present options to meet the requirements provided in 210.12(A) presently do not exist (210.12(A)(3) for example), any alternatives that provide for minimum safety should be always be allowed. In this case the proposed alternative is already readily available, does not decrease safety, resolves the significant issue from cable installation found in the UL fact finding reports, and gives the installer a very cost effective, user-friendly and viable alternative in making the installation.

Related Item

- Public Input No. 3183-NFPA 70-2017 [Additional Means within Section No. 210.12(A)]

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Committee: NEC-P02

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(7) A listed branch-circuit overcurrent protective device installed at the origin of the branch circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

d. The length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall be supported and secured by listed insulated staples, cable supports, standoff connectors or similar fittings.

“Updated substantiation regarding added installation solutions to address arc fault sources”

Why insulated staples, cable supports, standoff connectors or similar fittings:

Damage to branch-circuit cables during installation has been perceived to be a cause of arcing that may result in electrical fires. The proposed text provides an alternate installation solution to address these indicated sources of arc faults. Implementation of the securing and supporting requirements summarized in (7)(d) will protect the lengths (i.e. – 50 feet or less for a 14 AWG conductor, 70 feet or less for a 12 AWG conductor) of branch-circuit cabling as described in (7)(b) against this type of damage that could result in an arcing condition.

210.12(7) would afford arc protection by using devices that provide arc mitigation, coupled with enhanced protection of the branch-circuit cable to the first outlet against physical damage that could result in an arcing condition. The means described here within this proposed installation method delivers AFCI protection due to these factors:

A. Listed standard thermo-magnetic circuit breakers provide a significant level of parallel arc mitigation in the specified lengths of the branch-circuit conductors, in accordance with the UL fact finding study (as separately attached)...

B. The listed outlet branch-circuit type AFCI provides parallel-type downstream and series-type upstream and downstream AFCI protection, and...

C. The listed insulated staples, cable supports and standoff connectors used to support and secure the limited length of cable to the first outlet provides protection against damage due to inadvertently-placed drywall screws or nails, direct hammer blows, overdriven staples and similar circumstances involving installation fastening means.

The use and installation methods as described in (7)(d) for nonmetallic-sheathed cable commonly used in these applications are in alignment with and complementary to the securing and supporting requirements in 334.30. Although both Sections 300.4 and 334.30 specify requirements to ensure that properly installed cables are protected against physical damage, the proposed 210.12(7)(d) provides for an additional level of installation safety to further protect cables against damage that may result in arcing conditions.

**Public Comment No. 1367-NFPA 70-2018 [Section No. 210.12(A)]****(A) Dwelling Units.**

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (7) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - (8) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (11) ~~The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.~~
 - a.
- (12) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch-feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
210.12_A_Dwelling_Units_record_of_actual_desired_changes_delete_4_d_SGRood.docx	210.12(A) Dwelling Units record of actual desired changes delete (4)d SGRood	
Aug_28_2018_Attachment_1-3_to_AFCI_Consortium_Public_Comment.pdf	Attempt to procure purported listed "system combination- type AFCI" solution	

Statement of Problem and Substantiation for Public Comment

As explained in more detail below, this proposal deletes 210.12(A)(4)d principally because there is no reasonable rationale for continuing to prohibit the utilization of cost-effective OBC AFCI receptacles from being deployed throughout new residential construction. Listed OBC AFCIs provide for parallel-type downstream and series-type upstream and downstream AFCI protection, while listed circuit breakers provide a significant level of parallel arc mitigation in the specified lengths of the branch-circuit conductors.

The basis for deleting 210.12(A)(4)d is two-fold:

First, the standard set forth in 210.12(A)(4)d mandating that a combination of devices meet the requirements for a system combination-type AFCI "and shall be listed as such" is unenforceable because there exists no listing standard for system combination-type AFCIs. The expectation was that the recently deleted reference to UL 1699C in the Informational Note was to have been the listing standard to certify the combination-type AFCI devices contemplated by section 210.12(A)(4)d. This expectation was reflected in past Informational Notes (contained in both the 2014 and 2017 editions of the NEC) which directed those relying on 210.12(A)(4)d's listing requirement to consult UL 1699C. However, UL 1699C was never completed, never adopted, and ultimately, never published by UL. Two NEC code cycles (2014 and 2017) passed without the development of UL 1699C or an equivalent standard and there is no activity in progress to create such a listing standard. Memorializing the long stillborn status of UL 1699C, CMP2 recently removed reference to UL 1699C from the Informational Note in the First Draft revision of the 2020 NEC. In short, the panel should complete its good and important work in this area and recognize that, because 210.12(A)(4)d is also a dead letter, it must be removed from the NEC.

Second, 210.12(A)(4)d should be removed because it conveys the false impression that a product exists in the marketplace that meets the requirements of 210.12(A)(4)d. During the First Draft meetings in Hilton Head in January 2018, safe and reasonable alternatives to AFCI protection were not allowed to be considered due to announcement of a purported "system combination-type AFCI" listed solution. This seemingly misleading announcement relative to commercial viability and availability of a listed "system combination-type AFCI" served to continue the inappropriate blocking of safe and effective alternative solutions in the marketplace. This anti-competitive behavior results in unduly favoring one faction to the disadvantage of all other stakeholders. The associated heavy and unnecessary cost burdens are being disproportionately shifted to the installer and end homebuyer community. These users are denied the flexibility of safe and effective solutions. Instead, misinformation persists regarding the availability of a certain product that is said to satisfy 210.12(A)(4)d. The fact is, as further explained below, this product solution to the best of our knowledge does not exist and is not available for purchase in the market despite public statements to the contrary.

For example, we are aware of the one company that (as early as January 2018) has advertised and/or announced to the public and industry the availability of a product solution – a listed system-combination type AFCI – that was compliant with 210.12(A)(4)d. This product device was presented during the January 2018 CMP 2 First Draft meeting. However, despite announcing that such a product is available in the marketplace as a 210.12(A)(4)d-compliant solution, the fact is this product is not available for purchase, and in fact, cannot be purchased. After initially accepting an order for this product at a truly exorbitant price level with no basis in market reality, said manufacturer of this product returned the order, explaining that, although new, the product had been "discontinued." Attached to this comment are emails and other materials showing how this product solution, despite representations to the contrary, is commercially unavailable. (See Attachments 1-3.) Misinformation and inaccurate reporting regarding the availability of this fictional solution does not, and cannot, provide the marketplace with the assurance that the manufacturer is truly interested in providing a useful solution to the contractor.

Having a faction portray a product as being commercially available (when it is not) and communicating as such to key stakeholders serves to maintain an unduly restrictive installation requirement. This is a form of anti-competitive behavior which, in our opinion, is completely unacceptable in a market economy such as ours. Based on the lack of ANY commercially available alternatives to products that comply with 210.12(A)(4)d, we respectfully request, and strongly urge, that CMP 2 give due consideration to the removal of 210.12 (A)(4)d.

Related Item

• Public Input No. 4187-NFPA 70-2017 [Section No. 210.12(A)]

• Committee Input No. 7916-NFPA 70-2018 [Section No. 210.12(A)]

Submitter Information Verification

Submitter Full Name: Stephen Rood
Organization: Legrand North America
Affiliation: Arc Fault Circuit Interrupter Wiring Device Joint Research and Development Consortium
Street Address:
City:
State:
Zip:
Submission Date: Mon Aug 27 14:37:31 EDT 2018
Committee: NEC-P02

Copyright Assignment

I, Stephen Rood, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Comment (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Comment in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this copyright assignment.

☒ By checking this box I affirm that I am Stephen Rood, and I agree to be legally bound by the above Copyright Assignment and the terms and conditions contained therein. I understand and intend that, by checking this box, I am creating an electronic signature that will, upon my submission of this form, have the same legal force and effect as a handwritten signature

210.12 Arc-Fault Circuit-Interrupter Protection.

Arc-fault circuit-interrupter protection shall be provided as required in 210.12(A), (B), and (C). The arc-fault circuit interrupter shall be installed in a readily accessible location.

(A) Dwelling Units. All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

(1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:

- a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
- b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

(4) A listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:

- a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
- b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

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

(5) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72 -2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Attachment 1 to AFCI Consortium Public Comment

Excerpt from NECA website, <http://www.neca-neis.org/code-question-of-the-day/code-question/cqd-3-1-2018> [accessed August 23, 2018], showing exchange between Kevin S. Arnold, P.E., Manager National Codes & Standards and Industry Relations at Eaton, and NECA Q&A host discussing product solutions that comply with 210.12(A)(4)d:

Kevin Arnold:

[A]rticle 210.12 allows for different installation methods for AFCI protected circuits to be utilized. The 'system combination type' under 210.12(A)(4)d can be complied with utilizing 'System Combination' type products that have been evaluated under UL Product Category 'AWDT'. The category and approved products can be viewed thru UL's ProductSpec website for evaluated products [at] <http://productspec.ul.com/document.php?id=AWDT.E497944>

NECA Q&A host:

Hey Kevin thank you very much for providing that information[.] It is great to know that listed system combination-type AFCI's for use with 210.12(A)(4)(d) are now available. The wording in the productspec.ul states that the molded case circuit breaker and outlet branch circuit AFCI are packaged together and marked as a system-combination AFCI. A diagram and table show the protection provided.

The web link referenced in Mr. Arnold's comment (a UL Product Category page) is also attached and made a part of this Attachment 1.



UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH?

2. RESULTS

UL PRODUCT CATEGORY

Arc-fault Circuit Interrupters, System-Combination Type Arc-fault Circuit Protection

See [General Information for Arc-fault Circuit Interrupters](#), [System-Combination Type Arc-fault Circuit Protection](#)

EATON

1000 CHERRINGTON PKWY
MOON TOWNSHIP, PA 15108-4312 USA

E497944

System-Combination AFCI, Model(s) SCDF15; Molded Case Circuit Breaker Cat no BRN115SC with Outlet Branch Circuit Arc Fault Circuit Interrupter Cat no TRAFCI15W.

System-Combination AFCI, Model(s) SCAF20; Molded Case Circuit Breaker Cat no BRN120SC with Outlet Branch Circuit Arc Fault Circuit Interrupter Cat no TRAFCI20W.

System-Combination AFCI, Model(s) SCDF15; Molded Case Circuit Breaker Cat no BRN115SC with Dual Function Ground Fault Circuit Interrupter and Outlet Branch Circuit Arc Fault Circuit Interrupter Cat no TRAFGF15W.

System-Combination AFCI, Model(s) SCDF20; Molded Case Circuit Breaker Cat no BRN120SC with Dual Function Ground Fault Circuit Interrupter and Outlet Branch Circuit Arc Fault Circuit Interrupter Cat no TRAFGF20W.

Last Updated on 2018-01-02

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

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Print

New Search

Attachment 2 to AFCI Consortium Public Comment

Print out from the ElectricSMARTS website, <http://www.electricsmarts.com/industry/smartecat/product/search/Eaton/all-categories/1?q=SCAF15>, [accessed August 23, 2018], showing pricing information for Eaton's system combination AFCI kit (SCAF15).

General



Manufacturer: Eaton

Catalog Number: SCAF15

UPC: 786689042400

Description: SCAF15System combination AFCI kit

Long Description: System Combination AFCI Kit - 15A, White

No image found

Pricing

Mfg List Pricing: 402.99

Unit of Measure: E

More Info

Date Last Updated: 2018-08-17T00:00:00

Account

Result

Saved

Details



Attachment 3 to AFCI Consortium Public Comment

Record of an attempted order and purchase of the Eaton system combination product (SCAF15) which was cancelled by Eaton.

REFUND FOR BREAKER/RECEPTACLE

Kevin <kevinr@quermback.com>

Fri 8/10/2018 11:23 AM

To: Frank L Terino <frank.terino@legrand.us>;

Cc: Steve Rood <steve.rood@legrand.us>;

📎 1 attachments (87 KB)

REFUND.pdf;

Good morning,

Attached is a receipt for the refund on the breaker/receptacle combo pack that we had ordered a week or so back. Not sure if Steve told you but we are unable to get this material now as it has been discontinued even before production. This should refund your Amex card the full \$407.92 (including tax) right back to the card. If you have any questions or need anything else just let me know!

Thank you,

Kevin

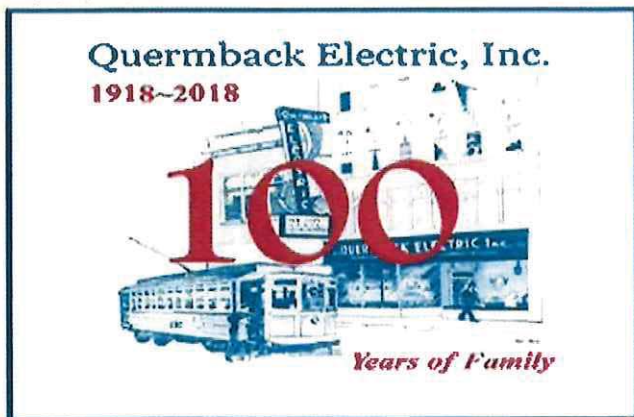
Kevin Rood

Inside Sales

[Quermback Electric](#)

kevinr@quermback.com

716-856-6644



FW: pricing

Kevin <kevinr@quermback.com>

Fri 8/3/2018 4:24 PM

To: Steve Rood <steve.rood@legrand.us>;

Yo check this out...I will have to do a return on that credit card

Kevin

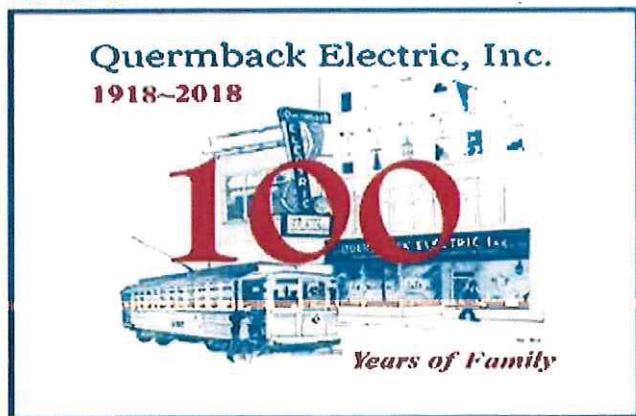
Kevin Rood

Inside Sales

[Quermback Electric](#)

kevinr@quermback.com

716-856-6644



From: Jarnot, Keith [mailto:KJarnot@wescodist.com]

Sent: Friday, August 03, 2018 4:19 PM

To: Kevin <kevinr@quermback.com>

Subject: RE: pricing

HI KEVIN,

IT SEEM'S THERE IS A PROBLEM WITH YOUR ORDER.

EATON NOTIFIED ME TODAY THAT COMBINATION RECEPTACLE IS DICONTINUED AND THEY DON'T CURRENTLY HAVE A REPLACEMENT.

THE REPLACEMENT ISN'T READY FOR PRODUCTION.

8/10/2018

Mail - steve.rood@legrand.us

PLEASE ADVISE .

I'M SORRY FOR THE INCONVIENCE.

THANK YOU

KEITH JARNOT WESCO BUFFALO

From: Kevin [<mailto:kevinr@quermback.com>]

Sent: Friday, July 27, 2018 3:31 PM

To: Jarnot, Keith

Subject: [EXTERNAL] RE: pricing

Good afternoon,

Here is the purchase order for that Eaton item I requested. Rich has this but his email says he is off until Monday so I just wanted to make sure one of the two of you has it. I wrote on here my contact information as I will be picking this item up from you guys so just call my cell when in stock: 716-572-8558.

Thank you,

Kevin

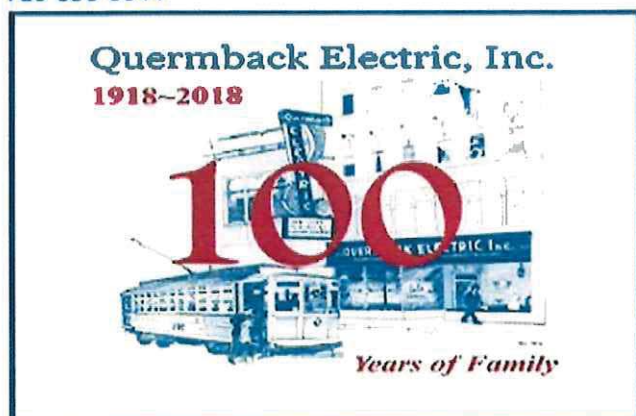
Kevin Rood

Inside Sales

[Quermback Electric \[quermback.com\]](http://Quermback Electric [quermback.com])

kevinr@quermback.com

716-856-6644



From: Jarnot, Keith [<mailto:KJarnot@wescodist.com>]

Sent: Thursday, July 26, 2018 9:27 AM

To: Kevin <kevinr@quermback.com>

Subject: pricing

HI KEVIN,

8/10/2018

Mail - steve.rood@legrand.us

PRICING ON (1) EATON SCAF15 UPC# 78668904240 IS \$370.84 EA

ITS MADE TO ORDER PART.

4-5 WEEK LEAD TIME.

LET US KNOW IF YOU HAVE ANY QUESTIONS

THANK YOU

KEITH JARNOT WESCO BUFFALO

	Keith Jarnot Inside Sales Buffalo, NY P: 716-684-7300 F: 716-684-7310 kjarnot@wesco.com



Public Comment No. 1381-NFPA 70-2018 [Section No. 210.12(A)]

(A) Dwelling Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas units shall be protected by any of the means described in 210.12(A)(1) through (6) following means :

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
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 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - (11) The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.
- (12) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Statement of Problem and Substantiation for Public Comment

After the January CMP meetings, CMP-2 created a Committee Statement to FR 7916: "CMP-2 continues the incremental steps to protect the entire dwelling. These remaining circuits (should) now have the protection from arc faults as the rest of the dwelling." ACBMA fully supports this statement. This is a necessary measure to continue the practical safeguarding of persons and property from hazards arising from the use of electricity. The following points provide support for this position.

– The gradual increase in the number of locations that require AFCI's is similar to gradual increase of GFCI's when they were introduced. The original intent, when AFCI requirements were introduced, was to cover the entire dwelling. However, the panel determined that a gradual introduction was best. If you reference the NEC 1999 ROC document you will see this trend. This is based on feedback from multiple industry representatives: CPSC, Electrical Contractors, Electronics Industry Association, and others. A majority wanted to protect more than just the bedroom branch circuits, but that was the starting point in the process to include this fire protection.

– NFPA/UL's study on building furnishings and the drastic increase in the flammability of these furnishings show the need for preventing any ignition source possible as part of the home's electrical safety system. AFCI's supply this function for the entire circuit where they are applied. <https://www.youtube.com/watch?v=aDNPhq5ggoE>

– The average cost for an AFCI circuit breaker is \$35 according to the Electrical Safety Foundation International. (<https://www.esfi.org/resource/q-and-a-arc-fault-circuit-interrupters-191>) or approx. \$280 to protect a new 2,000- square-foot, four-bedroom home from electrical fires caused by electrical arcing. That's about \$1.34 per month to protect a family from electrical fires over a 30-year mortgage. This is very minimal cost when compared to other items as part of home construction.

– While there has been feedback to circuit breaker manufacturers on interoperability with certain appliances, this feedback relates only 0.01% of AFCI's shipped by ACBMA members. Investigation of this 0.01% by ACBMA members actually shows nuisance trip and interoperability issues as only 0.0078% of units shipped. While each is investigated and resolved, the question of interoperability is a very small percentage of units shipped.

Related Item

- FR 7916

Submitter Information Verification

Submitter Full Name: Randy Dollar

Organization: Siemens Industry Inc

Affiliation: American Circuit Breaker Manufacturers Association (ACBMA)

Street Address:

City:

State:

Zip:

Submission Date: Mon Aug 27 16:39:59 EDT 2018

Committee: NEC-P02

Copyright Assignment

I, Randy Dollar, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Comment (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Comment in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this copyright assignment.

☒ By checking this box I affirm that I am Randy Dollar, and I agree to be legally bound by the above Copyright Assignment and the terms and conditions contained therein. I understand and intend that, by checking this box, I am creating an electronic signature that will, upon my submission of this form, have the same legal force and effect as a handwritten signature

**Public Comment No. 1432-NFPA 70-2018 [Section No. 210.12(A)]****(A) Dwelling Units.**

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit ~~kitchens, family unit family~~ rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, ~~laundry areas, or~~ or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (7) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - (8) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - (11) The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.
- (12) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
210.12_A_Dwelling_Units_record_of_actual_desired_changes_delete_kitchens_and_laundry_SGRood.docx	210.12 (A) Dwelling Units record of actual desired changes to delete kitchens and laundry areas	
State-by-State_NEC_AFCI_Amendments_08-29-18.pdf	Summary of State Amendments to reduce AFCI requirements as of 08-29-18	
Clear_Path_for_Veterans.pdf	Clear Path for Veterans support Public Comment No. 1432	
Triangle_Inc_NEC_Letter.pdf	Triangle, Inc.'s support of Public Comment No. 1432	
Building_Homes_for_Heroes_NEC_letter-signed.pdf	Building Homes for Heroes support Public Comment No. 1432	
NortheastArc_NFPA_NEC_letter.pdf	Northeast Arc's support of Public Comment No. 1432	
AFCI_Nuisance_Trip_Testimonials_08-30-18.pdf	Testimonials on AFCI Nuisance Tripping	

Statement of Problem and Substantiation for Public Comment

No Technical Substantiation Provided. The Panel did not provide a technically substantiated response for the rejection of PI 3813 to delete the requirements for AFCIs in kitchens and laundry areas. A review of the previous expansion proposals to add kitchens and laundry areas and their ballot comments noted that the panel did not have specific substantiation of fires specifically in kitchens or laundry areas from the fire data used to justify that expansion. This lack of technical substantiation was noted in several comments for the 2014 NEC cycle that were rejected by the panel.

The panel today does not have specific fire data to substantiate expansion to other areas of the dwelling. The fire data, even in the latest reports, does not provide specifics on age of dwelling, that the cause is in the branch circuit wiring vs an appliance or equipment, or other specifics that would allow future measurement of success in reducing the number of fires.

Residential electrical fire problem is recognized. We recognize there's a problem with residential fires due to electrical systems, but there's no independently verifiable measurement method to determine the performance of solutions. As acknowledged during the First Draft Meeting, due to changes in the NFIRS collection system, as reported in the NFPA Research report for Electrical Fires, dated March 2017, the fire data that was used for the original substantiation for AFCIs is no longer suitable as a means for comparison to measure the success or lack thereof over the last 15+ years. This fire data from the mid 1990's served the purpose of quantifying the existence of the problem, and at that time provided the basis for the substantiation used in the 1999 NEC cycle. However, due to the changes in reporting and analysis, this data presently does not serve to reflect the efficacy of any implemented solution.

Ballot Statements. Panel members had noted in their ballot statements that there was no technical substantiation in this cycle for whole dwelling unit AFCI expansion as was proposed by the panel. Additionally, the panel noted the lack of technical substantiation in the response to many other PIs (including but not limited to PI 3962) to expand GFCIs throughout the dwelling; the reasons for rejection should be consistent – no data provided in this cycle should continue to result in no expansion. Data or reference to past debates from past Code cycles that may not have been seen or the debates not heard by newer panel members should not qualify as sufficient substantiation to make these kinds of changes. The need for technical substantiation for every proposal or comment in each Code cycle is a fundamental precept for the code change process.

FPRF Project Forthcoming Makes Expansion Premature. Although CMP2 has periodically expanded requirements for AFCI's since the initial introduction in the 1999 NEC, recent fire reports, which were used to substantiate the original requirement, indicate that there has been no significant reduction in residential fires during this same period. The NFPA Research Report titled Electrical Fires (dated March 2017) and the FEMA report covering Residential Building Fire Trends (2006-2015) both contain similar conclusions: the number of residential fires due to electrical failures has shown no notable decrease in the period from 2002 to 2015. A very pertinent detail with this timeframe is the fact that this time period directly coincides with the initiation and subsequent expansion of AFCI protection. CMP2 in the initial acceptance of AFCI requirements based their substantiation on a reduction in residential electrical fires. Fifteen-plus years later, the most recent fire data indicates that this is not and has not been the case. It is agreed, that from the NFPA fire data available, the details of the perceived hazards have not been sufficiently identified for the origin of the fire (branch circuit home run) or other locations (extension or other cords) and causes, as well as the age of the dwelling. Since there are questions as to the suitability of the fire data that shows no marked reduction of electrical fires since the introduction of AFCIs, CMP2 is left with no independently verifiable tool to measure the veracity of AFCI protection.

In response to this lack of data, a project by the Fire Protection Research Foundation (FPRF) called "Analysis of Factors Contributing to Residential Electrical Fires" is in progress. The stated goal of the project is to "...summarize the landscape of residential electrical fire incident data and provide recommendations for future efforts to precisely define the residential electrical fire problem and the impact of the NECs regulatory changes (e.g. - AFCIs)." This will better identify the sources of actual fires for branch circuit wiring, and to what degree the "home run" is actually involved for the location arc-fault related fire. As of the writing of this comment, there has not been any research or other activities to provide data or information completed.

The AFCI requirements for dwellings in the NEC should not be expanded until there is evidence or an independently verifiable measurement means that the proliferation of AFCI's up-to-now, has in fact, reduced the number of residential electrical fires. CMP2 should take into consideration the FPRF findings before proceeding with any expansion of the AFCI requirements.

Nuisance Tripping Problem Increased with Expanded AFCI Use. Review of ballot comments from CMP2 members for the first draft showed some direct knowledge of nuisance trips in general. Discussions during the panel meetings were focused on issues found in kitchens and laundry areas as well as some other areas. As such, the AFCI requirements for kitchens and laundry areas should be rolled back. As stated in another Panel member's ballot statement regarding expansion to more areas, "It would help if there were compatibility studies for other motor-driven devices that could be connected to the outlets".

As noted in advance of and during the First Draft meeting, there continues to be a task force limited to selected AFCI breaker and appliance companies seeking to address the nuisance tripping issue. Reports of nuisance trip incidents involving refrigerators, dishwashers and microwave ovens among other appliances are continuing to be accumulated. The impacts of the nuisance trips are multi-fold, including but not limited to:

-  - Removal of AFCI and GFCI protection by replacing a dual function AFCI/GFCI circuit breaker with a standard thermal-magnetic circuit breaker
-  - Unpaid call-backs for contractors
-  - Homeowner inconvenience
-  - Power loss resulting in property loss or injury
-  - Untested workarounds such as EMI filters
-  - Unsafe workarounds such as extension cords

If GFCI protection is inadvertently removed and not replaced with a suitable GFCI device (which has been stated as happening in actual practice) to resolve an AFCI/GFCI nuisance trip, then the safety provided by the GFCI is lost. In view of the issues with nuisance tripping of AFCI or dual function AFCI/GFCI devices, accessibility for required monthly testing and to reset now becomes a very important safety factor to assure continued personnel protection. The accompanying comments and organizational support letters serve to effectively summarize the concerns of those among us who are most impacted.

AFCI Amendments in Many States. As of August 2018, 15 states have amendments or exceptions to the NEC or IRC AFCI requirements. Due to the many issues with AFCIs, their adoption by local jurisdictions has become very controversial. This has resulted in many states either eliminating the requirements or heavily modifying the requirements. The more local amendments made to the NEC, the more expense and time spent in the jurisdiction results in less consistency across the country. The need for amendments could cause states to less frequently adopt NEC revisions and the applicable sections in the IRC standards.

[Related Item](#)

• Public Input No. 3813-NFPA 70-2017 [Section No. 210.12(A)]

• Committee Input No. 7916-NFPA 70-2018 [Section No. 210.12(A)]

Submitter Information Verification

Submitter Full Name: Stephen Rood

Organization: Legrand North America

Street Address:

City:

State:

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Submittal Date: Tue Aug 28 14:08:48 EDT 2018

Committee: NEC-P02

Copyright Assignment

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210.12 Arc-Fault Circuit-Interrupter Protection.

Arc-fault circuit-interrupter protection shall be provided as required in 210.12(A), (B), and (C). The arc-fault circuit interrupter shall be installed in a readily accessible location.

(A) Dwelling Units. All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit ~~kitchens~~, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, ~~laundry areas~~, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
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 - a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (4) A listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - d. The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.

(5) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72 -2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

State-by-State NEC Adoption – as of August 29, 2018

Overview of NEC adopted versions:

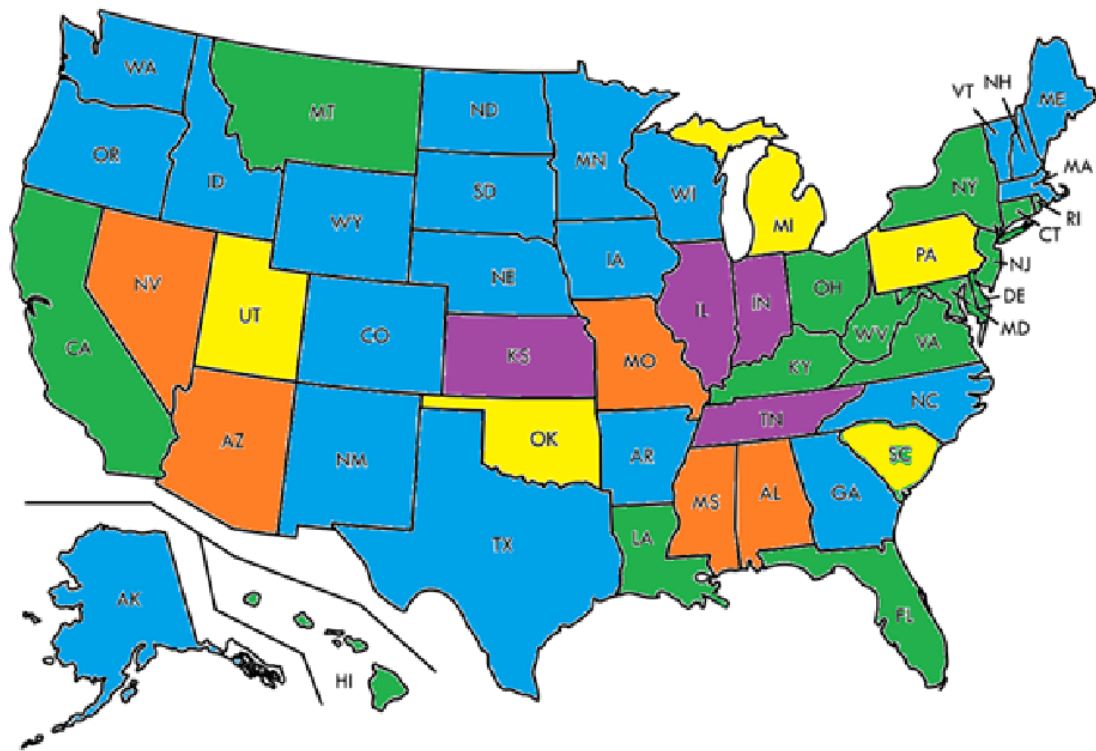
- 2017 NEC – 22 States
- 2014 NEC – 14 States
- 2011 NEC – 0 States
- 2008 NEC – 4 States
- Local Adoption – 5 States
 - Alabama, Arizona, Mississippi, Missouri and Nevada.
- AFCI Requirements Controlled by International Residential Code – 5 States

Overview of AFCI Requirements:

15 states and 3 major municipalities have made amendments to reduce the AFCI requirements. Below is summary of the changes that have been made:

- Arkansas (2017 NEC) – AFCI's are not required in kitchens and laundry areas.
- Delaware (2014 NEC) – Smoke alarms shall not be placed on branch circuits protected by AFCI's.
- Idaho (2017 NEC) – AFCI protection is only required in bedrooms.
- Iowa (2017 NEC) – AFCI requirements for branch circuit extensions or modifications in dwelling or dormitory units were deleted.
- Michigan (2018 IRC) – AFCI requirements were deleted.
- New Hampshire (2017 NEC) – AFCI requirements for dormitory unit devices and bathrooms, guest rooms and guest suites, and branch circuit extensions or modifications for dormitory units were deleted.
- New Jersey (2014 NEC) – AFCI requirements for kitchens and laundry areas, as well as for branch circuit extensions or modifications, were deleted.
- North Carolina (2017 NEC) – AFCI requirements for kitchens and laundry areas were deleted, as well as those for dormitory unit bathrooms guest room and guest suites, and extensions or modifications.
- Oregon (2017 NEC) – AFCI requirements deleted from branch circuits that supply hallways, kitchen or laundry areas, as well as GFCI protected receptacles installed in dining rooms. AFCI protection shall not be required for optional, dedicated outlets that supply equipment known to cause unwanted tripping of AFCI devices and for branch circuits that serve an appliance that is not easily moved or that is fastened in place.
- South Carolina (2018 IRC) – AFCIs will not be required in kitchens and laundry areas.*
- Tennessee (2008 NEC) – The 2017 NEC will become effective in the state on October 1, 2018 and states that AFCIs shall be optional for bathrooms, laundry areas, garages, unfinished basements, work or similar area, and for branch circuits dedicated to supplying refrigeration equipment.
- Utah (2015 IRC) – AFCI requirements were deleted.
- Vermont (2017 NEC) – AFCI requirements for branch circuit extensions or modifications were deleted where the extension of the existing conductors is used solely to hardwire single station smoke and or CO alarms in an existing dwelling or dormitory unit.
- Virginia (2014 NEC) – AFCI's only required in bedrooms.
- Wisconsin (2017 NEC) – AFCI requirements do not apply to kitchens.
- Mobile, AL (2014 NEC) – AFCI's requirements were deleted for family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets and hallways
- Kansas City and Springfield, MO (2011 NEC) – AFCI's only required in bedrooms.

*Adoption of 2018 IRC was approved by Building Codes Council and is pending legislative review.



2017	2014	2008	IRC	L.A.



1223 Salt Springs Road
Chittenango, NY 13037
(315) 687-3300
ClearPathForVets.com

December 29, 2017

**Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471**

**Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894**

Dear Mr. Hilbert/Earley

I understand that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. I wanted to ask you to reject any code change proposal which would result in this move.

As the Director of Facilities at Clear Path for Veterans, and a New York State Certified Code Enforcement Officer since 1989, I strongly oppose these proposed changes. We believe that by allowing for the removal of the point of use functionality, it will create an unnecessary and potentially costly burden that our Veterans will be forced to deal with. For the elderly, parents watching small children and veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far-removed panel could be an issue.

Clear Path for Veterans is a community-based resource center that connects service members and their families to the resources they need and provides them with in-house non-clinical programs to ensure that our Veterans are holistically supported in all of their physical and emotional needs. Clear Path exists to serve veterans and their families and it is for that reason that we are urging you to reject these proposals. Please do not hesitate to contact me if you have questions.

Due to the support of our friends and family we are able to provide a center for services that is unlike anything else in the country and gives us the opportunity to touch the lives of more than 30,000 veterans per year.

Sincerely,

**Ron Dean
Director of Facilities Management
Clear Path for Veterans**



December 11, 2017

Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894

Dear Mr. Hilbert/Earley

I am writing to you today in regards to the development of the 2020 National Electrical Code, with a specific concern related to the proposed changes that pose a threat to the safety, accessibility and mobility of those with disabilities within their homes. We here at Triangle, Inc., where we help those with disabilities and their families lead rich, fulfilling lives, recently became aware of requests by manufacturers that would result in the movement of the "Test/Reset" buttons from electrical outlets in homes and move the functionality to the breaker panel, which in many homes is in the basement or garage. This change is of particular concern to us as we aim to empower transition-age youth and adults with disabilities to meet their personal and professional goals and ultimately achieve independence. We believe that by allowing for the relocation of the point-of-use functionality to the breaker panel, it will create another barrier to independence for the people we serve. We want our members to feel safe in their homes and asking them to go to an inconvenient, and for some unsafe, location just to troubleshoot a simple household problem is wrong when a much easier push of a button is a better fix.

In its early days, Triangle, Inc. represented a place for those who did not feel appreciated or comfortable in their communities to be welcomed and serve alongside their peers in sheltered workshops and on-site day programs. Now, 46 years later, our organization stands as an entry point into the community for our participants to gain employment, establish residency, and learn effective self-advocacy skills.

As you consider these proposed code changes, please keep in the mind the people that need to be able to reach these outlets for their everyday needs for cooking, cleaning and medical equipment. It would be a shame for the business interests of some to supersede the safety of so many.

Please keep safety accessible in the home and reject these proposals.

Sincerely,

A handwritten signature in blue ink, appearing to read "Coleman Nee", is written over a horizontal line.

Coleman Nee
CEO
Triangle, Inc.

December 20, 2017

Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471



Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894

Dear Mr. Hilbert/Earley

It has come to my attention that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. If the National Fire Protection Association were to accept these proposals, it would directly impact the lives of the brave men and women who were injured while serving this country.

Started in 2006, Building Homes for Heroes is a national non-profit that has been at the forefront of making a significant difference in the lives of wounded American service members and their families. The organization gifts mortgage-free homes that meet the needs of the men and women who have selflessly served our country. These homes not only help to remove the family's financial burden, they help to restore the individual's freedom, and enable the veteran to lead a more independent and productive civilian life.

As the National Director of Construction Development, I strongly oppose these proposed changes because it will create an unnecessary and potentially costly burden that our Veterans will be forced to deal with. For the elderly, parents watching small children and veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far removed panel could be an issue.

It is for these reasons that I urge you to reject these proposals. Please do not hesitate to contact me if you have questions.

Sincerely,

A handwritten signature in cursive script, reading 'Chad Gottlieb', is positioned above the printed name.

Chad Gottlieb

Director of Construction Development, National
Building Homes for Heroes, Inc.
Phone: (516) 395-2440

www.BuildingHomesforHeroes.org

NortheastArc

Lifelong support for people with disabilities

November 29, 2017

Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894

Dear Mr. Hilbert,

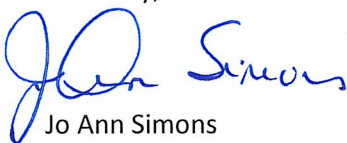
I recently became aware that proposed changes to the upcoming National Electrical Code pose a threat to the safety, accessibility and mobility of those with intellectual and physical disabilities within their homes. Our organization has become aware of requests by manufacturers that would remove the "Test/Reset" buttons from many outlets in homes and move the functionality to the breaker panel which in many homes is in the basement or garage. For many people we serve, resetting a circuit on a circuit breaker may be overwhelming while simply pushing a button on an outlet is far easier. I fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently.

As CEO of the Northeast ARC, I am fully aware of the challenges posed every day to the members we serve. At the Northeast Arc our mission is to help people with disabilities become full participants in the community; choosing for themselves how to live, learn, work, socialize and play. It is however, in my role of an adult son with Down syndrome, that I raise my highest objections. Jon Lives independently and in his own home. While he can confidently navigate most of his daily life, he is uncomfortable with the workings of his circuit breaker. In addition to being in his basement, it is confusing to him.

As you consider these proposed code changes, please keep in the mind the people that need to be able to reach these outlets for their everyday needs for cooking, cleaning and medical equipment.

Please keep safety accessible in the home and reject these proposals and if I can provide any additional information please contact me.

Sincerely,



Jo Ann Simons
President and CEO
Northeast Arc
JAS@ne-arc.org
978-624-2408

TESTIMONIALS ON AFCI NUISANCE TRIPPING

Nuisance tripping is a significant problem with AFCI's – a problem that has only grown in the past several years as home electrical products become more complex. The National Electrical Manufacturers Association produced a white paper (*"Recommendation on AFCI/Home Electrical Product Compatibility,"* National Electrical Manufacturers Association, March 2011) discussing AFCI nuisance tripping with many common home electrical products.

In a September 2017 study conducted by The Farnsworth Group, more than 200 contractors who were surveyed expressed serious concerns with AFCIs and nuisance tripping:

- 60% say nuisance tripping is an issue with DF AFCI/GFCI Breakers
- 85% say that DF Breaker nuisance tripping has resulted in call backs

The following are a collection of testimonials detailing the instances of real-world issues within the home with AFCIs and modern appliances

Testimonials from Electricians and Contractors:

"We do see nuisance tripping. The nuisance tripping is mostly caused by inductive loads. That's kind of the standard of why it trips all the time. Someone plugs in a portable heater or a fan and it trips the breaker – the arc fault setting specifically. The occupant of the house has to retrip the breaker."

Kirk Kurtz

Digital Networks Group

"We have eaten countless hours, fuel and money going back out to warranty calls when AFCI breakers trip."

Douglas Onion

VP of Canby Electric

"AFCI is very sensitive and they can become a nuisance. People call and ask if I'll take out their AFCI breakers and put in GFCI...Paddle fans are very likely to trip."

Mike Nannie

The Electric Connection

"Sometimes lighting will cause them to trip off. Most of the customers I deal with hate them. In the newer homes, you gotta stick with them. It's really sensitive. I would like them to be improved, so this wouldn't happen."

Stephen Owen

EM Logan & Sons

"A lot of times it's from vacuums. People will leave the vacuum running and just unplug and it sparks and that creates the arc. A lot of people have no idea what they're doing when they go in the panel."

David Blanchet
Energy Electric

"I have had a lot of trouble with AFCI false tripping. The worst was a group of homes where the bath fans would trip the AFCI while the home owners were in the shower. The company who wires the houses refused to admit AFCI tripping was a fault. I rewired the fans to a different circuit and have not had a call back since."

Ron Smith
Heritage Electrical

"If they'd let you go without them in, I would. They're too much trouble. It's terrible. Because of the troubleshooting. It's hard to tell a customer I can't come back for free if this don't work. I'm sure the manufacturer doesn't want to pick up the cost of troubleshooting. I had trouble with them...Sparks set them up--caused by arcs on motors. Washers and dryers can set them off. They were tripping on motors like treadmills. It can cost thousands of dollars because you need to replace appliances. It happens when you first install them, usually, when there's old wiring."

Chris Lepore
IBEW

"Our company wires 35-40 homes per year. These are large houses with numerous circuits that require numerous arc faults. We are definitely in favor of deleting the arc fault breakers from the 2017 NEC in SC. We have had more than a few warranty call backs on arc fault breakers. This causes time loss and revenue loss. Arc fault breakers are too sensitive to the circuits."

Gene Howard
Pro Electric, Inc.

"We have had numerous instances with breaker representatives attempting to identify why AFCI breakers are tripping in real world use; they have never been able to tell us on the spot, even with their personnel and test equipment what the causes of tripping are during these troubleshooting visits. Millions of brush type motors are in kitchen appliances - mostly old style appliances. Brush type motors have driven AFCI manufacturers nuts. Instead of solving the issue, the AFCI CB guys have changed firmware to ignore brush type motor signatures. As the manufacturers update the firmware to fix one issue, they don't account for application issues that come up; we end up being their beta testing for them. We don't see that the problem lies with the building wiring, but with the appliances or combinations of them used. The numbers of combinations of appliances being used is infinite, so there would be no way to solve the nuisance tripping by testing and adjusting the firmware, because there are too many combinations to possibly test. Have talked with fire marshals that would not support AFCI expansion; his position was that they posed more danger to people because they were messing with CB to remove and replace with thermal magnetic. AFCIs more likely to trip when there are multiple loads on

the circuit, with combinations of applications going on (lighting and treadmills in simultaneous use). There are dangers associated with the workarounds people are using because of nuisance tripping."

Carl Redman
Bear Electric, Inc.

Testimonials from Distributors:

AFCI nuisance tripping happens all the time. We end up having to take back breakers that aren't bad because it's a device that hasn't been matched up to the arc fault breaker. When I sell a load center, I frequently sell a surge and noise suppression device with it. It's a mess. Therefore, it would be our position to halt the unnecessary expansion of AFCI requirements throughout the home.

Greg Miller
Dahl Electric Supply

Comments on Accessibility:

"[Building Homes for Heroes] gifts mortgage-free homes that meet the needs of the men and women who have selflessly served our country. These homes not only help remove the family's financial burden, they help to restore the individual's freedom, and enable the veteran to lead a more independent and productive civilian life. [An AFCI expansion would] create an unnecessary and potentially costly burden that our Veterans will be forced to deal with."

Chad Gottlieb
National Director of Construction Development, Building Homes for Heroes

"For the elderly, parents watching small children and Veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far removed panel could be an issue."

Ron Dean
Director of Facilities Management, Clear Path for Veterans

"As CEO of the Northeast ARC, I am fully aware of the challenges posed every day to the members we serve. At the Northeast Arc our mission is to help people with disabilities become full participants in the community; choosing for themselves how to live, learn, work, socialize and play. For many people we serve, resetting a circuit on a circuit breaker may be overwhelming while simply pushing a button on an outlet is far easier. I fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently."

Jo Ann Simons
CEO, Northeast Arc

“Triangle, Inc. recently became aware of requests by manufacturers that could remove the “Test/Reset” buttons from many outlets in homes and move the functionality to the breaker panel, which in many homes is in the basement or garage. This change is of particular concern to us as we aim to empower transition-age youth and adults with disabilities to meet their personal and professional goals and ultimately achieve independence. We believe that by allowing for the relocation of the point-of-use functionality to the breaker panel, it will create another barrier to independence for the people we serve.”

Coleman Nee
CEO, Triangle, Inc.

“Here at Able SC, we believe that if AFCI protection were required throughout dwellings, it would pose a serious threat to the safety, accessibility and mobility of those with intellectual and physical disabilities within their homes. Specifically, we are concerned that by mandating AFCI protection, GFCI point-of-use will be relocated to the circuit breaker. This relocation of the familiar “Test/Reset” buttons from the outlet to the breaker panel in a basement and garage will severely impact the independence of the people we serve.”

Kimberly Tissot
Executive Director, Able South Carolina

Public Postings about Nuisance Tripping:

“Since the pertinent Article 210.12 first appeared in the 1999 NEC, each successive Code cycle has broadened AFCI requirements. When evaluated objectively, arc fault circuit interrupters are found not to be the panaceas they’re made out to be. No one can show that any specific number of dwelling unit fires result directly from electrical arcing. What deserves serious consideration is the validity of the information supporting the effectiveness of AFCIs-the frequency and the nature of fires proven to result from arcing; the ability of the AFCI to clearly distinguish a dangerous arc from the routine voltage/current signature of standard appliances; and the cost of AFCI installation to contractors, electricians, and the public. Are they ‘worth it’? Saving lives and property, however laudable, must always have limits.”

“The problem with AFCIs”
November 1, 2016
Electrical Apparatus
Richard L. Nailen
EA Engineering Editor

“We live in a single-family home built in 2002. We have always had problems with vacuum cleaners tripping circuit breakers, regardless of whether the vacuums are old or new. After several unsuccessful attempts to troubleshoot the vacuum cleaners, we had our electrician come and monitor the load on our 15-amp outlet circuits. He found the vacuum never exceeds 12 amps, yet the breakers tripped when the vacuum was started or restarted. He determined the problem was the outlets are wired with AFCI circuit breakers and the vacuum trips them when it is started. The electrician indicated that current code

requires AFCI breakers in all outlets except for those with GFI breakers such as bathrooms, kitchens and outdoor circuits. We contacted a vacuum specialist in search of a machine that would not arc. He told us there is not a vacuum made that will not trip an AFCI breaker. He went on to say that AFCI breakers are required only in outlet circuits in sleeping areas and that we could have them replaced on circuits that supply hallways. Or we could run extension cords from our GFI-protected outlets.”

“Q&A with Henri de Marne”

June 13, 2018

The Daily Herald

“In my brother’s newer home in VT, we could not use the vacuum cleaner. It would immediately cause the AFCI to trip. My next visit he removed most of them and replaced with standard breakers. This was about 2-3 years after it was built.”

[WorthFlorida](#)

Homeowner

“AFCI’s are truly untested, unproven, unreliable and unnecessary technology that has been foisted onto the electrical trade and its customers. The original series AFCI’s were a pant load and the new Combo AFCI’s are even more so. They are as close to 100% pure BS as you will find anywhere. They are in no way as significant or equivalent in importance as the development of the GFCI was or is like so many attempt to relate and to compare them to. All of the laboratory and field-testing for these is biased, irrelevant and useless.”

[KayJay](#)

Homeowner

“We’ve had a ton of issues with arc faults, [especially] when people are doing finish carpentry, its the windings in the motors of a lot of these things that arc when started and throw the breaker. Had an inspector tell us 2 weeks ago, once its inspected do what ever you want, leave em in, take em out, whatever. But ya we’ve had a lot of issues. One house actually had to replace a handful of them, homeowner would leave, come home a few hours later and a handful of arc faults would be tripped.”

[kawaikfx400](#)

Business Owner

“AFCI technology, while it has been around since 2002, is still not ready to be installed in homes. They simply do not work, and we have taken out and replaced most of the AFCI circuit breakers we ever installed with conventional circuit breakers. The problem is that certain very common household loads, such as simple electro-magnetic alarm clocks will trip them every time. It is simply unacceptable to have your power go out every morning at 6:00 AM. Vacuum cleaners are another example of equipment that regularly trips AFCI breakers. Instead of trying to deal with equipment that will trip when we have an arc problem in the wall, we should change the way connections are put together to avoid the arc in the first place. Fix the problem, do not just create more problems!”

[Ted L. Clifton](#)

Homeowner

Founder and Chief Designer of Zero Energy Home Plans

"We bought a Samsung refrigerator and we remodeled our kitchen starting in January, and we have to follow 2014 NEC... The fridge trips the breaker every day, the fridge hasn't worked 24 hours in the almost 3 weeks we've had it installed, until we used an extension cord to plug it into a non-AFCI/GFCI plug. Samsung has been out 4 times and after the technical [manager] talked to his supervisor on the phone... it seems like some/all new refrigerators will have a problem with the new regulations... We've been told by our contractor, other chief building officers/inspectors, multiple electricians, now Samsung and multiple places online, to just get it to pass code and then have an electrician switch it back to a regular outlet..."

[mama2princess](#)

Homeowner

In response to mama2princess:

"Motors should never be plugged into a gfi or arc fault breaker, recipe for disaster. Pass inspection then switch out for a regular breaker. Did the same thing with my GE fridge."

[Matthew Hallett](#)

Ellsworth-Hallett Home Professionals

"We just bought a brand new Samsung refrigerator and our house is also brand new with all the new GFCI breaker requirements. Our fridge has tripped the breaker twice and both times we were out of town - so all the food had to be tossed. I'll be switching to a non-gfci breaker this week to prevent this from happening again."

[Jfidler80](#)

Homeowner



Public Comment No. 1852-NFPA 70-2018 [Section No. 210.12(A)]

(A) Dwelling Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit ~~kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas,~~ or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (7) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - (8) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - (11) The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.
- (12) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Clear_Path_for_Veterans.pdf	Copy of letter that was submitted during first draft stage.	

Statement of Problem and Substantiation for Public Comment

As the Chief Executive Officer at Clear Path For Veterans, I am formally submitting public comments related to the issue of nuisance tripping and how it impacts the population we serve. We believe that an expansion of AFCI requirements will likely result in the relocation of the Test and Reset functionality from many residential electrical outlets, moving it from an accessible location to the circuit breaker which might be in the basement or garage.

Clear Path For Veterans is a community-based resource center that connects service members and their families to the resources they need and provides them with in-house non-clinical programs to ensure that our Veterans are holistically supported in all of their physical and emotional needs. Clear Path exists to serve veterans and their families.

This possible change would have a disproportionate impact on vulnerable populations including the elderly, parents with young children and veterans with disabilities with whom we work. Removing the point of use functionality and instead resetting a circuit on a breaker panel in a remote location may be more difficult than simply pushing a button on a nearby outlet. Our concern is this will create an unnecessary and potentially costly and harmful burden on our Veterans. Further, with increased nuisance trips occurring as a result of AFCIs, we fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently.

As you consider these public comments, we urge you to keep in mind the people that rely on the point of use functionality to lead independent lives. Please do not hesitate to contact me if you have questions.

Sincerely,

Melissa Spicer
Chief Executive Office
Clear Path For Veterans

Related Item

- CI 7916

Submitter Information Verification

Submitter Full Name: Bethany Frank

Organization: Clear Path For Veterans

Street Address:

City:

State:

Zip:

Submittal Date: Thu Aug 30 10:24:07 EDT 2018

Committee: NEC-P02

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Chittenango, NY 13037
(315) 687-3300
ClearPathForVets.com

December 29, 2017

**Mark W. Earley, Chief Electrical Engineer
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471**

**Mark R. Hilbert, Panel 2 Chair
MR Hilbert Electrical Inspections & Training
14 Beach Pond Rd
Wolfeboro, NH 03894**

Dear Mr. Hilbert/Earley

I understand that there are several proposals for the 2020 National Electrical Code that would likely result in the moving of the Test and Reset functionality from many residential electrical outlets and moving it to the circuit breaker, which might be in the basement or garage. I wanted to ask you to reject any code change proposal which would result in this move.

As the Director of Facilities at Clear Path for Veterans, and a New York State Certified Code Enforcement Officer since 1989, I strongly oppose these proposed changes. We believe that by allowing for the removal of the point of use functionality, it will create an unnecessary and potentially costly burden that our Veterans will be forced to deal with. For the elderly, parents watching small children and veterans with disabilities, resetting a circuit on a circuit breaker in a remote location may be more difficult than simply pushing a button on an outlet. We fear that moving the functionality to the breaker panel will make it even more difficult for the families and individuals we serve to live safely and independently. Further, the cost of installing a home run to a far-removed panel could be an issue.

Clear Path for Veterans is a community-based resource center that connects service members and their families to the resources they need and provides them with in-house non-clinical programs to ensure that our Veterans are holistically supported in all of their physical and emotional needs. Clear Path exists to serve veterans and their families and it is for that reason that we are urging you to reject these proposals. Please do not hesitate to contact me if you have questions.

Due to the support of our friends and family we are able to provide a center for services that is unlike anything else in the country and gives us the opportunity to touch the lives of more than 30,000 veterans per year.

Sincerely,

**Ron Dean
Director of Facilities Management
Clear Path for Veterans**

**Public Comment No. 377-NFPA 70-2018 [Section No. 210.12(A)]****(A) Dwelling Units.**

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas units shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (7) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - (8) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - (11) The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.
- (12) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Statement of Problem and Substantiation for Public Comment

This comment is similar to PCN-376 submitted for 210.8(A). AFC requirements have been added for almost 30 years, resulting in a list of 'areas' where AFCI protection is required. AFCIs have proven to provide additional protection, as well as ensure that there are not wiring errors downstream of the AFCI device; such as neutral-to-ground connections, crossed neutrals between multiple circuits.

This 'list' of areas contained in 210.8 where GFCI is required is an accumulation of rules added over the past 40+ years. GFCI's have proven to add safety and to continue with a list makes it more difficult for the industry to know where GFCI is required and where not.

I understand that there are special interest groups represented on code panel 2 that don't want to expand AFCIs and I understand that I have no 'technical' reason to make this rule simpler and clear. AFCI protection for 'all' 15A and 20A, 120V circuits in a dwelling unit will one day will be required, so let's just have it happen now.

Related Item

• FR8131

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submission Date: Sat Aug 04 11:37:22 EDT 2018

Committee: NEC-P02

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☒ By checking this box I affirm that I am Mike Holt, and I agree to be legally bound by the above Copyright Assignment and the terms and conditions contained therein. I understand and intend that, by checking this box, I am creating an electronic signature that will, upon my submission of this form, have the same legal force and effect as a handwritten signature

**Public Comment No. 52-NFPA 70-2018 [Section No. 210.12(A)]**

NEMA recommends that CMP 2 should create a Second Revision with the same text as that used in the First Revision.

(A) Dwelling Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (7) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - (8) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - (11) The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.
- (12) If RMC, IMC, EMT, Type MC, or steel-armored Type AC cables meeting the requirements of 250.118, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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, Type MC or Type AC, meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Informational Note No. 1: For information on combination-type and branch-feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Statement of Problem and Substantiation for Public Comment

The issue of unwanted tripping was cited in comments to the FR 7916 ballot. For many years NEMA has requested that these issues be reported directly to the manufacturers so that they can be addressed. The feedback received has been minimal. NEMA remains committed to addressing this issue and again requests that unwanted tripping issues be reported online at:

<https://www.afcsafety.org/home-owners/unwanted-tripping/>

NEMA fully supports the direction given in CMP-2's Committee Statement to FR 7916: "CMP-2 continues the incremental steps to protect the entire dwelling. These remaining circuits (should) now have the protection from arc faults as the rest of the dwelling." It is a necessary measure to continue the practical safeguarding of persons and property from hazards arising from the use of electricity.

Related Item

- FR 7916

Submitter Information Verification

Submitter Full Name: Vince Baclawski

Organization: Nema

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Submittal Date: Wed Jun 27 14:39:19 EDT 2018

Committee: NEC-P02

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Public Comment No. 730-NFPA 70-2018 [Section No. 210.12(A)]

(A) Dwelling Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

- (1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the 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 arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - (4) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (5) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
- (7) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - (8) The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - (9) The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device 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 in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
 - (11) The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.
- (12) If ~~RMC - metal raceway, IMC, EMT, metal wireways, metal auxiliary gutters, or~~ Type MC ~~or~~ steel-armored Type AC ~~cables-cable~~ meeting the applicable requirements of 250.118, with metal wireways boxes, metal auxiliary gutters conduit bodies, and metal outlet and junction boxes- enclosures, are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for 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 overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception: 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 wireways, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC ~~cable~~ meeting the applicable requirements of 250.118, with metal boxes, metal conduit bodies, and metal enclosures.

Informational Note No. 1: For information on combination-type and branch/feeder-type arc-fault circuit interrupters, see UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*. For information on outlet branch-circuit-type arc-fault circuit interrupters, see UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*.

Informational Note No. 2: See 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*, for information related to secondary power-supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Statement of Problem and Substantiation for Public Comment

READABILITY OF THE CODE: Editorial consistency between a First Revision (FR-8130) made and existing text elsewhere in this Section and the entire Code. Also correlation issues with requirements elsewhere in the Code.

- Both NEC® 210.12(A)(5) and NEC® 210.12 Exception refer JOINTLY to Types AC and MC cables. Prior to FR-8130, the Exception referred to "steel-SHEATHED cable, Type AC or Type MC"; changing this to "steel-ARMORED cable, Type MC or Type AC" provides no further accuracy and no improved readability.

- Steel sheath (tape) is not steel armor. Steel armor is not steel sheath (tape).

- Type AC cable is defined in NEC® 320.2 as "a fabricated assembly of insulated conductors in a flexible interlocked METALLIC ARMOR". This armor is not restricted by NEC® 250.118(8) or NEC® 320.100 and 320.108 to be solely of steel. Indeed, the Standard ANSI/UL 4-2008 (R2018) and the Guide Information AWEZ are inclusive of both steel and aluminum armor, with the latter being the more prevalent commercially. In this list item NEC® 210.12(A)(5), the armor is not installed embedded in concrete that could possibly react with unprotected aluminum.

- Type MC cable is defined in NEC® 330.2 as a factory assembly of insulated conductors in "interlocking METAL TAPE, or a smooth or corrugated METALLIC SHEATH". This sheath/tape is not restricted by NEC® 250.118(10) or NEC® 320.108 to be solely of steel. Indeed, the Standard ANSI/UL 1569-2008 (R2018) and the Guide Information PJAZ are inclusive of steel, aluminum, copper and bronze sheath/tape, with aluminum being the more prevalent commercially. In this list item NEC® 210.12(A)(5), the sheath/tape is not installed embedded in concrete that could possibly react with unprotected aluminum.

- Inclusion of either "metal-SHEATHED" or "metal-ARMORED" is redundant to the definitions of Type MC and of Type AC. Nowhere else in the NEC® where reference is made JOINTLY to Type MC and Type AC cables are the redundant qualifiers "metal-SHEATHED" or "metal-ARMORED" used.

NOTE WELL: Any revisions made by this Public Comment PC-730 are solely to NEC® 210.12(A)(5) and NEC® 210.12 Exception. Any underlining elsewhere in NEC® 210.12(A) and any renumbering of list items are spontaneously introduced by that travesty-of-nature and insult to the written language TerraView™ and consequently should be disregarded.

Related Item

- First Revision No. 8130-NFPA 70-2018 [Detail]

- Public Input No. 3228-NFPA 70-2017 [Section No. 210.12(A)]

- Public Input No. 3386-NFPA 70-2017 [Section No. 210.12(A)]

Submitter Information Verification

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Committee: NEC-P02

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**Public Comment No. 1849-NFPA 70-2018 [Section No. 210.12(D)]**

(D) Branch Circuit Extensions or Modifications — Dwelling Units, Dormitory Units, and Guest Rooms and Guest Suites.

Where branch circuit wiring for any of the areas specified in 210.12(A), (B), or (C) is modified, replaced, or extended, the branch circuit shall be protected by ~~one of the following:~~ By any of the means described identified in 210.12(A)(1) through (A)(6)

- ~~A listed outlet branch-circuit-type AFCI located at the first receptacle outlet of the existing branch circuit~~

~~Exception:~~ -

(1)

Exception No. 1: AFCI protection shall not be required where the extension of the existing branch circuit conductors is not more than 1.8 m (6 ft) and does not include any additional outlets or devices, other than splicing devices. This measurement shall not include the conductors inside an enclosure, cabinet, or junction box.

Exception No. 2: Where a means, as required by 210.12(A)(1) through (6), is not listed for the installed electrical equipment, a listed outlet branch-circuit-type AFCI located at the first receptacle outlet of the existing branch circuit shall be installed.

Statement of Problem and Substantiation for Public Comment

Section 210.12(A) clearly lists the acceptable installations of Arc-Fault Circuit Interrupter Protection. An exception is added in the event a commercial solution does not exist for one of these acceptable installation methods. It was shown during the last code cycle and reinforced at the First Draft meetings that OBC AFCIs do not provide complete protection to the home run of the circuit upstream of the OBC AFCI. This change in the language will ensure that if a circuit is modified that it will have complete protection of the entire branch circuit if the installed equipment will allow it.

Related Item

- FR 7963

Submitter Information Verification

Submitter Full Name: Randy Dollar

Organization: Siemens Industry Inc

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Submittal Date: Thu Aug 30 10:15:41 EDT 2018

Committee: NEC-P02

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Public Comment No. 652-NFPA 70-2018 [Section No. 210.19(A)(1)]

(1) General.

Branch-circuit conductors shall have an ampacity not less than the larger of 210.19(A)(1)(a) or (A)(1)(b) and shall meet the equipment termination provisions of 110.14(C).

(a) Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size shall have an ampacity not less than the noncontinuous load plus 125 percent of the continuous load in accordance with 310.15(B).

(b) The minimum branch-circuit conductor size shall have an ampacity not less than the maximum load to be served ~~after the application of any adjustment or correction factors in accordance with 310.15(B).~~

Exception No. 1: If the assembly, including the overcurrent devices protecting the branch circuit(s), is listed for operation at 100 percent of its rating, the ampacity of the branch-circuit conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load in accordance with 110.14(C).

Exception No. 2: Where a portion of a branch circuit is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), it shall be permitted to have an allowable ampacity, in accordance with 310.15(B), not less than the sum of the continuous load plus the noncontinuous load. No portion of a branch circuit installed under this exception shall extend into an enclosure containing either the branch-circuit supply or the branch-circuit load terminations.

Statement of Problem and Substantiation for Public Comment

The rule currently uses the term "ampacity" incorrectly. That term, as defined in Article 100, always means the ampacity of the conductor after the application of any required correction and/or adjustment factors. The rule needs to reflect that the intent in (a) is to use the conductor ampacity directly from the appropriate ampacity table and in (b) use the ampacity as defined in Article 100.

Related Item

• First Revision No. 7981-NFPA 70-2018 • Public Comment No. 648-NFPA 70-2018

Submitter Information Verification

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Committee: NEC-P02

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**Public Comment No. 847-NFPA 70-2018 [Section No. 210.19(A)(1)]****(1) General.**

Branch-circuit conductors shall have an ampacity not less than the larger of 210.19(A)(1)(a) or (A)(1)(b) and shall meet the equipment termination provisions of 110.14(C).

(a) Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size shall have an ampacity not less than the noncontinuous load plus 125 percent of the continuous load in accordance with 310.15(B).

(b) The minimum branch-circuit conductor size shall have an ampacity not less than the maximum load to be served after the application of any adjustment or correction factors in accordance with 310.15(B).

Exception No. 1: If the assembly, including the overcurrent devices protecting the branch circuit(s), is listed for operation at 100 percent of its rating, the ampacity of the branch-circuit conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load in accordance with 110.14(C).

Exception No. 2: Where a portion of a branch circuit is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), it shall be permitted to have an allowable ampacity, in accordance with 310.15(B), not less than the sum of the continuous load plus the noncontinuous load. No portion of a branch circuit installed under this exception shall extend into an enclosure containing either the branch-circuit supply or the branch-circuit load terminations.

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
CN_159.pdf	70_CN 159

Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 159 in the First Draft Report on First Revision No. 7981.

The Correlating Committee directs that the panel remove "provision of" to correlate with other actions throughout this code.

The Correlating Committee directs that the panel review the location of Exception No. 1 And Exception No. 2.

This action will be considered as a public comment.

Related Item

- FR 7981

Submitter Information Verification

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Submission Date: Mon Aug 20 11:55:43 EDT 2018

Committee: NEC-P02

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Correlating Committee Note No. 159-NFPA 70-2018 [Section No. 210.19(A)(1)]

Submitter Information Verification

Submitter Full Name: Erik Hohengasser

Committee:

Submittal Date: Fri May 11 09:25:06 EDT 2018

Committee Statement and Meeting Notes

Committee Statement: The Correlating Committee directs that the panel remove "provision of" to correlate with other actions throughout this code.

The Correlating Committee directs that the panel review the location of Exception No. 1 And Exception No. 2.

This action will be considered as a public comment.

First Revision No. 7981-NFPA 70-2018 [Section No. 210.19(A)(1)]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.

**Public Comment No. 254-NFPA 70-2018 [Section No. 210.25(B)]****(B) Common Area Branch Circuits.**

Branch circuits installed for lighting, central alarm, signal, communications, or other purposes for public or common areas of a two-family dwelling, a multifamily dwelling, or a multi-occupancy building shall not be supplied from equipment that supplies an individual dwelling unit or tenant space.

Informational Note: Examples of public or common areas include, but are not limited to, lobbies, corridors, stairways, laundry rooms, roofs, elevators, washrooms, store rooms, driveways (parking), and mechanical rooms.

Exception: Where electric service and electrical maintenance are provided by the building

management and where these are under continuous building management supervision, the common area branch circuit

shall be permitted to be supplied from equipment that supplies an individual tenant space.

Statement of Problem and Substantiation for Public Comment

This section does not recognize the building that provides all the utilities for the occupants, yes that means no one gets an electric bill, it is included with the rent. there needs to be an exception for this circumstance. This exception would offer clarification under this condition.

Related Item

- Public Input No. 237-NFPA 70-2017

Submitter Information Verification

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Submission Date: Sun Jul 22 08:28:20 EDT 2018

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**Public Comment No. 559-NFPA 70-2018 [Section No. 210.50(C)]****(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. (Unless specific equipment or appliances require the receptacle outlet to be installed closer than 6 ft. as stated elsewhere in this code.)

Statement of Problem and Substantiation for Public Comment

"Appliance Receptacle Outlets" especially wherein 422 is concerned, trash compactors in particular. If a trash compactor cord is limited to 4 ft. in length and this rule allows for the receptacle to be as far as 6 ft., there is an obvious contradiction. There may be other instances but this one comes to mind. Adding a "blanket" provision would alleviate this contradiction.

Related Item

- 210.50(C)

Submitter Information Verification

Submitter Full Name: Dan Haruch

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Submittal Date: Fri Aug 10 19:44:17 EDT 2018

Committee: NEC-P02

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Public Comment No. 231-NFPA 70-2018 [Section No. 210.52(A)(2)]

(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 any of the following: doorways and similar openings, fireplaces, ~~and fixed~~ fixed cabinets that do not have countertops or similar work surfaces, and spaces dedicated for the installation of appliances including but not limited to ranges and refrigerators.
- (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

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Practically_Speaking.JPG	Wall space behind range	

Statement of Problem and Substantiation for Public Comment

Here's a question to chew on. If the gas range in the photo is plugged into a 125-volt receptacle outlet located in the wall space directly behind the range, and the receptacle is on a 15-amp 120-volt branch circuit as permitted by exception 2 for Section 210.52(B)(1), does the Code still require a receptacle outlet on a 20-amp branch circuit to be installed in this same wall space? The short answer is "Yes, a receptacle on 20-amp circuit is required too!" Now, this interpretation is based strictly on the literal wording in the Code. Here's another question. Is a receptacle outlet required for the wall space behind the range? Yes, the wall space is required to have a receptacle outlet since nothing in section 210.52(A)(2) allows us to exclude the wall space behind this appliance. Section 210.52(A)(2)(1) specifically includes ANY space 2ft. or more in width, unbroken along the floor line by doorways, and similar openings, fireplaces and fixed cabinets without countertops or other work surfaces but does not exclude wall spaces occupied by appliances. Therefore, a 125-volt receptacle outlet is absolutely required for this wall space. The literal wording requires it even if this was an electric range plugged into a 50-amp receptacle! Unfortunately, section 210.52(A)(4) does not permit the countertop receptacles required by 210.52(C), to be considered as the wall receptacles required by 210.52(A). If it did, then most likely a countertop receptacle could be considered the wall receptacle for this space. So, the wall space behind the range still requires a receptacle outlet. Does it need to be on a 20-amp circuit? Yes. The wording in 210.52(B)(1) requires 20-amp circuits to supply ALL wall receptacle outlets required by Section 210.52(A). A quick look at exception no. 2 for 210.52(B)(1) would seem to indicate a 15-amp circuit instead of a 20-amp circuit would be allowed to supply the receptacle installed for range. However, a closer look at the wording of the exception will reveal the reason why we still need to install a 20-amp circuit too. The literal wording states "In addition to the required receptacles..." rather than saying "in lieu of the required receptacles...". Since the wall space occupied by the range is not excluded from receptacle requirements, a receptacle outlet on a 20-amp circuit is literally required.

Related Item

- PI 257

Submitter Information Verification

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Public Comment No. 1418-NFPA 70-2018 [Section No. 210.52(C)]

(C) Countertops and Work Surfaces.

In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, receptacle outlets for countertop and work surfaces shall be installed in accordance with 210.52(C)(1) and (C)(2) and shall not be considered as the receptacle outlets required by 210.52(A).

(1) Countertop and Work Surface.

A receptacle outlet shall be installed at each countertop and work surface that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed following either 210.52(C)(1)(a) or (C)(1)(b).

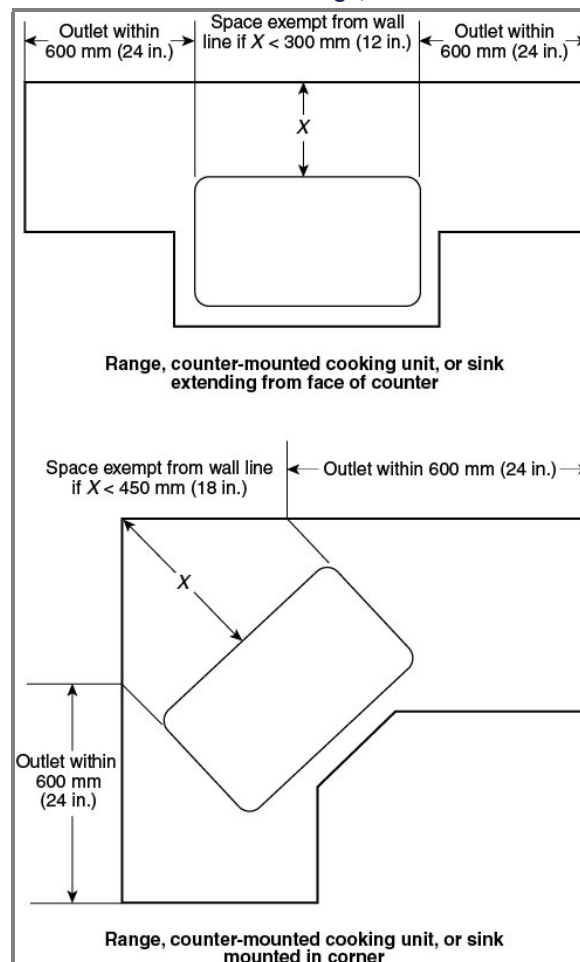
(a) ~~No~~ For wall countertop and work surfaces no point along the wall line is ~~shall be~~ more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space

(b) ~~No point on the countertop or work surface is more than 900 mm (36 in.) measured horizontally from a receptacle outlet in that space~~ For peninsulas and islands at least one receptacle outlet shall be installed at each countertop space with a long dimension of 1800 mm (72 in.) or less. At least two receptacle outlets shall be installed at each countertop space with a long dimension of greater than 1800 mm (72 in.).

Exception to (b): Peninsulas and island dimensions shall not include countertop or work surfaces with seating areas on both sides. Such areas are not required to be served by a receptacle outlet.

Exception: 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).

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



(2) Receptacle Outlet Location.

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

- (1) On or above countertop or work surfaces: On or above, but not more than 500 mm (20 in.) above, the countertop or work surface.
- (2) In countertop or work surfaces: Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces.
- (3) Below countertop or work surfaces: Not more than 300 mm (12 in.) below the countertop or work surface. Receptacles installed below a countertop or work surface shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond its support base.

Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(1), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets.

Informational Note: See Annex J and ANSI/ICC A117.1-2009, *Standard on Accessible and Usable Buildings and Facilities*.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
FR_7537_Section_210.52_Substantiation.pdf	Public Comment: FR 7537 Section 210.52(C)(1)	

Statement of Problem and Substantiation for Public Comment

See the attached substantiation.

Related Item

- FR 7537

Submitter Information Verification

Submitter Full Name: Daniel Buuck

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Submittal Date: Tue Aug 28 11:21:04 EDT 2018

Committee: NEC-P02

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Revise Section 210.52(C)(1) as follows:

(1) Countertop and Work Surface.

A receptacle outlet shall be installed at each countertop and work surface that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed following either 210.52(C)(1)(a) or (C)(1)(b).

- (a) For wall countertop and work surfaces no point along the wall line ~~is~~ shall be more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space
- (b) For peninsulas and islands at least one receptacle outlet shall be installed at each countertop space with a long dimension of 1800 mm (72 in.) or less. At least two receptacle outlets shall be installed at each countertop space with a long dimension of greater than 1800 mm (72 in.).
~~No point on the countertop or work surface is more than 900 mm (36 in.) measured horizontally from a receptacle outlet in that space.~~
Exception to (b): Peninsulas and island dimensions shall not include countertop or work surfaces with seating areas on both sides. Such areas are not required to be served by a receptacle outlet.

Exception: Receptacle outlets shall not be required on a wall directly behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52(C)(1).

[Remaining text and figures unchanged]

Substantiation:

It's understandable that CMP-2 wanted to simplify the language in Section 210.52(C)(1), but the requirements were also changed in the First Draft and are very restrictive as shown. It is not necessary to require receptacles to cover all work surfaces of peninsulas and islands. Small appliances can be placed in those areas served by receptacles. No substantiation was given why this was inadequate.

Some kitchen islands have no space for receptacles on either of the long dimensions, because both sides are filled with drawer faces and cabinet doors. No location is available other than the ends for locating receptacles, but one installed on each end would provide reasonable coverage to serve specific areas on the countertops and work surfaces for locating small appliances. This is more restrictive than current code.

Sections of peninsulas and islands which are designed to be used as dining areas across the entire depth should not be required to have receptacles installed. It is purely a design option and replaces a dining room table or breakfast nook which would also have no requirement for receptacles. Such dining surfaces provide no space to located receptacles and do not need any, the same as a dining table.

**Public Comment No. 419-NFPA 70-2018 [Section No. 210.52(C)]****(C) Countertops and Work Surfaces.**

In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, readily accessible receptacle outlets for countertop and work surfaces shall be installed in accordance with 210.52(C)(1) and (C)(2) and shall not be considered as the receptacle outlets required by 210.52(A).

(1) Countertop and Work Surface.

A receptacle outlet shall be installed at for each countertop and work surface that is 300 mm (12 in.) or wider .
~~Receptacle outlets shall be installed following either in accordance with 210.52(C)(1)(a) or (C)(1)(b).~~

(a) Wall Space. No point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space

(b) No Wall Space. No point on the countertop or work surface is more than 900 mm (36 in.) measured horizontally from a receptacle outlet in that space.

Exception:-

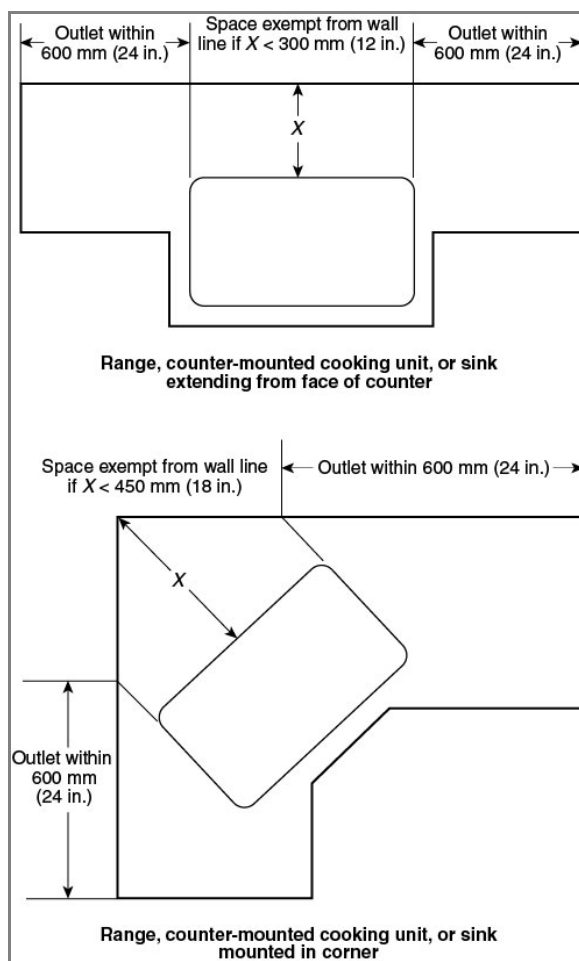
(a) (c)

(2) Receptacle outlets shall not be required

directly behind

(1) for the countertop or work surface behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52(C)(1) .

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



(2) Receptacle Outlet Location.

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

On or above

- (1) Above countertop or work surfaces:

On or above, but not

- (1) Receptacle outlets shall not be located more than 500 mm (20 in.) above, the countertop or work surface.
(2) In countertop or work surfaces: Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces.
(3) Below countertop or works surfaces:

Not

- (1) Receptacle outlets shall not be located more than 300 mm (12 in.) below the countertop or work surface.

Receptacles installed

- (1) Receptacle outlets installed below a countertop or work surface shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond its support base.

~~Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(1), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets.~~

Informational Note: See Annex J and ANSI/ICC A117.1-2009, *Standard on Accessible and Usable Buildings and Facilities*.

Statement of Problem and Substantiation for Public Comment

- (1) added the word 'readily accessible' so that the rule that was in (C)(2) could be deleted. Plus the rule about readily accessible belongs in (1), not (2). Incorporated the exception as a (c) requirement.
(2)(1) Made it clear that this applies to receptacle 'above', not 'on' countertops.

Related Item

- FR-7637

Submitter Information Verification

Submitter Full Name: Mike Holt

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Submittal Date: Mon Aug 06 09:46:45 EDT 2018

Committee: NEC-P02

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Public Comment No. 1893-NFPA 70-2018 [Section No. 210.52(C)(1)]

(1) Countertop and Work Surface.

A receptacle outlet shall be installed at each countertop and work surface that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed following either 210.52(C)(1)(a) or (C)(1)(b) or (C)(1)(c).

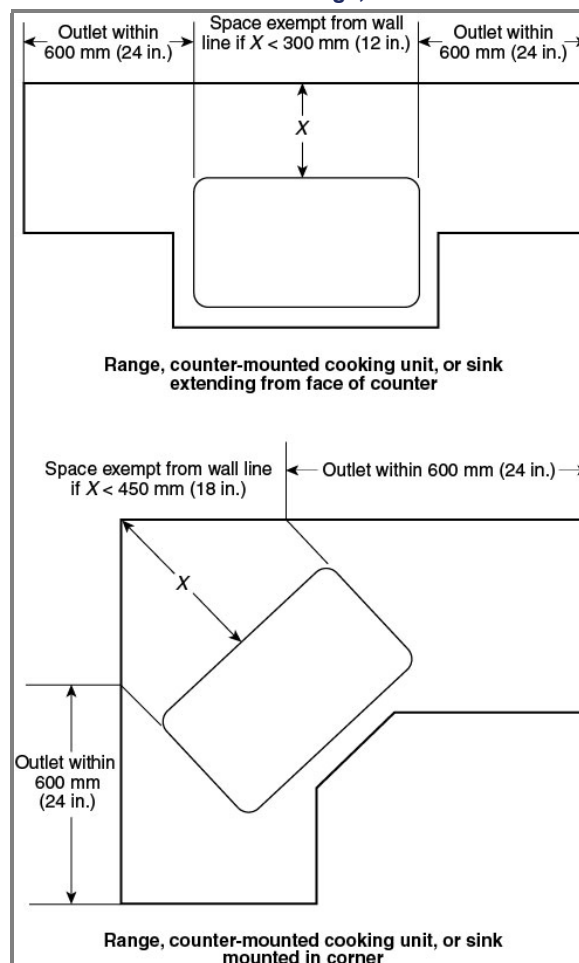
(a) No point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space

(b) No point on the countertop or work surface without permanent seating is more than 900 mm (36 in.) measured horizontally from a receptacle outlet in that space.

(c) For a countertop or work surface constructed over permanent seating provisions, no point on the surface shall be greater than 1.8 m (6 ft) from a receptacle outlet serving that space.

Exception: 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).

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



Statement of Problem and Substantiation for Public Comment

A greater distance is necessary to accommodate the way these surfaces are often designed. CMP 2 seems to consistently overlook island and peninsular counters that are, quite simply, permanently attached dining tables. The submitter raised four children with all meals on an 5 ft by 6 ft kitchen island, equipped with a range, base cabinets and two receptacle outlets at one end, and the surface extending over chairs with about an 18-in. overhang on the other three sides to accommodate six chairs. A very large lazy Susan sits in the middle so everyone can pass food across this large island. The only way to comply with the 3-ft rule as proposed would be to super-glue a Wiremold box and raceway to the

underside of the work surface, only to result in a receptacle between two elbows. This comment is conditioned on permanent seating provisions, which should be adequate to prevent abuse. I defy CMP 2 and its inspector members to explain how they would enforce the rule as proposed in such cases. It is so egregious it will likely invite legislative interference in the code adoption process.

Related Item

- FR 7537

Submitter Information Verification

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Organization: Hartwell Electrical Services,

Affiliation: self

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Submission Date: Thu Aug 30 11:22:31 EDT 2018

Committee: NEC-P02

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Public Comment No. 32-NFPA 70-2018 [Section No. 210.52(C)(1)]

(1)– Countertop and Work Surface _ _ General .

A receptacle outlet shall be installed at each countertop and work surface that is 300 mm (12 in.) or wider greater in any direction . Receptacle outlets shall be installed following either 210.52(C)(1) through (a) or (C)(4) .

(b 2) Wall Space .

No point along the wall line is more than

600 mm

600 mm (

24 in

24 in .) measured

horizontally

horizontally from a receptacle

outlet

outlet in that space

No point on the countertop or work surface is more than 900 mm (36 in.) measured horizontally from a receptacle outlet in that space

(3) Islands and Peninsulas.

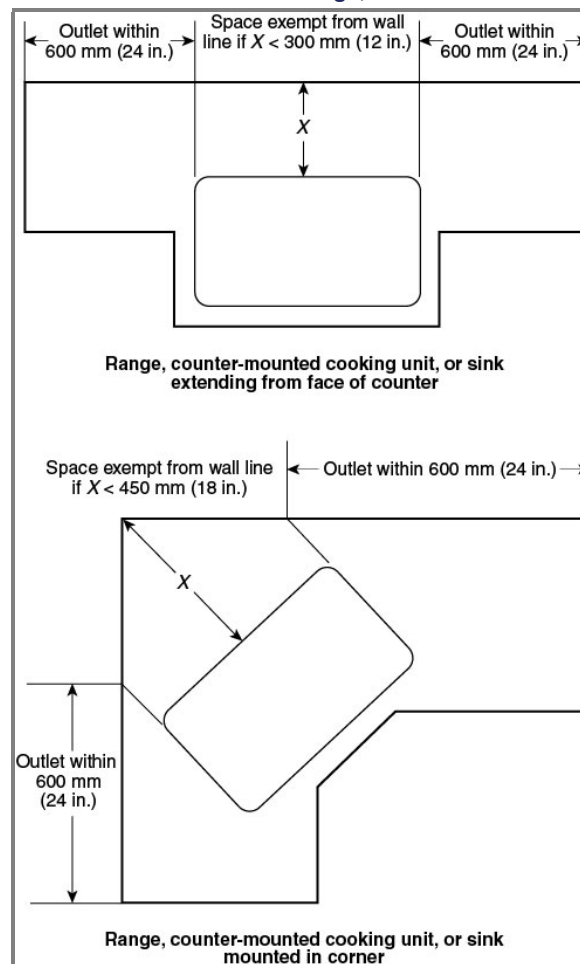
Receptacle outlets shall be installed in accordance with (a) and (b).

(a) A receptacle out shall be provided for each 837 sq. mm (9 sq. ft.), or fraction thereof, of countertop or workspace.

(b) The number of receptacle(s) required shall be permitted to be determined in accordance with (a) and located as determined by the designer or building owner .

Exception: 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).

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



Statement of Problem and Substantiation for Public Comment

The term “wider” was replaced with “greater” and the “in any direction” as added in (C)(1) for clarity, consistency and to address countertops and work surfaces of all shapes. The panel removed the “(24 in.) in the long dimension” measurement in the First Draft stage noting that it was confusing to readers of the Code. Replacing “wider” with “greater” and adding “in any direction” as recommended will make it clear to readers of the Code that a receptacle outlet is required if the countertop or work surface is (12 in.) or more in any direction and provides consistency with the measurement changes made to 210.65(B)(2) (former 210.71) for floor receptacles in meeting rooms.

Because of the modern “open style” kitchens, many of which have only island countertops or other work surfaces, there is a merit in changing the “one receptacle outlet” requirement. However, the First Draft requirement of “900 mm (36 in.) from a receptacle outlet in that space” could result in having to install a receptacle outlet in or on the countertop in locations where they serve no practical or safeguarding purpose, such as in area of an island used exclusively for eating. The NEC does not require a receptacle outlet(s) on a dining room or kitchen table so why is one necessary in an area of island or peninsula designed for eating purposes only? By revising the text to a square meter (square foot) application and permitting the required number receptacles to be placed by design, the need for additional receptacles on islands and peninsulas is met while maintaining the practical safeguarding of persons and property by allowing them to be located by design.

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 34-NFPA 70-2018 [Section No. 210.52(C)(2)]	
<u>Related Item</u>	
• FR 7537	

Submitter Information Verification

Submitter Full Name: Mark Hilbert
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Committee: NEC-P02

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Public Comment No. 494-NFPA 70-2018 [Section No. 210.52(C)(1)]

(1) Countertop and Work Surface.

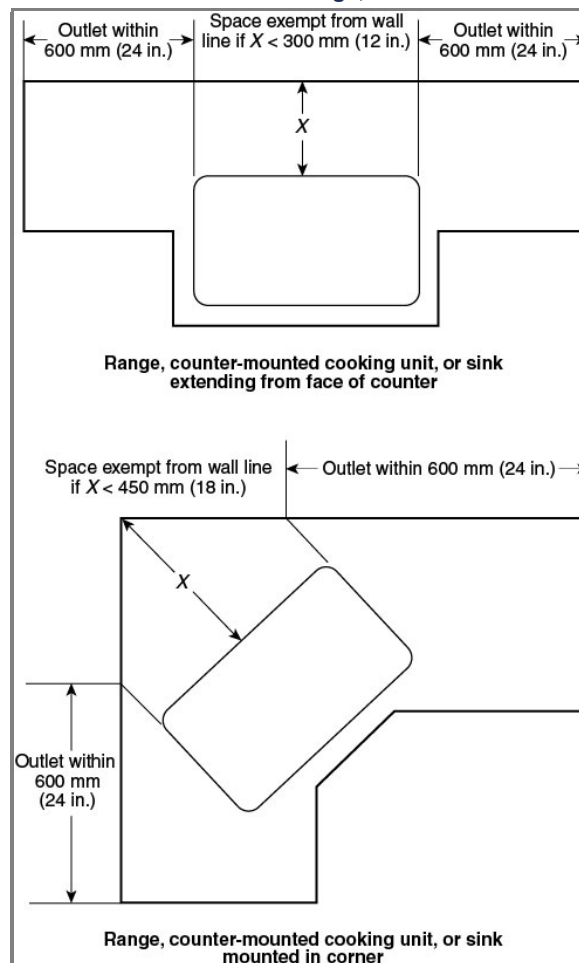
A receptacle outlet shall be installed at each countertop and work surface that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed following either 210.52(C)(1)(a) or (C)(1)(b).

(a) No point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space

(b) No point on the island or peninsular countertop or work surface is more than 900-1,829 mm (36-72 in.) measured horizontally from a receptacle outlet in that space. The receptacle(s) would be measured along a continuous counter top surface. The receptacle(s) installed to meet the conditions of 210.52(C)(1)(a) shall be permitted to be used in the peninsular countertop measurement.

Exception: 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).

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



Statement of Problem and Substantiation for Public Comment

When enforcing the NEC, it's easy to justify or convince homeowners to install "one" receptacle on an island or peninsular counter surface. That being said, with the cost of the kitchen cabinets, and the various construction of the cabinet bases (drawers, pullouts and etc.), it becomes difficult to cut-in or hole saw for yet another receptacle. The public input lacks substantiation to require the need for the additional receptacle(s) on these work surfaces. The proposed comment brings back the requirements of the 2017 NEC, and makes the language clear that only "one" receptacle is required unless the island or peninsular cabinet is over 6' in length.

Related Item

• PI 1647 • FR 7537

Submitter Information Verification

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Submittal Date: Thu Aug 09 14:22:45 EDT 2018

Committee: NEC-P02

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Public Comment No. 537-NFPA 70-2018 [Section No. 210.52(C)(1)]

(1) Countertop and Work Surface.

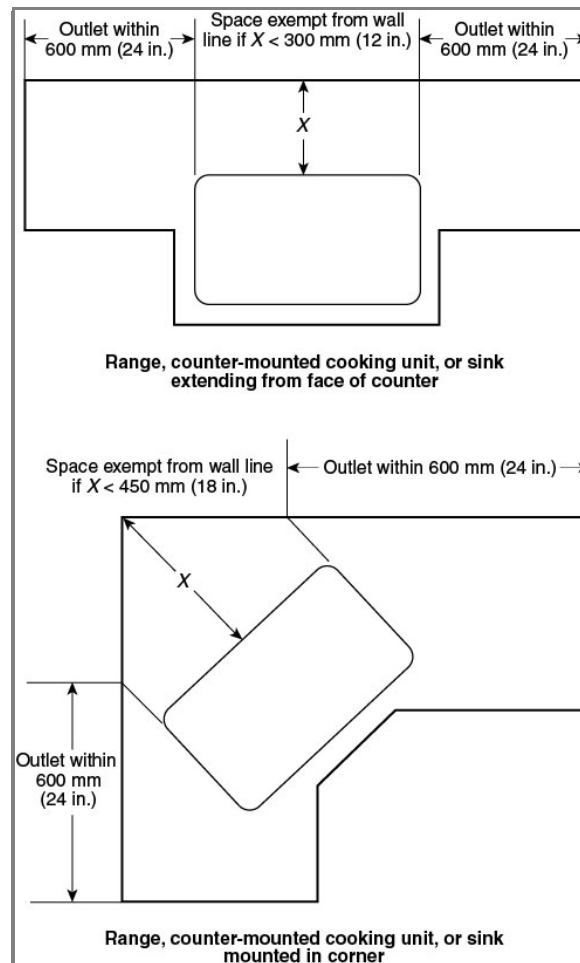
A receptacle outlet shall be installed at each countertop and work surface that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed following either comply with the applicable requirements in 210.52(C)(1)(a) or (C)(1)(b).

(a) **Wall Space Countertop or Work Surfaces.** No point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space

(b) **Island and Peninsular Countertop or Work Surfaces.** No point on the countertop or work surface is more than 900 mm (36 in., 1.2 m (4 ft)) measured horizontally from a receptacle outlet in that space.

Exception: 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).

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



Additional Proposed Changes

File Name	Description	Approved
Large_Kitchen_Island_IAEI_.jpg	Large Kitchen Island (IAEI)	

Statement of Problem and Substantiation for Public Comment

As revised by the 2020 NEC First Draft language, 210.52(C)(1) leaves users of the Code an option on how to place receptacle outlets on BOTH wall space countertops and islands and Peninsular countertops. The requirement for

receptacle outlets to be installed so that no point along the wall line is more than 600 mm (24 in.) from a receptacle outlet has a long and successful history on the NEC. As currently proposed, the installer could choose to install kitchen wall countertop receptacle outlets using the long-standing 24 in. (48 in. apart) rule OR if the installer does not like that, go ahead and make them 36 in (6 ft apart). This is comparable to having the installer install a ground rod driven in contact with the earth for 8 ft OR if you don't like that, just make it 6 ft in contact with the earth!

The need for more than one receptacle at modern-day islands and peninsular countertops is warranted. At many of today's dwelling unit kitchens, large islands and/or peninsular countertops exist. I propose to change the proposed dimension from 3 ft or 4 ft. With the proposed 3 ft rule for islands and peninsular countertops, it would not take much effort to find a large island countertop where the only way to comply with this 3 ft rule would be to install a "pop=up" hydraulic receptacle outlet in order to satisfy this proposed requirement.

Related Item

• FR 7537 • 210.52(C)(1)

Submitter Information Verification

Submitter Full Name: L. Keith Lofland

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Submission Date: Fri Aug 10 16:41:08 EDT 2018

Committee: NEC-P02

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Public Comment No. 680-NFPA 70-2018 [Section No. 210.52(C)(1)]

(1) Countertop and Work Surface.

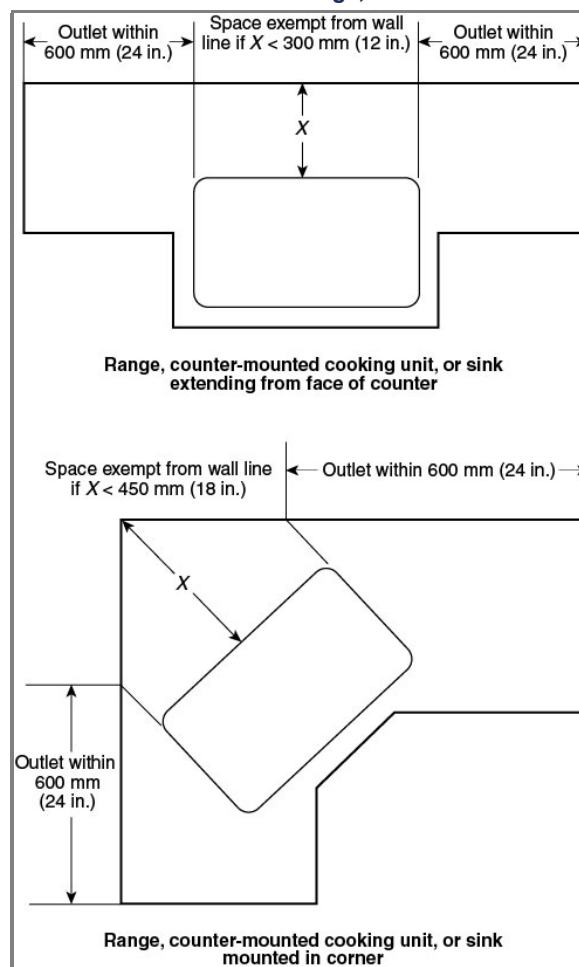
A receptacle outlet shall be installed at each countertop and work surface that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed following either 210.52(C)(1)(a) or (C)(1)(b).

(a) No point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space.

(b) No point on the countertop or work surface is more than 900 mm (36 in.) measured horizontally from a receptacle outlet in that space.

Exception: 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).

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



Statement of Problem and Substantiation for Public Comment

The new 210.52(C)(1)(a) is not needed since (b) covers all instances including those counters along a wall and wall receptacles can be used to satisfy the 36 inch requirement. For example, a counter with a depth of 2 feet along a wall, spacing would be about 4 feet.

The addition of (a) adds confusion to peninsulas which is one of the issues this FR is attempting to alleviate. With the wording in (C)(1), Items (a) or (b) can be used. If a peninsula is attached to the wall, 1 receptacle on the wall within 2 feet of the peninsula would be the only requirement, regardless of the length of the peninsula.

(a) is not needed, (a) needs to be removed.

The lower case e that is underlined is not intended, it is an issue with terra-view.

Related Item

- FR 7537

Submitter Information Verification

Submitter Full Name: John McCamish

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Submittal Date: Wed Aug 15 12:00:29 EDT 2018

Committee: NEC-P02

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Public Comment No. 909-NFPA 70-2018 [Section No. 210.52(C)(1)]

(1) Countertop and Work Surface.

A receptacle outlet shall be installed at each countertop and work surface that is 300 mm (12 in.) or wider.

Receptacle outlets shall be installed following either 210.52(C)(1)(a) or (C)(1)(b).

- No point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space

No point on the

installed so that no point along the long dimension of the countertop surface is more than 600 mm (24 in.) without a receptacle outlet. For peninsulas and islands the receptacle outlet locations shall be such that no point along the long dimension of the countertop or work surface is more than 900 mm (36 in.)

measured horizontally from

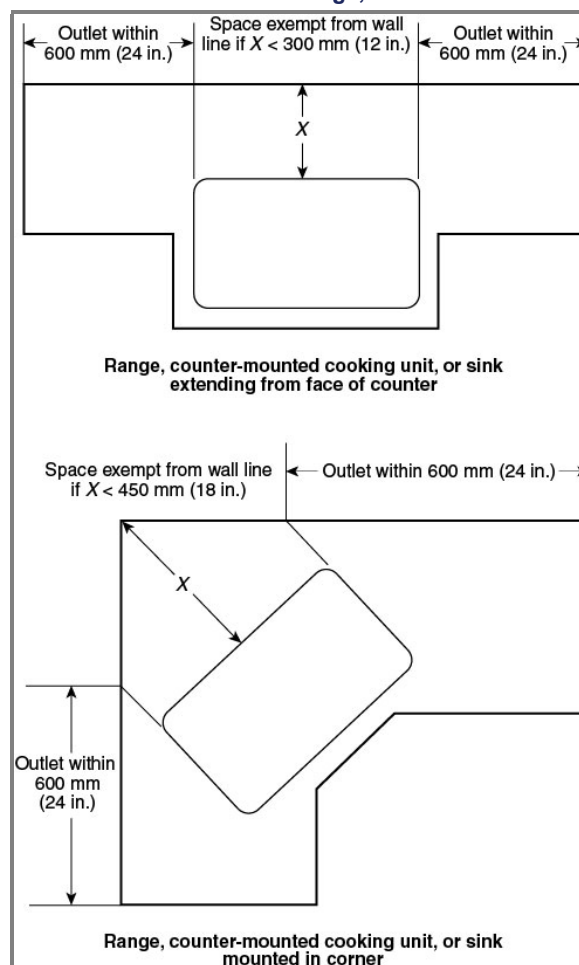
without a receptacle outlet

in that space

.

Exception: 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).

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



Statement of Problem and Substantiation for Public Comment

Substantiation: This comment seeks to clarify and refined the work by CMP-2 during the first draft stage of the process. CMP-2 acted favorably to eliminating all the cumbersome text about receptacle outlet locations at kitchen countertops and

have the requirement be based on the amount of countertop, rather than wall space at a countertop as described in the substantiation. There should not be an option here especially when one option is less than required by another option. The other clarification provided in this comment seeks to insert the phrase "long dimension" for both countertops along a wall and those at an island or peninsula. This will clarify that the length of the countertop or work surface drives the minimum number of receptacle outlets and not requiring a measurement in all directions. Exceptions should be considered by CMP-2 for installations where the above required number of receptacles is unachievable, such as for island and peninsula countertop with overhangs or other unique applications.

Related Item

- FR 7537

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz

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Submittal Date: Mon Aug 20 15:36:15 EDT 2018

Committee: NEC-P02

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**Public Comment No. 1433-NFPA 70-2018 [Section No. 210.52(C)(2)]****(2) Receptacle Outlet Location.**

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

- (1) On or above ~~countertop or work surfaces~~ countertops : On or above, but not more than 500 mm (20 in.) above, the ~~countertop or work surface~~ .
- (2) In ~~countertop or work surfaces~~ : Receptacle outlet assemblies listed for use in ~~countertops or work surfaces~~ shall be permitted to be installed in ~~countertops or work surfaces~~.
- (3) Below ~~countertop or work surfaces~~ : Not more than 300 mm (12 in.) below the ~~countertop or work surface~~ . Receptacles installed below a ~~countertop or work surface~~ countertop shall not be located where the ~~countertop or work surface~~ countertop extends more than 150 mm (6 in.) beyond its support base.

Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(1), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets.

Informational Note: See Annex J and ANSI/ICC A117.1-2009, *Standard on Accessible and Usable Buildings and Facilities*.

Statement of Problem and Substantiation for Public Comment

This comment eliminates reference to work surfaces. Pop-up type receptacle outlet assemblies listed for use in counter tops are required to pass a liquid spill test for the product listing. Those listed for use in work surfaces are not required to pass such a test. Activities in kitchens would be subject to spills. In lieu the panel could chose to define the difference between the two locations so that the correct type of wiring devices can be installed.

Related Item

- First Revision No. 7537-NFPA 70-2018

Submitter Information Verification

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Submittal Date: Tue Aug 28 14:35:48 EDT 2018

Committee: NEC-P02

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**Public Comment No. 34-NFPA 70-2018 [Section No. 210.52(C)(2)]****(24) Receptacle Outlet Location.**

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

- (1) On or above countertop or work surfaces: On or above, but not more than 500 mm (20 in.) above, the countertop or work surface.
- (2) In countertop or work surfaces: Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces.
- (3) Below countertop or work surfaces: Not more than 300 mm (12 in.) below the countertop or work surface. Receptacles installed below a countertop or work surface shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond its support base.

Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(1), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets.

Informational Note: See Annex J and ANSI/ICC A117.1-2009, *Standard on Accessible and Usable Buildings and Facilities*.

Statement of Problem and Substantiation for Public Comment

The section was renumbered to correlate with the changes made by PC 31 and 32. The remainder of the subsection is unchanged by this comment.

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 31-NFPA 70-2018 [Section No. 210.52(C) [Excluding any Sub-Sections]]	
Public Comment No. 32-NFPA 70-2018 [Section No. 210.52(C)(1)]	
<u>Related Item</u>	
• FR 7537	

Submitter Information Verification

Submitter Full Name: Mark Hilbert
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Submittal Date: Tue Jun 26 16:44:14 EDT 2018
Committee: NEC-P02

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**Public Comment No. 31-NFPA 70-2018 [Section No. 210.52(C) [Excluding any Sub-Sections]]**

In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, receptacle outlets for countertop and work surfaces shall be installed in accordance with 210.52(C)(1)- ~~and through~~ (C)(2 4) and shall not be considered as the receptacle outlets required by 210.52(A).

Statement of Problem and Substantiation for Public Comment

The First Draft version of 210.52(C) was revised to restore the separation of the countertop wall space requirements from the island and peninsula requirements and to include a general requirement as 210.52(C)(1). Perhaps the need was there to clarify the short and long dimension requirements for countertop wall spaces, but there was no substantiation for changing the long standing and well understood 600 mm (24 in.) receptacle outlet spacing for countertop wall spaces. Providing the option of 900 mm (36 in.) countertop wall space measurement creates confusion and presents significant enforcement challenges so it was revised.

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 34-NFPA 70-2018 [Section No. 210.52(C)(2)]	
<u>Related Item</u>	
• FR 7537	

Submitter Information Verification

Submitter Full Name: Mark Hilbert
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Committee: NEC-P02

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**Public Comment No. 656-NFPA 70-2018 [Section No. 210.52(E)(3)]****(3) Balconies, Decks, and Porches.**

Balconies, decks, and porches that are within 102 mm (4 in.) horizontally of the dwelling unit shall have at least one receptacle outlet ~~accessible from~~ accessible from and within the perimeter of the balcony, deck, or porch. The receptacle outlet shall not be located more than 2.0 m (6½ ft) above the balcony, deck, or porch walking surface.

Where balconies, decks, or porches are connected by stairways of 3 risers or more, each connected balcony, deck, or porch shall be considered a separate balcony, deck, or porch and each shall have at least one additional receptacle outlet installed accessible from and within its perimeter.

Statement of Problem and Substantiation for Public Comment

Stairways cause separate spaces. Added receptacles for these added deck spaces would prevent extension cords draped across the steps. Multi-tier decks don't always meet grade level and the upper level of a dwelling unit where those receptacles would already be required. Square footage doesn't factor into the code language. Multi-tier means likely more elaborate and greater square footage. Added convenience receptacles would add safety.

The NEC Handbook says to install the receptacle within the spaces perimeter. The code book should state that as well for both installers' and code official's sake.

Related Item

- 210.52E3

Submitter Information Verification

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Committee: NEC-P02

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**Public Comment No. 609-NFPA 70-2018 [Section No. 210.52(F)]****(F) Laundry Areas.**

In dwelling units, at least one receptacle outlet shall be installed in areas designated for the installation of laundry equipment.

Exception No. 1: A receptacle for laundry equipment shall not be required in a dwelling unit of a multifamily building where laundry facilities are provided on the premises for use by all building occupants.

Exception No. 2: A receptacle for laundry equipment shall not be required in other than one-family dwellings where laundry facilities are not to be installed or permitted.

Exception No. 3: Where the laundry area is located in a closet specifically designed for the laundry equipment, only that which is required for the laundry equipment shall be installed. No additional receptacle outlet is required.

Statement of Problem and Substantiation for Public Comment

Where the laundry equipment is installed in a closet as in a hall closet or "mud room" entry for example, requiring an additional outlet would serve no useful purpose and in fact would create additional hazard(s) as there is no reasonable space for "ironing" etc.

Related Item

• 210.50(F) • PI No.: 34 • PI No.: 35 • PI No.: 38

Submitter Information Verification

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Committee: NEC-P02

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Public Comment No. 654-NFPA 70-2018 [Section No. 210.52 [Excluding any Sub-Sections]]

This section provides requirements for 125-volt, 15- and 20-ampere receptacle outlets. The receptacles required by this section shall be in addition to any receptacle that is:

- (1) Part of a luminaire or appliance, or
- (2) Controlled by a wall switch in accordance with 210.70(A)(1), Exception No. 1, or
- (3) Located within cabinets or cupboards, or
- (4) Located more than 1.7 m (5½ ft) above the floor

Permanently installed electric baseboard heaters equipped with factory-installed receptacle outlets or outlets provided as a separate assembly by the manufacturer shall be permitted as the required outlet or outlets for the wall space utilized by such permanently installed heaters. Such receptacle outlets shall not be connected to the heater circuits.

Receptacles shall not be mounted directly above electric or hot water baseboard heaters.

Exception: Receptacles mounted at 5 ½' or greater above hot water baseboard heaters shall be permitted. Those receptacles mounted at greater than 5 ½' above baseboard heaters shall not be counted as part of the required number of receptacle outlets.

Informational Note: Listed baseboard heaters include instructions that may not permit their installation below receptacle outlets.

Above mentioned Informational Note may be omitted due to new proposed text.

Statement of Problem and Substantiation for Public Comment

I think not only of potential fire hazards from damaged cords but of the affected ampacity (400.5(A)) of an electric cord draped across or through heated parts of baseboard heaters. The design of electric baseboard heaters doesn't generally have the cords in direct contact with heated surfaces. At least, not as much as with hot water baseboard heaters. There's no way to control what will be plugged in, drapes, furniture layout, direct contact to heated surfaces, ambient heat, insulation, etc. The best precaution is to not allow receptacles directly above electric or baseboard heaters. Instead of (1) 8' heater, (2) separated 4 footers will be installed; for example. Those receptacles at 5 ½' or greater above the baseboard heaters (notice it says above baseboard heaters not floor) will likely be plugging wall mount TVs or similar. By implementing this new proposed text, Information Note of 210.52 and Information Note of 424.9 can be omitted.

Related Item

- 210.52

Submitter Information Verification

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Committee: NEC-P02

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Public Comment No. 1505-NFPA 70-2018 [Section No. 210.63]

210.63 ~~Areas Where Equipment Requires~~ Requiring Servicing.

A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location within 7.5 m (25 ft) of ~~locations~~ the equipment as specified in 210.63(A) and (B).

(A) ~~Heating, Air-Conditioning, and Refrigeration Equipment- Outlet~~ .

The receptacle outlet shall be located on the same level as the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.

Exception: A receptacle outlet shall not be required at one- and two-family dwellings for the service of evaporative coolers.

(B) ~~Other Electrical Equipment- Areas~~ .

In other than one- and two-family dwellings, a receptacle outlet shall be located as specified in 210.64 ~~63~~ (B)(1) and (B)(2).

(1) ~~Indoor Service Equipment~~.

The required receptacle outlet shall be located within the same room or area as the service equipment.

(2) ~~Dedicated- Indoor Equipment~~ Requiring Dedicated Equipment Spaces- ~~Without Service Equipment~~.

The

:

Where equipment, other than service equipment, requires dedicated equipment space as provided in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment and shall not be connected to the load side of the equipment disconnecting means.

Statement of Problem and Substantiation for Public Comment

Revising the text in the titles as proposed provides consistency and clarifies the initiating requirement is the type of equipment and not the space it is located in. The reference in the first sentence of (B) was editorially revised to reflect the relocation to 210.63 in the First Draft. Section 210.63(B)(2) was revised by providing a reference to 110.26(E) so that it is perfectly clear what type of dedicated space is being referenced

Related Item

- FR 7588

Submitter Information Verification

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Committee: NEC-P02

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Public Comment No. 2156-NFPA 70-2018 [Section No. 210.63]

210.63— Areas Where ~~63~~ Equipment Requires Requiring Servicing.

A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location within 7.5 m (25 ft) of ~~locations~~ equipment as specified in 210.63(A) and (B).

(A) Heating, Air-Conditioning, and Refrigeration Equipment ~~Outlet~~.

The receptacle outlet shall be located on the same level as the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.

Exception: A receptacle outlet shall not be required at one- and two-family dwellings for the service of evaporative coolers.

(B) Other Electrical Equipment ~~Areas~~.

In other than one- and two-family dwellings, a receptacle outlet shall be located as specified in 210.64 ~~63~~ (B)(1) and (B)(2).

(1) Indoor Service Equipment.

The required receptacle outlet shall be located within the same room or area as the service equipment.

(2) ~~Dedicated~~ Other Indoor Equipment Requiring Dedicated Spaces ~~Without Service Equipment~~.

The

:

Where equipment, other than service equipment, requires dedicated space as provided in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment and shall not be connected to the load side of the equipment disconnecting means.

Statement of Problem and Substantiation for Public Comment

Revising the text in the titles as proposed provides consistency and clarifies the initiating requirement is the type of equipment and not the space it is located in. The reference in the first sentence of (B) was editorially revised to reflect the relocation to 210.63 in the First Draft. Section 210.63(B)(2) was revised by providing a reference to 110.26(E) so that it is perfectly clear what type of dedicated space is being referenced.

Related Item

- FR 7588

Submitter Information Verification

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Committee: NEC-P02

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**Public Comment No. 255-NFPA 70-2018 [Section No. 210.63(A)]****(A) Heating, Air-Conditioning, and Refrigeration Equipment Outlet.**

The receptacle outlet shall be located on the same level as the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.

Exception: A receptacle outlet shall not be required at one- and two-family dwellings for the service of evaporative coolers HVAC condenser or evaporator units .

Statement of Problem and Substantiation for Public Comment

Ok lets at least update the term evaporator cooler which is the function of a water cooling system. This term not in sync with today's equipment supplied to a single family home. this is equipment is supplied by a refrigerant liquid deliver system by way of a condenser when in AC mode and for a heat pump in heating mode an evaporator.

Related Item

- Public Input No. 775-NFPA 70-2017

Submitter Information Verification

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Submittal Date: Sun Jul 22 08:45:54 EDT 2018

Committee: NEC-P02

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**Public Comment No. 793-NFPA 70-2018 [Section No. 210.63(B)(2)]****(2) Dedicated Indoor Equipment Spaces Without Service Equipment.**

The required receptacle outlet shall be located within the same room or area as the electrical equipment- ~~and shall not be connected to the load side of the equipment disconnecting means~~ .

Statement of Problem and Substantiation for Public Comment

Please delete or clarify the second half of Section 210.63(B)(2). As currently written "and shall not be connected to the load side of the equipment disconnecting means" would prohibit a receptacle outlet from being installed from a panel with a main disconnect.

Related Item

- FR-7588

Submitter Information Verification

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Committee: NEC-P02

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Public Comment No. 1441-NFPA 70-2018 [Section No. 210.63(B) [Excluding any Sub-Sections]]

In other than one- and two-family dwellings, a receptacle outlet shall be located as specified in 210.64 63 (B)(1) and (B)(2).

Statement of Problem and Substantiation for Public Comment

210.64 was deleted the correct reference is 210.63

Related Item

- First Revision No. 7588-NFPA 70-2018

Submitter Information Verification

Submitter Full Name: Don Ganiere

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Submittal Date: Tue Aug 28 15:28:25 EDT 2018

Committee: NEC-P02

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**Public Comment No. 614-NFPA 70-2018 [Section No. 210.63(B) [Excluding any Sub-Sections]**

]

In other than one- and two-family dwellings, a receptacle outlet shall be located as specified in 210.64 63 (B)(1) and (B)(2).

Statement of Problem and Substantiation for Public Comment

This comment corrects the reference section in the text to address the correct parts (A) and (B).

Related Item

- FR 7588

Submitter Information Verification

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Committee: NEC-P02

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**Public Comment No. 681-NFPA 70-2018 [Section No. 210.63 [Excluding any Sub-Sections]]**

A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location within 7.5 m (25 ft) of locations as specified in 210.63(A) and (B). This receptacle shall be GFCI protected.

Statement of Problem and Substantiation for Public Comment

PI 1397 was rejected by the panel which would have required GFCI protection in these areas. Similar areas throughout the code where powered hand tools are expected to be used have GFCI protection. In areas described in 210.64 where electrical workers in particular are likely to be using tools equipment, they need to be protected. GFCI protection needs to be required in areas where equipment requires servicing is present. The receptacles are located up to 25 feet away from the equipment, so extension cord use is expected, which can increase the hazard.

Related Item

- PI 1397

Submitter Information Verification

Submitter Full Name: John McCamish

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Submittal Date: Wed Aug 15 12:21:51 EDT 2018

Committee: NEC-P02

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**Public Comment No. 1583-NFPA 70-2018 [Section No. 210.65(B)(1)]****(1) Receptacle Outlets in Fixed Walls.**

The required number of receptacle outlets in fixed walls shall be determined in accordance with 210.52(A)(1) through (A)(4). ~~These~~ These receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner.

Exception: 1. Fixed walls that do not allow for receptacle outlet mounting, such as glass walls without a solid wall below the window to mount a receptacle outlet, shall not be included in the linear measurement requirements of 210.52(A)(1) through (A)(4).

Statement of Problem and Substantiation for Public Comment

There are design situations where an owner is designing a conference room with three glass walls and one hard wall. Requiring an owner to either place all receptacles along the one hard wall or requiring them to place expensive floor boxes or poke thrus does not seem reasonable for the code to mandate. This is amplified with existing buildings with substantial alterations.

Furthermore, I understand the intent for the intent of 210.52(A)(1) through (A)(4) is to reduce the number of user-installed extension cords as a long-term solution. This makes a lot of sense in residential spaces, but with purposed-built owner occupied office buildings with transient use of the meeting rooms, having long-term user-installed extension cords is not typical. Users bring their laptop, projectors (if AV is not permanently installed), and phone chargers, plug them in, use them, and then leave.

I do understand the desire in "public" use space, such as hotel conference rooms, where owners may install a minimal number of receptacles in order to save money, and there could be a need for additional receptacles, but in an owner-occupied space, I do not see the code-requirement. It is good design practice, but as the code implies is NEC 90.1(A) that it is not a design guide.

Please consider exceptions for purpose-built owner-occupied spaces. Thank you!

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 1601-NFPA 70-2018 [Section No. 210.65(B)(1)]	
<u>Related Item</u>	
• 90.1(A)	

Submitter Information Verification

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Submittal Date: Wed Aug 29 12:27:11 EDT 2018

Committee: NEC-P02

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**Public Comment No. 1601-NFPA 70-2018 [Section No. 210.65(B)(1)]****(1) Receptacle Outlets in Fixed Walls.**

The required number of receptacle outlets shall be determined in accordance with 210.52(A)(1) through (A)(4). These receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner. Receptacles located in furniture, such as recessed table-mounted receptacles in a table, shall be permitted to be part of the required number of receptacles.

Statement of Problem and Substantiation for Public Comment

The intent, as I understand the code, is to reduce the number of extension cords. If we are able to use the built-in receptacles in furniture then additional extension cords would not be required and therefore satisfy the safety aspect of this code.

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 1583-NFPA 70-2018 [Section No. 210.65(B)(1)]	
<u>Related Item</u>	
• 210.65(B)(1)	

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**Public Comment No. 1977-NFPA 70-2018 [Section No. 210.65(B)(2)]****(2) Floor Outlets.**

A meeting room with any floor dimension that is 3.7 m (12 ft) or greater in any ~~direction~~ direction its smallest dimension and that has a floor area of at least 20 m² (215 ft²) shall have at least one floor receptacle outlet, or at least one floor outlet to serve receptacle(s), located at a distance not less than 1.8 m (6 ft) from any fixed wall for each 20 m² (215 ft²) or major portion of floor space.

Informational Note No. 1: See 314.27(B) for floor boxes used for receptacles located in the floor.

Informational Note No. 2: See Article 518 for assembly occupancies designed for 100 or more persons.

Statement of Problem and Substantiation for Public Comment

If one of the dimensions is less than 12', then it is not possible to locate the floor receptacle so that it is a minimum of 6' from any wall.

Related Item

- First Revision No. 7593-NFPA 70-2018

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Committee: NEC-P02

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Public Comment No. 460-NFPA 70-2018 [Section No. 210.70]

210.70 Lighting Outlets Required.

Lighting outlets shall be installed where specified in 210.70(A), (B), and (C).

(A) Dwelling Units.

In dwelling units, lighting outlets shall be installed in accordance with 210.70(A)(1), (A)(2), and (A)(3).

(1) Habitable Rooms.

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

Exception No. 1: In other than kitchens and bathrooms, one or more receptacles controlled by a 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 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.

(2) Additional Locations.

Additional lighting outlets shall be installed in accordance with the following:

- (1) At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in hallways, stairways, attached garages, and detached garages with electric power.
- (2) For dwelling units, attached garages, and detached garages with electric power, at least one lighting outlet controlled by a listed wall-mounted control device shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade-level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.
- (3) Where one or more lighting outlet(s) are installed for interior stairways, there shall be a listed wall-mounted control device at each floor level and landing level that includes an entryway to control the lighting outlet(s) where the stairway between floor levels has six risers or more.

Exception to (A)(2)(1), (A)(2)(2), and (A)(2)(3): In hallways, in stairways, and at outdoor entrances, remote, central, or automatic control of lighting shall be permitted.

- (4) Lighting outlets controlled in accordance with 210.70(A)(2)(3) shall not be controlled by use of listed wall-mounted control devices unless they provide the full range of dimming control at each location.

(B) Guest Rooms or Guest Suites.

In hotels, motels, or similar occupancies, guest rooms or guest suites shall have at least one lighting outlet controlled by a listed wall-mounted control device installed in every habitable room and bathroom.

Exception No. 1: In other than bathrooms and kitchens where provided, one or more receptacles controlled by a 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 listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that allows the sensor to function as a wall switch.

(C) All Occupancies.

For attics and underfloor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch or listed wall-mounted control device shall be installed where these spaces are used for storage or contain equipment requiring servicing. A point of control shall be at each entry that permits access to the attic and underfloor space, utility room, or basement. Where a lighting outlet is installed for equipment requiring service, the lighting outlet shall be installed at or near the equipment.

Informational Note to (A), (B), and (C): Listed wall-mounted control devices include, but are not limited to, toggle switches, occupancy sensors, dimmers, daylight sensors, and programmable timer switches.

Statement of Problem and Substantiation for Public Comment

The removal of the term "switch-controlled" provides clarity that permits lighting and receptacle control technology that is currently being installed to serve as the means of control for lighting outlets. However, the term "listed wall-mounted control device" could create confusion in the field between installers and AHJ's. The propose Informational Note would provide clarity of what is an approved "listed wall-mounted control device".

Related Item

• FR 7598 NFPA 70-2018 • FR 7590 NFPA 70-2018 • FR 7592 NFPA 70-2018

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Committee: NEC-P02

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**Public Comment No. 658-NFPA 70-2018 [Section No. 210.70(A)(1)]****(1) Habitable Rooms.**

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

An additional wall switch-controlled lighting outlet shall be installed at each entrance, unless within 10' of another entrance with a wall switch, to every habitable room and bathroom when that room is 60 sq.' or greater in size. A switched receptacle is not considered one of the receptacle outlets required by 210.52.

Exception No. 1: In other than kitchens and bathrooms, one or more receptacles controlled by a 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 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.

Statement of Problem and Substantiation for Public Comment

The idea behind the first sentence of this code change is to prevent a person from having to cross a dark room to turn the lights on in that room, lessening the chances of a person hurting themselves. The 60sq.' or greater size (similar to 210.52(l)) makes this added code text reasonable.

The new text "unless within 10' of another entrance with a wall switch" makes it so doorways or entrances adjacent to each other or very near each other do not require an additional wall switch. A Jack and Jill bathroom could be an example of not requiring (or prohibiting either) an additional wall switch.

The second sentence on a switched receptacle not being considered a wall space receptacle is taken word for word from the NEC70 Handbook. Placing it in the code book is very useful and makes it more easily enforced by code officials and adhered to by installers.

Related Item

- 210.70A1

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Committee: NEC-P02

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**Public Comment No. 660-NFPA 70-2018 [New Section after 210.70(A)(2)]**

210.70(A)(2)(5) Now reads: Lighting outlets controlled in accordance with 210.70(A)(2)(3), and A(2)(4) shall not be controlled by use of dimmer switches unless they provide the full range of dimming control at each location.

TITLE OF NEW CONTENT

Type your content here ...

Statement of Problem and Substantiation for Public Comment

The newer version of 210.70(A)(2)(4) should be included to 210.70(A)(2)(5) to prevent someone from entering a darkened hallway by use a maintained dimmable switch at one end of the hallway or the other.

Some electronic 3-way switches and typical potentiometer 3-way switches that didn't have full range of dimming control at each end would violate the new 210.70A(2)(5). Other electronic switches with slave switches do have that full range capability at each end and are code compliant.

Related Item

- 210.70A(2)(5)

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Public Comment No. 659-NFPA 70-2018 [Section No. 210.70(A)(2)]

(2) Additional Locations.

Additional lighting outlets shall be installed in accordance with the following:

- (1) At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in hallways, stairways, attached garages, and detached garages with electric power.
- (2) For dwelling units, attached garages, and detached garages with electric power, at least one lighting outlet controlled by a listed wall-mounted control device shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade-level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.
- (3) Where one or more lighting outlet(s) are installed for interior stairways, there shall be a listed wall-mounted control device at each floor level and landing level that includes an entryway to control the lighting outlet(s) where the stairway between floor levels has six risers or more.

Exception to (A)(2)(1), (A)(2)(2), and (A)(2)(3): In hallways, in stairways, and at outdoor entrances, remote, central, or automatic control of lighting shall be permitted.

- (4) Lighting outlets controlled in accordance with 210.70(A)(2)(3) shall not be controlled by use of listed wall-mounted control devices unless they provide the full range of dimming control at each location. 210.70(A)(2)(4) and 210.70(A)(2)(5)

- Move existing text of 210.70(A)(2)(4) to 210.70(A)(2)(5)

210.70(A)(2)(4) Now reads: An additional wall switch-controlled lighting outlet shall be installed in hallways with a long dimension of 10' or greater. This measurement shall be taken from the center line of the hallway without passing through a doorway. The installed switches shall be at opposite ends of the hallway.

Statement of Problem and Substantiation for Public Comment

This proposal, if enacted, lessens the chance of a person being caught in a dark residential hallway. Commercial hallways often have 24 hour un-switched egress lighting.

Three-way switching is not mandated but would likely be installed.

The 10' dimension is derived from 210.52(H).

Related Item

- 210.70A(2)(4)

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Public Comment No. 2182-NFPA 70-2018 [Section No. 220.12(B)]

(B) Energy Code.

Where the building is designed and constructed to comply with an energy code adopted by the local authority, the lighting load shall be permitted to be calculated using the unit values specified in the energy code where the following conditions are met:

- (1) A power monitoring system is installed that will provide continuous information regarding the total general lighting load of the building.
- (2) The power monitoring system will be set with alarm values to alert the building owner or manager if the lighting load exceeds the values set by the energy code. Automatic means to take action to reduce the connected load shall be permitted.
- (3) The demand factors specified in 220.42 are not applied to the general lighting load.
- (4) The continuous load multiplier of 125 percent shall be applied.

Table 220.12 General Lighting Loads by Non-Dwelling Occupancy

<u>Type of Occupancy</u>	<u>Unit Load</u>	
	<u>Volt-amperes/m²</u>	<u>Volt-amperes/ft²</u>
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 ^a	18	1.7
Health care clinic	17	1.6
Hospital ¹⁷ 1.6		
Hotels and motels, including apartment houses without provisions for cooking by tenants ^b	18	1.7
Library	16	1.5
Manufacturing facility ^c	24	2.2
Motion picture theater	17	1.6
Museum	17	1.6
Office ^d	14	1.3
Parking garage ^e	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 ^f	16	1.5
Retail ^{g,h}	20	1.9
School/university	33	3
Sports arena	33	3
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 when using the unit loads in this table for calculating the minimum lighting load for a specified occupancy.

^aArmories and auditoriums are considered gymnasium-type occupancies.

^bLodge rooms are similar to hotels and motels.

^cIndustrial commercial loft buildings are considered manufacturing-type occupancies.

^dBanks are office-type occupancies.

^eGarages — commercial (storage) are considered parking garage occupancies.

^fClubs are considered restaurant occupancies.

^gBarber shops and beauty parlors are considered retail occupancies.

^hStores are considered retail occupancies.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
HospitalPowerUseStudy.xlsx	Study showing actual hospital demand and demand calculated using current NEC procedure and other potential options. Bourgault 1.1&2 is best option and is basis for proposed changes.	

Statement of Problem and Substantiation for Public Comment

This change is needed to avoid conflict with new proposed load factors for healthcare. Related proposals explain why this change is necessary/desirable.

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 2165-NFPA 70-2018 [New Section after 517.21]	sets new standard for hospital load factors
Public Comment No. 2172-NFPA 70-2018 [New Section after 517.21]	sets new standard for hospital load factors
<u>Related Item</u>	
• 3588-NFPA 70-2017	

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Committee: NEC-P02

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Definitions

Method	Receptacle Loads	Cord Connected Equipment
Current NEC	1st 10kVA @ 100% Remainder @ 50%	Nameplate Values
Bourgault 1.0	1st 10kVA @ 100% Remainder @ 50%	# pieces <=5: all equip. @ 100% of nameplate value. 6 <= # pieces <= 10: all equip. @ 50% of nameplate value. # pieces > 10: all equip. @ 25% of nameplate value.
Bourgault 1.1	1st 10kVA @ 100% Remainder @ 50%	# pieces <=5: all equip. @ 100% of nameplate value. # pieces > 5: all equip. @ 50% of nameplate value.
Bourgault 2	1st 5kVA @ 100% 2nd 5kVA @ 50% Remainder @ 25%	Nameplate Values
Bourgault 1.1 & 2	1st 5kVA @ 100% 2nd 5kVA @ 50% Remainder @ 25%	# pieces <=5: all equip. @ 100% of nameplate value. # pieces > 5: all equip. @ 50% of nameplate value.

Definitions:

Current NEC - Recep Loads: 1st 10kVA @ 100%, remainder @ 50%;
Cord connected equipment: Nameplate values.

Bourgault 1 - Recep Loads: 1st 10kVA @ 100%, remainder @ 50%;
Cord connected equipment: Less than 6 pieces @ 100%, btwn 6 and 10 pieces @ 50%, greater than 10 pieces @ 25% of nameplate values.

Bourgault 1.1 - Recep Loads: 1st 10kVA @ 100%, remainder @ 50%;
Cord connected equipment: Less than or equal to 5 pieces @ 100%, greater than 5 pieces @ 50% of nameplate values.

Bourgault 2 - Recep Loads: 1st 5kVA @ 100%, 2nd 5kVA @ 50% remainder at 25%; Cord connected equipment: Nameplate Values.

Bourgault 1.1 & 2 - Recep Loads: 1st 5kVA @ 100%, 2nd 5kVA @ 50% remainder at 25%;
Cord connected equipment: Less than or equal to 5 pieces @ 100%, greater than 5 pieces @ 50% of nameplate values.

TAB Summary:

Tab 1	Definitions	definitions of the different methods comparison of connected to NEC to actual, including safety factor
Tab 2	Current NEC	
Tab 3	Bourgault 1.0	comparison of the NEC for receps plus the proposed formula for medical equipment. You will see, from line 1, this method does not work in all cases. Comparison of NEC for receps and the REVISED formula for medical equipment, including safety factors
Tab 4	Bourgault 1.1	comparison of Nameplate for medical equipment, and the revised recep table we proposed, including safety factors.
Tab 5	Bourgault 2	revised recep table AND the revised formula for medical equipment
Tab 6	Bourgault 1.1 & 2	
Tab 7	All Methods	Depicts All Methods

Row #	Connected Load (VA)					Measured Peak VA
	# Recepts	Recep load	# CORD CONN EQP	Cord Con Load (nameplate)	Total Conn. Load, equip at nameplate	
22	22	3,960	8	4,681	8,641	3,290
37	113	20,340	5	5,080	25,420	7,550
34	28	5,040	7	5,843	10,883	3,790
26	47	8,460	7	8,302	16,762	5,760
35	28	5,040	7	5,663	10,703	3,670
16	3	540	23	16,712	17,252	5,780
25	50	9,000	13	11,302	20,302	6,420
21	92	16,560	9	7,602	24,162	6,140
8	118	21,240	11	11,326	32,566	7,680
9	107	19,260	14	8,976	28,236	6,620
1	164	29,520	4	3,400	32,920	6,240
20	102	18,360	1	360	18,720	3,850
5	111	19,980	17	12,914	32,894	7,230
7	147	26,460	10	7,007	33,467	5,950
30	76	13,680	7	5,584	19,264	4,000
15	110	19,800	6	2,310	22,110	3,880
31	66	11,880	13	15,805	27,685	5,920
10	28	5,040	21	8,716	13,756	3,010
32	113	20,340	7	7,837	28,177	4,750
24	119	21,420	5	3,620	25,040	3,710
14	128	23,040	0	0	23,040	3,150
27	57	10,260	18	12,767	23,027	4,350
17	138	24,840	4	3,333	28,173	3,650
12	147	26,460	0	0	26,460	3,170
11	148	26,640	8	6,205	32,845	4,160
23	136	24,480	0	0	24,480	2,890
19	114	20,520	5	6,704	27,224	3,410
18	117	21,060	8	9,165	30,225	3,740
13	95	17,100	1	500	17,600	2,000
28	112	20,160	8	5,728	25,888	2,930
2	164	29,520	0	0	29,520	2,780
29	106	19,080	2	2,522	21,602	2,350
36	97	17,460	11	10,372	27,832	2,870
4	156	28,080	0	0	28,080	2,170

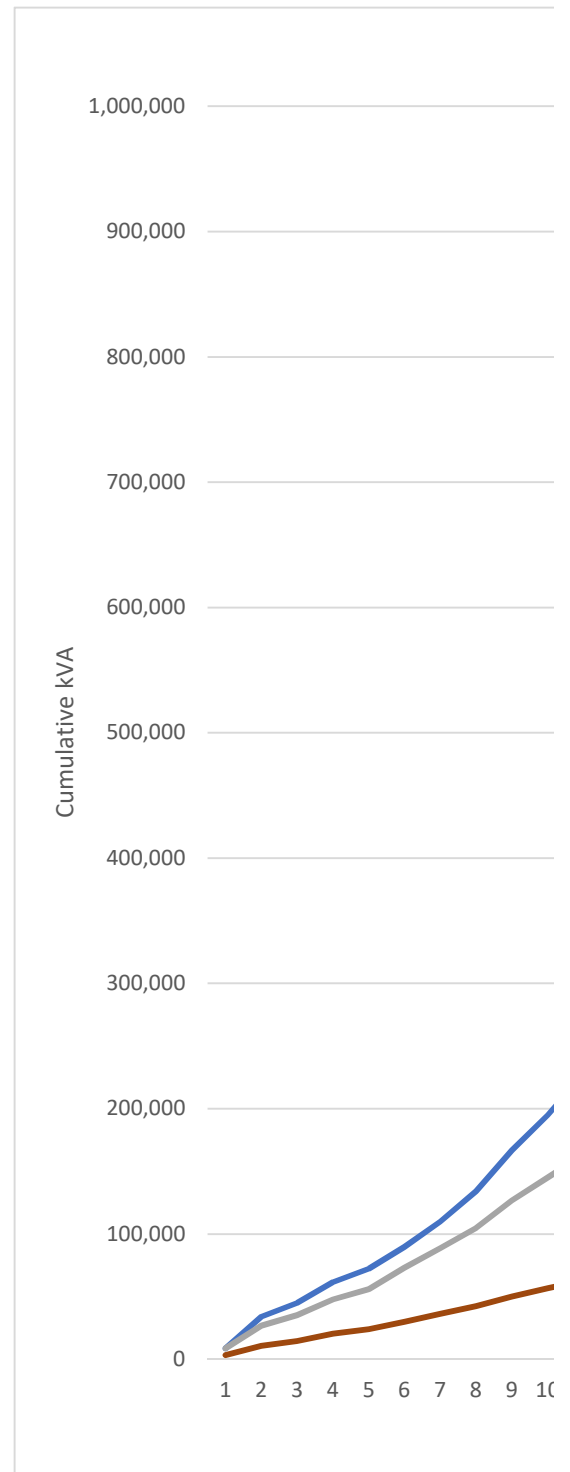
3	119	21,420	10	6,883	28,303	2,170
33	87	15,660	0	0	15,660	1,030
6	156	28,080	9	5,101	33,181	1,900

NEC DEMAND LOAD	Safety Factor Above Measured Demand	Cumulative Loads				
CORD CONN AT nameplate	NEC (w/ eqp at nameplate)	Measured peak demand	Recep Load	Cord Conn Load (nameplate)	Total Load (w/ eqp at nameplate)	NEC (w/ eqp at nameplate)
8,641	163%	3,290	3,960	4,681	8,641	8,641
20,250	168%	10,840	24,300	9,761	34,061	26,911
10,883	187%	14,630	29,340	15,604	44,944	35,274
16,762	191%	20,390	37,800	23,906	61,706	47,806
10,703	192%	24,060	42,840	29,569	72,409	55,989
17,252	198%	29,840	43,380	46,281	89,661	72,971
20,302	216%	36,260	52,380	57,583	109,963	88,773
20,882	240%	42,400	68,940	65,185	134,125	104,655
26,946	251%	50,080	90,180	76,511	166,691	126,601
23,606	257%	56,700	109,440	85,487	194,927	145,207
23,160	271%	62,940	138,960	88,887	227,847	163,367
14,540	278%	66,790	157,320	89,247	246,567	172,907
27,904	286%	74,020	177,300	102,161	279,461	195,811
25,237	324%	79,970	203,760	109,168	312,928	216,048
17,424	336%	83,970	217,440	114,752	332,192	228,472
17,210	344%	87,850	237,240	117,062	354,302	240,682
26,745	352%	93,770	249,120	132,867	381,987	262,427
13,756	357%	96,780	254,160	141,583	395,743	273,663
23,007	384%	101,530	274,500	149,420	423,920	291,670
19,330	421%	105,240	295,920	153,040	448,960	306,000
16,520	424%	108,390	318,960	153,040	472,000	317,520
22,897	426%	112,740	329,220	165,807	495,027	335,417
20,753	469%	116,390	354,060	169,140	523,200	351,170
18,230	475%	119,560	380,520	169,140	549,660	364,400
24,525	490%	123,720	407,160	175,345	582,505	383,925
17,240	497%	126,610	431,640	175,345	606,985	396,165
21,964	544%	130,020	452,160	182,049	634,209	413,129
24,695	560%	133,760	473,220	191,214	664,434	432,824
14,050	603%	135,760	490,320	191,714	682,034	441,874
20,808	610%	138,690	510,480	197,442	707,922	457,682
19,760	611%	141,470	540,000	197,442	737,442	472,442
17,062	626%	143,820	559,080	199,964	759,044	484,504
24,102	740%	146,690	576,540	210,336	786,876	503,606
19,040	777%	148,860	604,620	210,336	814,956	517,646

22,593	941%	151,030	626,040	217,219	843,259	535,239
12,830	1146%	152,060	641,700	217,219	858,919	543,069
24,141	1171%	153,960	669,780	222,320	892,100	562,210

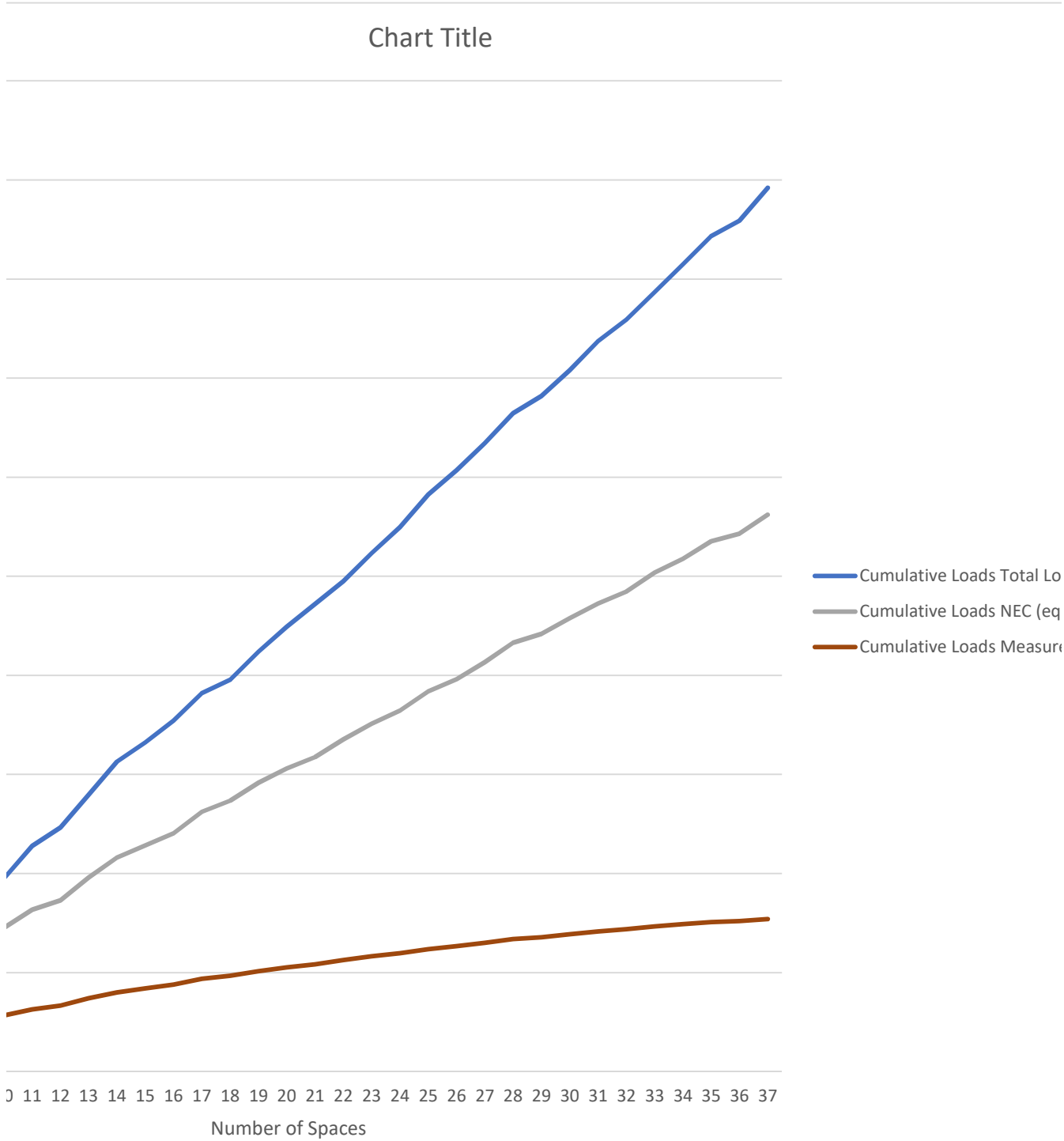
Data For Graph:

Cumulative Loads		
Total Load (w/ eqp at nameplate)	NEC (eqp at nameplate)	Measured peak demand
8,641	8,641	3,290
34,061	26,911	10,840
44,944	35,274	14,630
61,706	47,806	20,390
72,409	55,989	24,060
89,661	72,971	29,840
109,963	88,773	36,260
134,125	104,655	42,400
166,691	126,601	50,080
194,927	145,207	56,700
227,847	163,367	62,940
246,567	172,907	66,790
279,461	195,811	74,020
312,928	216,048	79,970
332,192	228,472	83,970
354,302	240,682	87,850
381,987	262,427	93,770
395,743	273,663	96,780
423,920	291,670	101,530
448,960	306,000	105,240
472,000	317,520	108,390
495,027	335,417	112,740
523,200	351,170	116,390
549,660	364,400	119,560
582,505	383,925	123,720
606,985	396,165	126,610
634,209	413,129	130,020
664,434	432,824	133,760
682,034	441,874	135,760
707,922	457,682	138,690
737,442	472,442	141,470
759,044	484,504	143,820
786,876	503,606	146,690
814,956	517,646	148,860



843,259	535,239	151,030
858,919	543,069	152,060
892,100	562,210	153,960

Chart Title



oad (w/ eqp at nameplate)
ip at nameplate)
ed peak demand

Row #	Connected Load (VA)					Measured Peak VA
	# Recepts	Recep load	# CORD CONN EQP	Cord Con Load (nameplate)	Total Conn. Load, equip at nameplate	
16	3	540	23	16,712	17,252	5,780
25	50	9,000	13	11,302	20,302	6,420
22	22	3,960	8	4,681	8,641	3,290
34	28	5,040	7	5,843	10,883	3,790
35	28	5,040	7	5,663	10,703	3,670
26	47	8,460	7	8,302	16,762	5,760
10	28	5,040	21	8,716	13,756	3,010
8	118	21,240	11	11,326	32,566	7,680
31	66	11,880	13	15,805	27,685	5,920
5	111	19,980	17	12,914	32,894	7,230
9	107	19,260	14	8,976	28,236	6,620
37	113	20,340	5	5,080	25,420	7,550
21	92	16,560	9	7,602	24,162	6,140
27	57	10,260	18	12,767	23,027	4,350
7	147	26,460	10	7,007	33,467	5,950
30	76	13,680	7	5,584	19,264	4,000
1	164	29,520	4	3,400	32,920	6,240
20	102	18,360	1	360	18,720	3,850
32	113	20,340	7	7,837	28,177	4,750
15	110	19,800	6	2,310	22,110	3,880
11	148	26,640	8	6,205	32,845	4,160
24	119	21,420	5	3,620	25,040	3,710
14	128	23,040	0	0	23,040	3,150
18	117	21,060	8	9,165	30,225	3,740
17	138	24,840	4	3,333	28,173	3,650
36	97	17,460	11	10,372	27,832	2,870
12	147	26,460	0	0	26,460	3,170
23	136	24,480	0	0	24,480	2,890
28	112	20,160	8	5,728	25,888	2,930
19	114	20,520	5	6,704	27,224	3,410
13	95	17,100	1	500	17,600	2,000
2	164	29,520	0	0	29,520	2,780
29	106	19,080	2	2,522	21,602	2,350
4	156	28,080	0	0	28,080	2,170

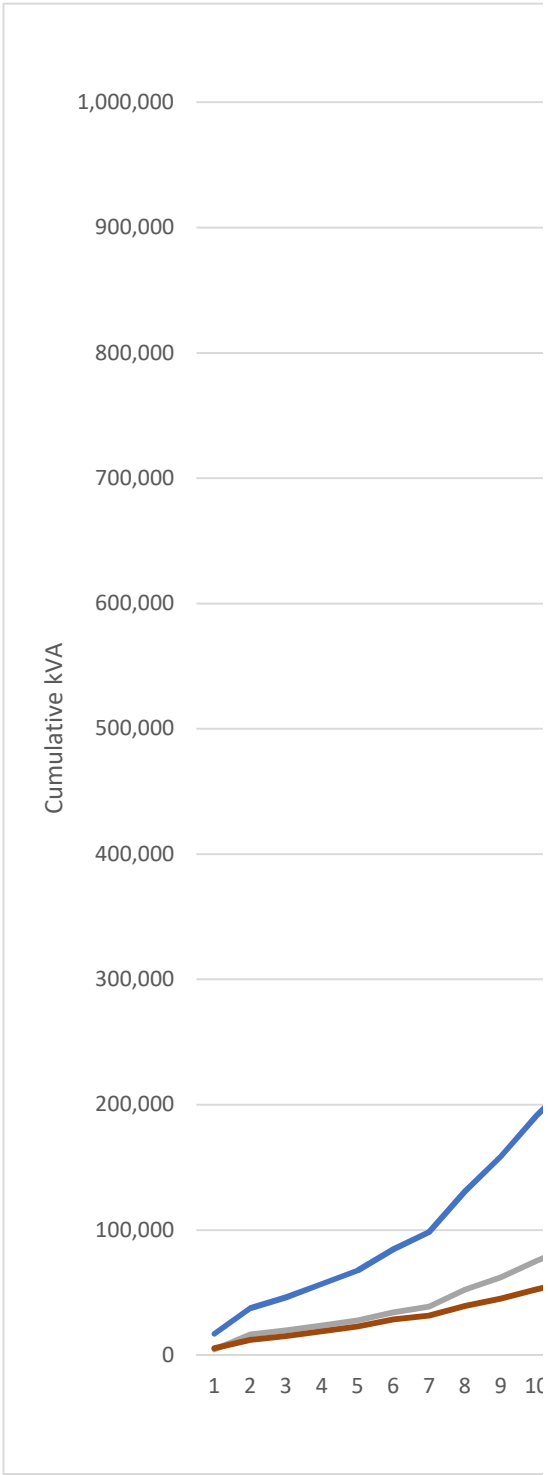
3	119	21,420	10	6,883	28,303	2,170
6	156	28,080	9	5,101	33,181	1,900
33	87	15,660	0	0	15,660	1,030

Bourgault 1.0	Safety Factor Above Measured Demand	Cumulative Loads				
rec at NEC, eqp at bourgault	Bourgault 1.0	Measured peak demand	Recep Load	Cord Conn Load (nameplate)	Total Load (w/ eqp at nameplate)	Cumulative Bourgault 1.0
4,718	-18%	5,780	540	16,712	17,252	4,718
11,826	84%	12,200	9,540	28,014	37,554	16,544
6,301	92%	15,490	13,500	32,695	46,195	19,924
7,962	110%	19,280	18,540	38,538	57,078	23,905
7,872	114%	22,950	23,580	44,201	67,781	27,840
12,611	119%	28,710	32,040	52,503	84,543	34,146
7,219	140%	31,720	37,080	61,219	98,299	38,845
18,452	140%	39,400	58,320	72,545	130,865	52,296
14,891	152%	45,320	70,200	88,350	158,550	62,188
18,219	152%	52,550	90,180	101,264	191,444	75,406
16,874	155%	59,170	109,440	110,240	219,680	87,280
20,250	168%	66,720	129,780	115,320	245,100	98,720
17,081	178%	72,860	146,340	122,922	269,262	108,901
13,322	206%	77,210	156,600	135,689	292,289	117,222
21,734	265%	83,160	183,060	142,696	325,756	132,204
14,632	266%	87,160	196,740	148,280	345,020	140,440
23,160	271%	93,400	226,260	151,680	377,940	156,050
14,540	278%	97,250	244,620	152,040	396,660	165,320
19,089	302%	102,000	264,960	159,877	424,837	177,449
16,055	314%	105,880	284,760	162,187	446,947	187,927
21,423	415%	110,040	311,400	168,392	479,792	202,798
19,330	421%	113,750	332,820	172,012	504,832	214,413
16,520	424%	116,900	355,860	172,012	527,872	225,933
20,113	438%	120,640	376,920	181,177	558,097	238,754
20,753	469%	124,290	401,760	184,510	586,270	252,008
16,323	469%	127,160	419,220	194,882	614,102	263,331
18,230	475%	130,330	445,680	194,882	640,562	276,561
17,240	497%	133,220	470,160	194,882	665,042	288,801
17,944	512%	136,150	490,320	200,610	690,930	300,313
21,964	544%	139,560	510,840	207,314	718,154	312,249
14,050	603%	141,560	527,940	207,814	735,754	320,924
19,760	611%	144,340	557,460	207,814	765,274	335,684
17,062	626%	146,690	576,540	210,336	786,876	345,854
19,040	777%	148,860	604,620	210,336	814,956	359,894

19,152	783%	151,030	626,040	217,219	843,259	372,325
21,591	1036%	152,930	654,120	222,320	876,440	387,640
12,830	1146%	153,960	669,780	222,320	892,100	395,470

Data For Graph:

Cumulative Loads		
Total Load (w/ eqp at nameplate)	Cumulative Bourgault 1.0	Measured peak demand
17,252	4,718	5,780
37,554	16,544	12,200
46,195	19,924	15,490
57,078	23,905	19,280
67,781	27,840	22,950
84,543	34,146	28,710
98,299	38,845	31,720
130,865	52,296	39,400
158,550	62,188	45,320
191,444	75,406	52,550
219,680	87,280	59,170
245,100	98,720	66,720
269,262	108,901	72,860
292,289	117,222	77,210
325,756	132,204	83,160
345,020	140,440	87,160
377,940	156,050	93,400
396,660	165,320	97,250
424,837	177,449	102,000
446,947	187,927	105,880
479,792	202,798	110,040
504,832	214,413	113,750
527,872	225,933	116,900
558,097	238,754	120,640
586,270	252,008	124,290
614,102	263,331	127,160
640,562	276,561	130,330
665,042	288,801	133,220
690,930	300,313	136,150
718,154	312,249	139,560
735,754	320,924	141,560
765,274	335,684	144,340
786,876	345,854	146,690
814,956	359,894	148,860



843,259	372,325	151,030
876,440	387,640	152,930
892,100	395,470	153,960

Chart Title

- Cumulative Loads Total Lo
- Cumulative Loads Cumulat
- Cumulative Loads Measuri

0 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37

Number of Spaces

oad (w/ eqp at nameplate)
tive Bourgault 1.0
ed peak demand

Row #	Connected Load (VA)					Measured Peak VA
	# Recepts	Recep load	# CORD CONN EQP	Cord Con Load (nameplate)	Total Conn. Load, equip at nameplate	
16	3	540	23	16,712	17,252	5,780
22	22	3,960	8	4,681	8,641	3,290
34	28	5,040	7	5,843	10,883	3,790
35	28	5,040	7	5,663	10,703	3,670
26	47	8,460	7	8,302	16,762	5,760
25	50	9,000	13	11,302	20,302	6,420
37	113	20,340	5	5,080	25,420	7,550
8	118	21,240	11	11,326	32,566	7,680
21	92	16,560	9	7,602	24,162	6,140
9	107	19,260	14	8,976	28,236	6,620
5	111	19,980	17	12,914	32,894	7,230
10	28	5,040	21	8,716	13,756	3,010
31	66	11,880	13	15,805	27,685	5,920
7	147	26,460	10	7,007	33,467	5,950
30	76	13,680	7	5,584	19,264	4,000
1	164	29,520	4	3,400	32,920	6,240
20	102	18,360	1	360	18,720	3,850
27	57	10,260	18	12,767	23,027	4,350
32	113	20,340	7	7,837	28,177	4,750
15	110	19,800	6	2,310	22,110	3,880
11	148	26,640	8	6,205	32,845	4,160
24	119	21,420	5	3,620	25,040	3,710
14	128	23,040	0	0	23,040	3,150
18	117	21,060	8	9,165	30,225	3,740
17	138	24,840	4	3,333	28,173	3,650
12	147	26,460	0	0	26,460	3,170
23	136	24,480	0	0	24,480	2,890
28	112	20,160	8	5,728	25,888	2,930
19	114	20,520	5	6,704	27,224	3,410
36	97	17,460	11	10,372	27,832	2,870
13	95	17,100	1	500	17,600	2,000
2	164	29,520	0	0	29,520	2,780
29	106	19,080	2	2,522	21,602	2,350
4	156	28,080	0	0	28,080	2,170

3	119	21,420	10	6,883	28,303	2,170
6	156	28,080	9	5,101	33,181	1,900
33	87	15,660	0	0	15,660	1,030

Bourgault 1.1	Safety Factor Above Measured Demand	Cumulative Loads				
rec at NEC, eqp at bourgault	Bourgault 1.1	Measured peak demand	Recep Load	Cord Conn Load (nameplate)	Total Load (w/ eqp at nameplate)	Cumulative Bourgault 1.1
8,896	54%	5,780	540	16,712	17,252	8,896
6,301	92%	9,070	4,500	21,393	25,893	15,197
7,962	110%	12,860	9,540	27,236	36,776	23,158
7,872	114%	16,530	14,580	32,899	47,479	28,740
12,611	119%	22,290	23,040	41,201	64,241	37,121
14,651	128%	28,710	32,040	52,503	84,543	47,272
20,250	168%	36,260	52,380	57,583	109,963	59,982
21,283	177%	43,940	73,620	68,909	142,529	76,265
17,081	178%	50,080	90,180	76,511	166,691	88,346
19,118	189%	56,700	109,440	85,487	194,927	102,464
21,447	197%	63,930	129,420	98,401	227,821	118,911
9,398	212%	66,940	134,460	107,117	241,577	125,789
18,843	218%	72,860	146,340	122,922	269,262	139,631
21,734	265%	78,810	172,800	129,929	302,729	156,365
14,632	266%	82,810	186,480	135,513	321,993	165,997
23,160	271%	89,050	216,000	138,913	354,913	182,457
14,540	278%	92,900	234,360	139,273	373,633	191,817
16,514	280%	97,250	244,620	152,040	396,660	203,330
19,089	302%	102,000	264,960	159,877	424,837	217,419
16,055	314%	105,880	284,760	162,187	446,947	228,474
21,423	415%	110,040	311,400	168,392	479,792	244,896
19,330	421%	113,750	332,820	172,012	504,832	257,416
16,520	424%	116,900	355,860	172,012	527,872	268,936
20,113	438%	120,640	376,920	181,177	558,097	284,049
20,753	469%	124,290	401,760	184,510	586,270	298,135
18,230	475%	127,460	428,220	184,510	612,730	311,365
17,240	497%	130,350	452,700	184,510	637,210	323,605
17,944	512%	133,280	472,860	190,238	663,098	336,549
21,964	544%	136,690	493,380	196,942	690,322	350,161
18,916	559%	139,560	510,840	207,314	718,154	364,077
14,050	603%	141,560	527,940	207,814	735,754	372,877
19,760	611%	144,340	557,460	207,814	765,274	387,637
17,062	626%	146,690	576,540	210,336	786,876	398,438
19,040	777%	148,860	604,620	210,336	814,956	412,478

19,152	783%	151,030	626,040	217,219	843,259	426,630
21,591	1036%	152,930	654,120	222,320	876,440	443,220
12,830	1146%	153,960	669,780	222,320	892,100	451,050

Data For Graph:

Cumulative Loads		
Total Load (w/ eqp at nameplate)	Cumulative Bourgault 1.1	Measured peak demand
17,252	8,896	5,780
25,893	15,197	9,070
36,776	23,158	12,860
47,479	28,740	16,530
64,241	37,121	22,290
84,543	47,272	28,710
109,963	59,982	36,260
142,529	76,265	43,940
166,691	88,346	50,080
194,927	102,464	56,700
227,821	118,911	63,930
241,577	125,789	66,940
269,262	139,631	72,860
302,729	156,365	78,810
321,993	165,997	82,810
354,913	182,457	89,050
373,633	191,817	92,900
396,660	203,330	97,250
424,837	217,419	102,000
446,947	228,474	105,880
479,792	244,896	110,040
504,832	257,416	113,750
527,872	268,936	116,900
558,097	284,049	120,640
586,270	298,135	124,290
612,730	311,365	127,460
637,210	323,605	130,350
663,098	336,549	133,280
690,322	350,161	136,690
718,154	364,077	139,560
735,754	372,877	141,560
765,274	387,637	144,340
786,876	398,438	146,690
814,956	412,478	148,860



843,259	426,630	151,030
876,440	443,220	152,930
892,100	451,050	153,960

Chart Title

- Cumulative Loads Total Lo
- Cumulative Loads Cumulat
- Cumulative Loads Measur

0 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37

Number of Spaces

oad (w/ eqp at nameplate)
tive Bourgault 1.1
ed peak demand

Row #	Connected Load (VA)					Measured Peak VA
	# Recepts	Recep load	# CORD CONN EQP	Cord Con Load (nameplate)	Total Conn. Load, equip at nameplate	
37	113	20,340	5	5,080	25,420	7,550
1	164	29,520	4	3,400	32,920	6,240
20	102	18,360	1	360	18,720	3,850
26	47	8,460	7	8,302	16,762	5,760
22	22	3,960	8	4,681	8,641	3,290
21	92	16,560	9	7,602	24,162	6,140
8	118	21,240	11	11,326	32,566	7,680
9	107	19,260	14	8,976	28,236	6,620
25	50	9,000	13	11,302	20,302	6,420
34	28	5,040	7	5,843	10,883	3,790
35	28	5,040	7	5,663	10,703	3,670
16	3	540	23	16,712	17,252	5,780
7	147	26,460	10	7,007	33,467	5,950
15	110	19,800	6	2,310	22,110	3,880
5	111	19,980	17	12,914	32,894	7,230
14	128	23,040	0	0	23,040	3,150
30	76	13,680	7	5,584	19,264	4,000
12	147	26,460	0	0	26,460	3,170
24	119	21,420	5	3,620	25,040	3,710
32	113	20,340	7	7,837	28,177	4,750
23	136	24,480	0	0	24,480	2,890
17	138	24,840	4	3,333	28,173	3,650
31	66	11,880	13	15,805	27,685	5,920
11	148	26,640	8	6,205	32,845	4,160
2	164	29,520	0	0	29,520	2,780
10	28	5,040	21	8,716	13,756	3,010
27	57	10,260	18	12,767	23,027	4,350
13	95	17,100	1	500	17,600	2,000
19	114	20,520	5	6,704	27,224	3,410
18	117	21,060	8	9,165	30,225	3,740
29	106	19,080	2	2,522	21,602	2,350
28	112	20,160	8	5,728	25,888	2,930
4	156	28,080	0	0	28,080	2,170
36	97	17,460	11	10,372	27,832	2,870

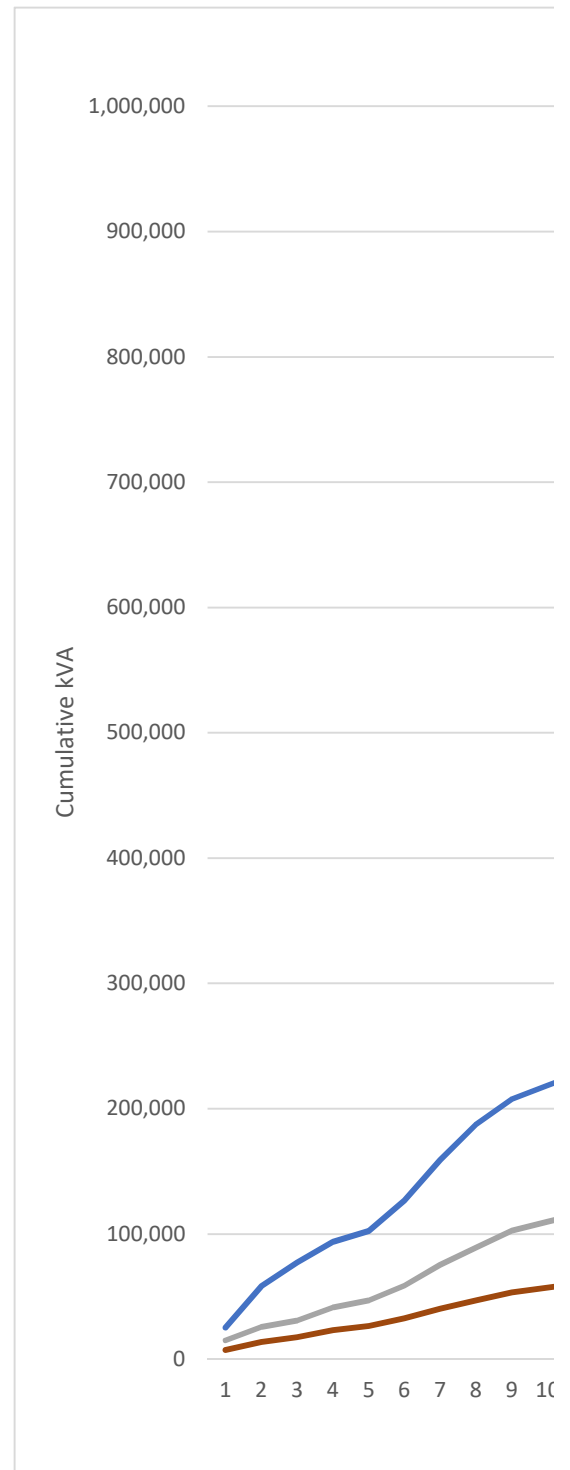
3	119	21,420	10	6,883	28,303	2,170
33	87	15,660	0	0	15,660	1,030
6	156	28,080	9	5,101	33,181	1,900

Bourgault 2	Safety Factor Above Measured Demand	Cumulative Loads				
rec at bourgault, eqp at nameplate	Bourgault 2	Measured peak demand	Recep Load	Cord Conn Load (nameplate)	Total Load (w/ eqp at nameplate)	Cumulative Bourgault 2
15,165	101%	7,550	20,340	5,080	25,420	15,165
15,780	153%	13,790	49,860	8,480	58,340	25,945
9,950	158%	17,640	68,220	8,840	77,060	30,895
15,032	161%	23,400	76,680	17,142	93,822	41,312
8,641	163%	26,690	80,640	21,823	102,463	46,983
16,742	173%	32,830	97,200	29,425	126,625	58,725
21,636	182%	40,510	118,440	40,751	159,191	75,361
18,791	184%	47,130	137,700	49,727	187,427	89,152
18,302	185%	53,550	146,700	61,029	207,729	102,704
10,863	187%	57,340	151,740	66,872	218,612	109,807
10,683	191%	61,010	156,780	72,535	229,315	116,730
17,252	198%	66,790	157,320	89,247	246,567	133,577
18,622	213%	72,740	183,780	96,254	280,034	147,199
12,260	216%	76,620	203,580	98,564	302,144	154,459
22,909	217%	83,850	223,560	111,478	335,038	172,368
10,760	242%	87,000	246,600	111,478	358,078	178,128
14,004	250%	91,000	260,280	117,062	377,342	187,132
11,615	266%	94,170	286,740	117,062	403,802	193,747
13,975	277%	97,880	308,160	120,682	428,842	202,722
17,922	277%	102,630	328,500	128,519	457,019	215,644
11,120	285%	105,520	352,980	128,519	481,499	221,764
14,543	298%	109,170	377,820	131,852	509,672	231,307
23,775	302%	115,090	389,700	147,657	537,357	250,082
17,865	329%	119,250	416,340	153,862	570,202	262,947
12,380	345%	122,030	445,860	153,862	599,722	270,327
13,736	356%	125,040	450,900	162,578	613,478	280,303
20,332	367%	129,390	461,160	175,345	636,505	295,635
9,775	389%	131,390	478,260	175,845	654,105	300,410
16,834	394%	134,800	498,780	182,549	681,329	312,244
19,430	420%	138,540	519,840	191,714	711,554	326,674
12,292	423%	140,890	538,920	194,236	733,156	333,966
15,768	438%	143,820	559,080	199,964	759,044	344,734
12,020	454%	145,990	587,160	199,964	787,124	351,754
19,737	588%	148,860	604,620	210,336	814,956	366,491

17,238	694%	151,030	626,040	217,219	843,259	378,729
8,915	766%	152,060	641,700	217,219	858,919	382,644
17,121	801%	153,960	669,780	222,320	892,100	394,765

Data For Graph:

Cumulative Loads		
Total Load (w/ eqp at nameplate)	Cumulative Bourgault 2	Measured peak demand
25,420	15,165	7,550
58,340	25,945	13,790
77,060	30,895	17,640
93,822	41,312	23,400
102,463	46,983	26,690
126,625	58,725	32,830
159,191	75,361	40,510
187,427	89,152	47,130
207,729	102,704	53,550
218,612	109,807	57,340
229,315	116,730	61,010
246,567	133,577	66,790
280,034	147,199	72,740
302,144	154,459	76,620
335,038	172,368	83,850
358,078	178,128	87,000
377,342	187,132	91,000
403,802	193,747	94,170
428,842	202,722	97,880
457,019	215,644	102,630
481,499	221,764	105,520
509,672	231,307	109,170
537,357	250,082	115,090
570,202	262,947	119,250
599,722	270,327	122,030
613,478	280,303	125,040
636,505	295,635	129,390
654,105	300,410	131,390
681,329	312,244	134,800
711,554	326,674	138,540
733,156	333,966	140,890
759,044	344,734	143,820
787,124	351,754	145,990
814,956	366,491	148,860



843,259	378,729	151,030
858,919	382,644	152,060
892,100	394,765	153,960

Chart Title

- Cumulative Loads Total Lo
- Cumulative Loads Cumulat
- Cumulative Loads Measuri

0 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37

Number of Spaces

oad (w/ eqp at nameplate)
tive Bourgault 2
ed peak demand

Row #	Connected Load (VA)					Measured Peak VA
	# Recepts	Recep load	# CORD CONN EQP	Cord Con Load (nameplate)	Total Conn. Load, equip at nameplate	
16	3	540	23	16,712	17,252	5,780
26	47	8,460	7	8,302	16,762	5,760
22	22	3,960	8	4,681	8,641	3,290
25	50	9,000	13	11,302	20,302	6,420
37	113	20,340	5	5,080	25,420	7,550
8	118	21,240	11	11,326	32,566	7,680
34	28	5,040	7	5,843	10,883	3,790
21	92	16,560	9	7,602	24,162	6,140
35	28	5,040	7	5,663	10,703	3,670
9	107	19,260	14	8,976	28,236	6,620
5	111	19,980	17	12,914	32,894	7,230
1	164	29,520	4	3,400	32,920	6,240
7	147	26,460	10	7,007	33,467	5,950
20	102	18,360	1	360	18,720	3,850
31	66	11,880	13	15,805	27,685	5,920
30	76	13,680	7	5,584	19,264	4,000
15	110	19,800	6	2,310	22,110	3,880
32	113	20,340	7	7,837	28,177	4,750
10	28	5,040	21	8,716	13,756	3,010
27	57	10,260	18	12,767	23,027	4,350
14	128	23,040	0	0	23,040	3,150
11	148	26,640	8	6,205	32,845	4,160
12	147	26,460	0	0	26,460	3,170
24	119	21,420	5	3,620	25,040	3,710
23	136	24,480	0	0	24,480	2,890
18	117	21,060	8	9,165	30,225	3,740
17	138	24,840	4	3,333	28,173	3,650
28	112	20,160	8	5,728	25,888	2,930
2	164	29,520	0	0	29,520	2,780
13	95	17,100	1	500	17,600	2,000
19	114	20,520	5	6,704	27,224	3,410
36	97	17,460	11	10,372	27,832	2,870
29	106	19,080	2	2,522	21,602	2,350
4	156	28,080	0	0	28,080	2,170

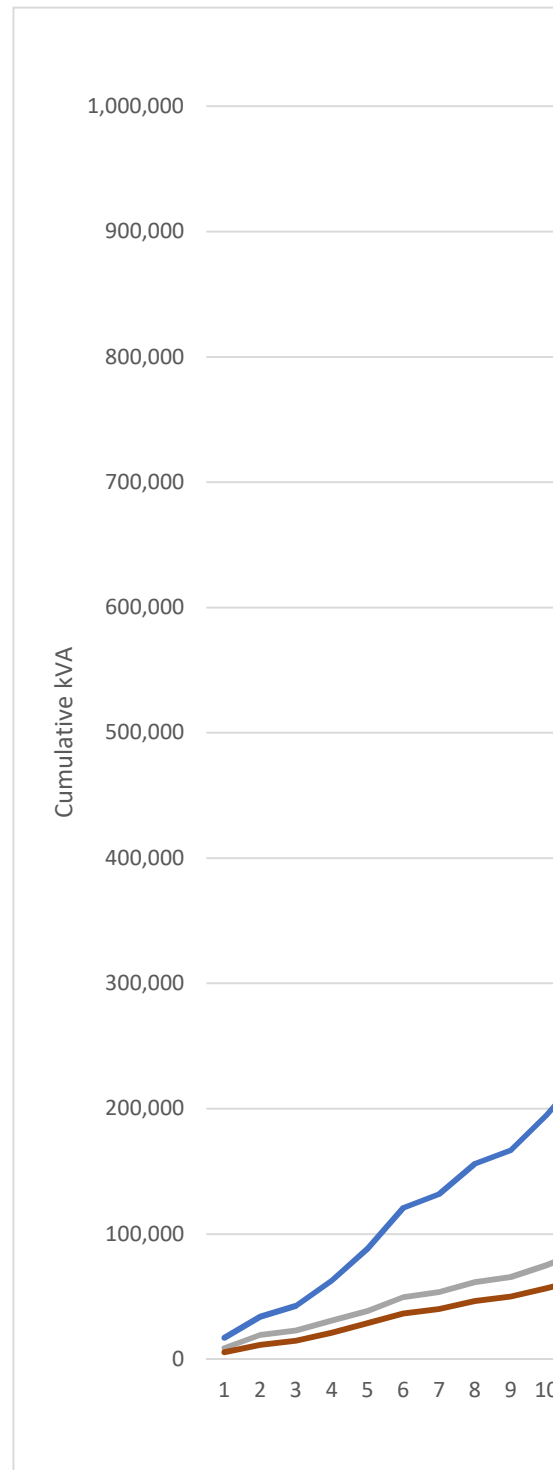
3	119	21,420	10	6,883	28,303	2,170
6	156	28,080	9	5,101	33,181	1,900
33	87	15,660	0	0	15,660	1,030

Bourgault 1.1 & 2	Safety Factor Above Measured Demand	Cumulative Loads				
rec at bourgault 2, eqp at bourgault 1.1	Bourgault 1.1 & 2	Measured peak demand	Recep Load	Cord Conn Load (nameplate)	Total Load (w/ eqp at nameplate)	Cumulative Bourgault 1.1 & 2
8,896	54%	5,780	540	16,712	17,252	8,896
10,881	89%	11,540	9,000	25,014	34,014	19,507
6,301	92%	14,830	12,960	29,695	42,655	23,088
12,651	97%	21,250	21,960	40,997	62,957	30,989
15,165	101%	28,800	42,300	46,077	88,377	38,614
15,973	108%	36,480	63,540	57,403	120,943	49,587
7,942	110%	40,270	68,580	63,246	131,826	53,768
12,941	111%	46,410	85,140	70,848	155,988	61,709
7,852	114%	50,080	90,180	76,511	166,691	65,801
14,303	116%	56,700	109,440	85,487	194,927	75,104
16,452	128%	63,930	129,420	98,401	227,821	86,556
15,780	153%	70,170	158,940	101,801	260,741	95,636
15,119	154%	76,120	185,400	108,808	294,208	105,754
9,950	158%	79,970	203,760	109,168	312,928	110,524
15,873	168%	85,890	215,640	124,973	340,613	121,397
11,212	180%	89,890	229,320	130,557	359,877	127,609
11,105	186%	93,770	249,120	132,867	381,987	133,714
14,004	195%	98,520	269,460	140,704	410,164	142,717
9,378	212%	101,530	274,500	149,420	423,920	148,335
13,949	221%	105,880	284,760	162,187	446,947	157,284
10,760	242%	109,030	307,800	162,187	469,987	163,044
14,763	255%	113,190	334,440	168,392	502,832	172,806
11,615	266%	116,360	360,900	168,392	529,292	179,421
13,975	277%	120,070	382,320	172,012	554,332	186,586
11,120	285%	122,960	406,800	172,012	578,812	192,706
14,848	297%	126,700	427,860	181,177	609,037	202,554
14,543	298%	130,350	452,700	184,510	637,210	210,430
12,904	340%	133,280	472,860	190,238	663,098	218,334
12,380	345%	136,060	502,380	190,238	692,618	225,714
9,775	389%	138,060	519,480	190,738	710,218	230,239
16,834	394%	141,470	540,000	197,442	737,442	238,721
14,551	407%	144,340	557,460	207,814	765,274	248,272
12,292	423%	146,690	576,540	210,336	786,876	254,303
12,020	454%	148,860	604,620	210,336	814,956	261,323

13,797	536%	151,030	626,040	217,219	843,259	270,120
14,571	667%	152,930	654,120	222,320	876,440	279,690
8,915	766%	153,960	669,780	222,320	892,100	283,605

Data For Graph:

Cumulative Loads		
Total Load (w/ eqp at nameplate)	Cumulative Bourgault 1.1 & 2	Measured peak demand
17,252	8,896	5,780
34,014	19,507	11,540
42,655	23,088	14,830
62,957	30,989	21,250
88,377	38,614	28,800
120,943	49,587	36,480
131,826	53,768	40,270
155,988	61,709	46,410
166,691	65,801	50,080
194,927	75,104	56,700
227,821	86,556	63,930
260,741	95,636	70,170
294,208	105,754	76,120
312,928	110,524	79,970
340,613	121,397	85,890
359,877	127,609	89,890
381,987	133,714	93,770
410,164	142,717	98,520
423,920	148,335	101,530
446,947	157,284	105,880
469,987	163,044	109,030
502,832	172,806	113,190
529,292	179,421	116,360
554,332	186,586	120,070
578,812	192,706	122,960
609,037	202,554	126,700
637,210	210,430	130,350
663,098	218,334	133,280
692,618	225,714	136,060
710,218	230,239	138,060
737,442	238,721	141,470
765,274	248,272	144,340
786,876	254,303	146,690
814,956	261,323	148,860



843,259	270,120	151,030
876,440	279,690	152,930
892,100	283,605	153,960

Chart Title

- Cumulative Loads Total Lo
- Cumulative Loads Cumulat
- Cumulative Loads Measuri

0 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37

Number of Spaces

oad (w/ eqp at nameplate)
tive Bourgault 1.1 & 2
ed peak demand

Row #	Connected Load (VA)					Measured Peak VA
	# Recepts	Recep load	# CORD CONN EQP	Cord Con Load (nameplate)	Total Conn. Load, equip at nameplate	
6	156	28,080	9	5,101	33,181	1,900
22	22	3,960	8	4,681	8,641	3,290
34	28	5,040	7	5,843	10,883	3,790
35	28	5,040	7	5,663	10,703	3,670
10	28	5,040	21	8,716	13,756	3,010
26	47	8,460	7	8,302	16,762	5,760
13	95	17,100	1	500	17,600	2,000
20	102	18,360	1	360	18,720	3,850
25	50	9,000	13	11,302	20,302	6,420
30	76	13,680	7	5,584	19,264	4,000
16	3	540	23	16,712	17,252	5,780
29	106	19,080	2	2,522	21,602	2,350
15	110	19,800	6	2,310	22,110	3,880
24	119	21,420	5	3,620	25,040	3,710
14	128	23,040	0	0	23,040	3,150
27	57	10,260	18	12,767	23,027	4,350
21	92	16,560	9	7,602	24,162	6,140
23	136	24,480	0	0	24,480	2,890
19	114	20,520	5	6,704	27,224	3,410
28	112	20,160	8	5,728	25,888	2,930
5	111	19,980	17	12,914	32,894	7,230
12	147	26,460	0	0	26,460	3,170
3	119	21,420	10	6,883	28,303	2,170
32	113	20,340	7	7,837	28,177	4,750
9	107	19,260	14	8,976	28,236	6,620
18	117	21,060	8	9,165	30,225	3,740
17	138	24,840	4	3,333	28,173	3,650
2	164	29,520	0	0	29,520	2,780
4	156	28,080	0	0	28,080	2,170
11	148	26,640	8	6,205	32,845	4,160
8	118	21,240	11	11,326	32,566	7,680
1	164	29,520	4	3,400	32,920	6,240
7	147	26,460	10	7,007	33,467	5,950
31	66	11,880	13	15,805	27,685	5,920

33	87	15,660	0	0	15,660	1,030
36	97	17,460	11	10,372	27,832	2,870
37	113	20,340	5	5,080	25,420	7,550

NEC DEMAND LOAD	Cumulative Loads					
CORD CONN AT nameplate	Measured peak demand	Recep Load	Cord Conn Load (nameplate)	Total Load (w/ eqp at nameplate)	NEC (w/ eqp at nameplate)	Bourgault 1.0 (rec at NEC, eqp at bourgault)
24,141	1,900	28,080	5,101	33,181	24,141	21,591
8,641	5,190	32,040	9,782	41,822	30,802	6,301
10,883	8,980	37,080	15,625	52,705	39,165	7,962
10,703	12,650	42,120	21,288	63,408	47,348	7,872
13,756	15,660	47,160	30,004	77,164	58,584	7,219
16,762	21,420	55,620	38,306	93,926	71,116	12,611
14,050	23,420	72,720	38,806	111,526	80,166	14,050
14,540	27,270	91,080	39,166	130,246	89,706	14,540
20,302	33,690	100,080	50,468	150,548	105,508	11,826
17,424	37,690	113,760	56,052	169,812	117,932	14,632
17,252	43,470	114,300	72,764	187,064	134,914	4,718
17,062	45,820	133,380	75,286	208,666	146,976	17,062
17,210	49,700	153,180	77,596	230,776	159,186	16,055
19,330	53,410	174,600	81,216	255,816	173,516	19,330
16,520	56,560	197,640	81,216	278,856	185,036	16,520
22,897	60,910	207,900	93,983	301,883	202,933	13,322
20,882	67,050	224,460	101,585	326,045	218,815	17,081
17,240	69,940	248,940	101,585	350,525	231,055	17,240
21,964	73,350	269,460	108,289	377,749	248,019	21,964
20,808	76,280	289,620	114,017	403,637	263,827	17,944
27,904	83,510	309,600	126,931	436,531	286,731	18,219
18,230	86,680	336,060	126,931	462,991	299,961	18,230
22,593	88,850	357,480	133,814	491,294	317,554	19,152
23,007	93,600	377,820	141,651	519,471	335,561	19,089
23,606	100,220	397,080	150,627	547,707	354,167	16,874
24,695	103,960	418,140	159,792	577,932	373,862	20,113
20,753	107,610	442,980	163,125	606,105	389,615	20,753
19,760	110,390	472,500	163,125	635,625	404,375	19,760
19,040	112,560	500,580	163,125	663,705	418,415	19,040
24,525	116,720	527,220	169,330	696,550	437,940	21,423
26,946	124,400	548,460	180,656	729,116	459,886	18,452
23,160	130,640	577,980	184,056	762,036	478,046	23,160
25,237	136,590	604,440	191,063	795,503	498,283	21,734
26,745	142,510	616,320	206,868	823,188	520,028	14,891

12,830	143,540	631,980	206,868	838,848	527,858	12,830
24,102	146,410	649,440	217,240	866,680	546,960	16,323
20,250	153,960	669,780	222,320	892,100	562,210	20,250

Proposed Methods

Cumulative Bourgault 1.0	Bourgault 1.1 (rec at NEC, eqp at bourgault)	Cumulative Bourgault 1.1	Bourgault 2 (rec at bourgault, eqp at nameplate)	Cumulative Bourgault 2	Bourgault 1.1 & 2 (rec at bourgault 2, eqp at bourgault 1.1)	Cumulative Bourgault 1.1 & 2
21,591	21,591	21,591	17,121	17,121	14,571	14,571
23,466	6,301	25,911	8,641	22,792	6,301	17,901
27,446	7,962	31,353	10,863	29,895	7,942	22,083
31,382	7,872	36,704	10,683	36,818	7,852	26,174
36,081	9,398	43,582	13,736	46,794	9,378	31,792
42,387	12,611	51,963	15,032	57,211	10,881	38,058
51,062	14,050	60,763	9,775	61,986	9,775	42,583
60,332	14,540	70,123	9,950	66,936	9,950	47,353
67,657	14,651	80,274	18,302	80,488	12,651	55,254
75,893	14,632	89,906	14,004	89,492	11,212	61,466
80,341	8,896	98,532	17,252	106,339	8,896	69,957
90,512	17,062	109,333	12,292	113,631	12,292	75,988
100,989	16,055	120,388	12,260	120,891	11,105	82,093
112,604	19,330	132,908	13,975	129,866	13,975	89,258
124,124	16,520	144,428	10,760	135,626	10,760	95,018
132,446	16,514	155,942	20,332	150,958	13,949	103,967
142,626	17,081	168,023	16,742	162,700	12,941	111,908
154,866	17,240	180,263	11,120	168,820	11,120	118,028
166,802	21,964	193,875	16,834	180,654	16,834	126,510
178,314	17,944	206,819	15,768	191,422	12,904	134,414
191,533	21,447	223,266	22,909	209,331	16,452	145,866
204,763	18,230	236,496	11,615	215,946	11,615	152,481
217,194	19,152	250,647	17,238	228,184	13,797	161,277
229,323	19,089	264,736	17,922	241,106	14,004	170,281
241,197	19,118	278,854	18,791	254,897	14,303	179,584
254,018	20,113	293,966	19,430	269,327	14,848	189,431
267,271	20,753	308,053	14,543	278,870	14,543	197,308
282,031	19,760	322,813	12,380	286,250	12,380	204,688
296,071	19,040	336,853	12,020	293,270	12,020	211,708
310,943	21,423	353,275	17,865	306,135	14,763	221,470
324,394	21,283	369,558	21,636	322,771	15,973	232,443
340,004	23,160	386,018	15,780	333,551	15,780	241,523
354,986	21,734	402,752	18,622	347,173	15,119	251,642
364,877	18,843	416,594	23,775	365,948	15,873	262,514

372,707	12,830	424,424	8,915	369,863	8,915	266,429
384,030	18,916	438,340	19,737	384,600	14,551	275,980
395,470	20,250	451,050	15,165	394,765	15,165	283,605

gsf	Space Type	Bourgault 3	Cumulative Bourgault 3
1,590	3	1,988	1,988
305	1	915	2,903
520	1	1,560	4,463
520	1	1,560	6,023
3,325	3	4,156	10,179
685	1	2,055	12,234
5,100	3	6,375	18,609
2,788	2	5,576	24,185
620	1	1,860	26,045
3,990	3	4,988	31,032
1,820	3	2,275	33,307
3,215	3	4,019	37,326
5,010	3	6,263	43,589
2,975	2	5,950	49,539
5,000	3	6,250	55,789
2,700	3	3,375	59,164
3,485	2	6,970	66,134
3,660	2	7,320	73,454
3,000	4	3,750	77,204
1,300	4	1,625	78,829
3,650	3	4,563	83,391
5,000	3	6,250	89,641
3,600	2	7,200	96,841
6,500	4	8,125	104,966
3,300	4	4,125	109,091
2,615	3	3,269	112,360
4,700	4	5,875	118,235
5,045	1	15,135	133,370
2,720	2	5,440	138,810
4,245	4	5,306	144,116
3,300	4	4,125	148,241
5,045	1	15,135	163,376
3,325	4	4,156	167,532
590	4	738	168,270

Safety Factor Above Meas (row by row)		
NEC (w/ eqp at nameplate)	Bourgault 1.0	Bourgault 1.1
1171%	1036%	1036%
163%	92%	92%
187%	110%	110%
192%	114%	114%
357%	140%	212%
191%	119%	119%
603%	603%	603%
278%	278%	278%
216%	84%	128%
336%	266%	266%
198%	-18%	54%
626%	626%	626%
344%	314%	314%
421%	421%	421%
424%	424%	424%
426%	206%	280%
240%	178%	178%
497%	497%	497%
544%	544%	544%
610%	512%	512%
286%	152%	197%
475%	475%	475%
941%	783%	783%
384%	302%	302%
257%	155%	189%
560%	438%	438%
469%	469%	469%
611%	611%	611%
777%	777%	777%
490%	415%	415%
251%	140%	177%
271%	271%	271%
324%	265%	265%
352%	152%	218%

3,950	3	4,938	173,207
6,000	4	7,500	180,707
8,050	4	10,063	190,770

1146%	1146%	1146%
740%	469%	559%
168%	168%	168%

Measured Demand
)

Bourgault 2	Bourgault 1.1 & 2
801%	667%
163%	92%
187%	110%
191%	114%
356%	212%
161%	89%
389%	389%
158%	158%
185%	97%
250%	180%
198%	54%
423%	423%
216%	186%
277%	277%
242%	242%
367%	221%
173%	111%
285%	285%
394%	394%
438%	340%
217%	128%
266%	266%
694%	536%
277%	195%
184%	116%
420%	297%
298%	298%
345%	345%
454%	454%
329%	255%
182%	108%
153%	153%
213%	154%
302%	168%

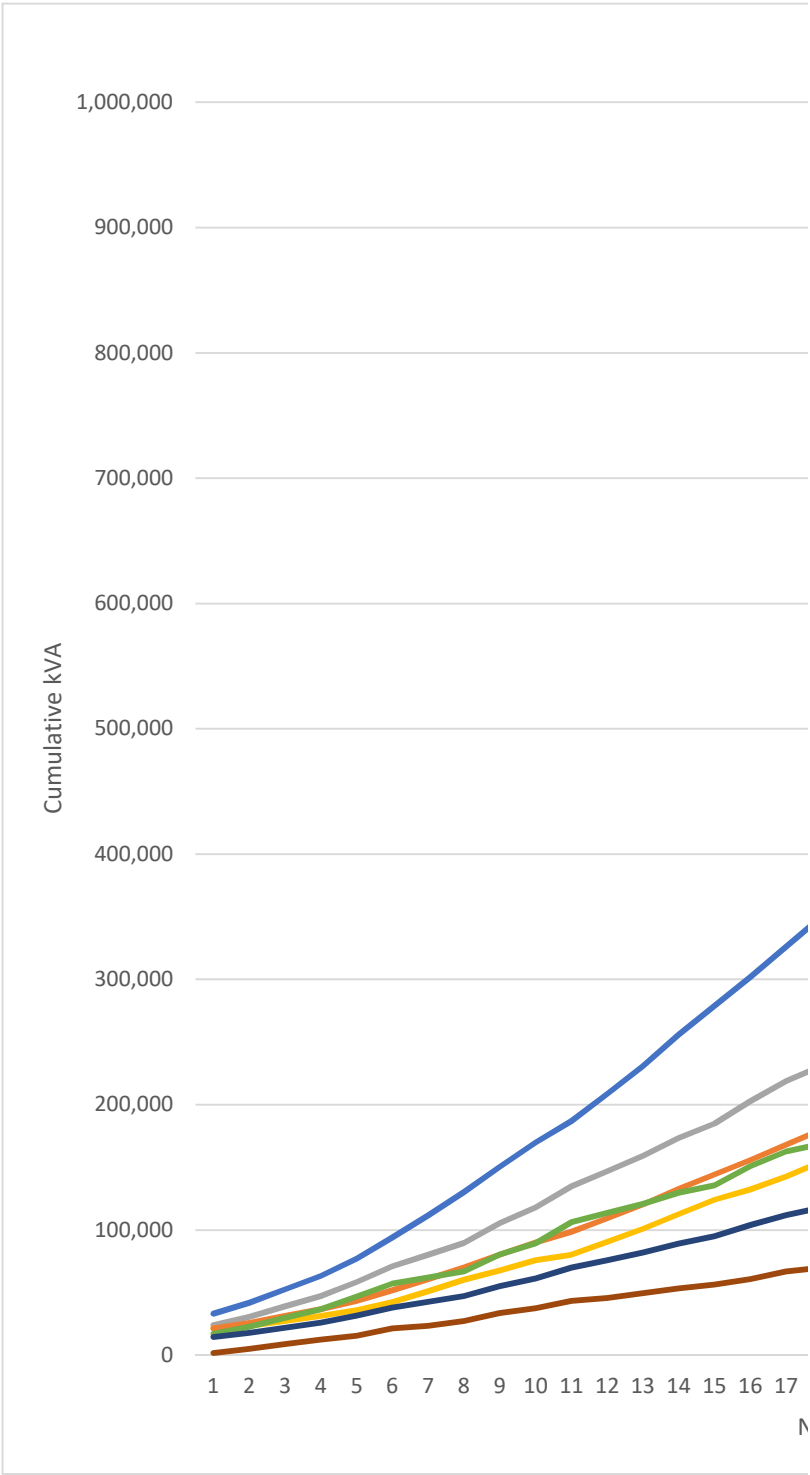
Data For Graph:

Cumulative Loads				
Total Load (w/ eqp at nameplate)	NEC (eqp at nameplate)	Cumulative Bourgault 1.0	Cumulative Bourgault 1.1	Cumulative Bourgault 2
33,181	24,141	21,591	21,591	17,121
41,822	30,802	23,466	25,911	22,792
52,705	39,165	27,446	31,353	29,895
63,408	47,348	31,382	36,704	36,818
77,164	58,584	36,081	43,582	46,794
93,926	71,116	42,387	51,963	57,211
111,526	80,166	51,062	60,763	61,986
130,246	89,706	60,332	70,123	66,936
150,548	105,508	67,657	80,274	80,488
169,812	117,932	75,893	89,906	89,492
187,064	134,914	80,341	98,532	106,339
208,666	146,976	90,512	109,333	113,631
230,776	159,186	100,989	120,388	120,891
255,816	173,516	112,604	132,908	129,866
278,856	185,036	124,124	144,428	135,626
301,883	202,933	132,446	155,942	150,958
326,045	218,815	142,626	168,023	162,700
350,525	231,055	154,866	180,263	168,820
377,749	248,019	166,802	193,875	180,654
403,637	263,827	178,314	206,819	191,422
436,531	286,731	191,533	223,266	209,331
462,991	299,961	204,763	236,496	215,946
491,294	317,554	217,194	250,647	228,184
519,471	335,561	229,323	264,736	241,106
547,707	354,167	241,197	278,854	254,897
577,932	373,862	254,018	293,966	269,327
606,105	389,615	267,271	308,053	278,870
635,625	404,375	282,031	322,813	286,250
663,705	418,415	296,071	336,853	293,270
696,550	437,940	310,943	353,275	306,135
729,116	459,886	324,394	369,558	322,771
762,036	478,046	340,004	386,018	333,551
795,503	498,283	354,986	402,752	347,173
823,188	520,028	364,877	416,594	365,948

766%	766%
588%	407%
101%	101%

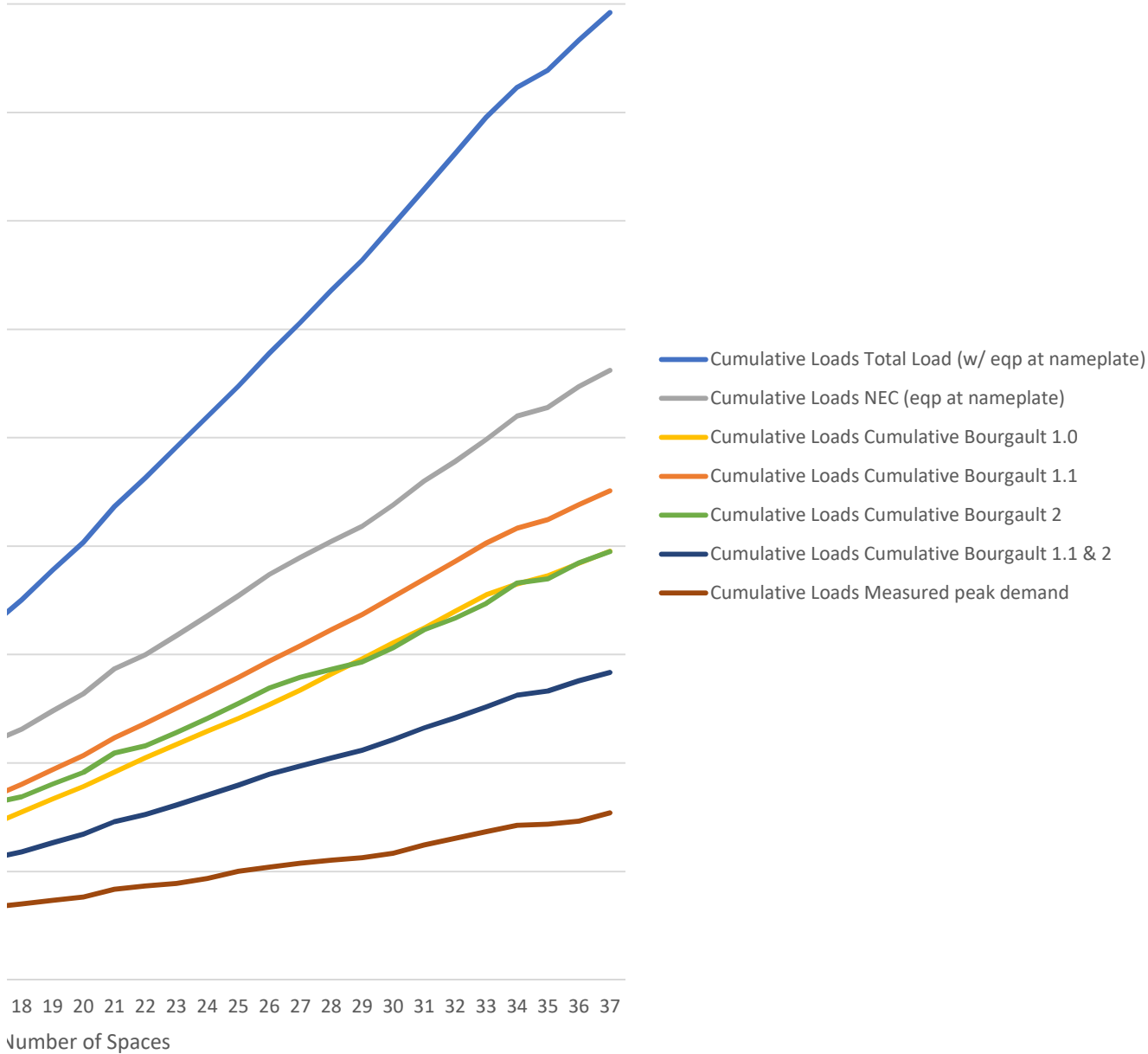
838,848	527,858	372,707	424,424	369,863
866,680	546,960	384,030	438,340	384,600
892,100	562,210	395,470	451,050	394,765

Cumulative Bourgault 1.1 & 2	Measured peak demand
14,571	1,900
17,901	5,190
22,083	8,980
26,174	12,650
31,792	15,660
38,058	21,420
42,583	23,420
47,353	27,270
55,254	33,690
61,466	37,690
69,957	43,470
75,988	45,820
82,093	49,700
89,258	53,410
95,018	56,560
103,967	60,910
111,908	67,050
118,028	69,940
126,510	73,350
134,414	76,280
145,866	83,510
152,481	86,680
161,277	88,850
170,281	93,600
179,584	100,220
189,431	103,960
197,308	107,610
204,688	110,390
211,708	112,560
221,470	116,720
232,443	124,400
241,523	130,640
251,642	136,590
262,514	142,510



266,429	143,540
275,980	146,410
283,605	153,960

Chart Title



**Public Comment No. 2200-NFPA 70-2018 [Section No. 220.14(I)]****(I) Receptacle Outlets.**

Except as covered in 220.14(J) ~~and (K)~~ and Section 517.23, receptacle outlets shall be calculated at not less than 180 volt-amperes for each single or for each multiple receptacle on one yoke. A single piece of equipment consisting of a multiple receptacle comprised of four or more receptacles shall be calculated at not less than 90 volt-amperes per receptacle. This provision shall not be applicable to the receptacle outlets specified in 210.11(C)(1) and (C)(2).

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
NFPA_70_Article_220..14_I_for_New_Section_517.23_Bourgault_Submission.pdf	Original substantiation for this enabling proposal.	

Statement of Problem and Substantiation for Public Comment

This change breaks the tie of 180 VA for health care facilities allowing 517.23 to dictate the load calculation.

Note, if the committee decides that demand factors for health care facilities should be in section 220, then this comment should be updated to point to the appropriate location in section 220.

This comment is substantially the same as the associated public input. We have (with related public comments) provided additional data to further substantiate the proposed change in load factors.

Additional substantiation provided in attachment

Related Public Comments for This Document

<u>Related Comment</u>	<u>Relationship</u>
Public Comment No. 2165-NFPA 70-2018 [New Section after 517.21]	this comment required so content of other public comments can govern demand factors
<u>Related Item</u>	
• 3585-NFPA 70-2017	

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Committee: NEC-P02

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Section 220.14 (I)

Change to 220.14 (I) Add new section 517.23 to paragraph. And Table 220.12: Delete Hospitals from table.

Substantiation

This change breaks the tie of 180 VA for health care facilities allowing 517.23 to dictate the load calculation

Due to the requirements of NFPA 99 and FGI Guidelines (which are enforced through the Federal Centers of Medicare & Medicaid Services) the outlet quantity in health care facilities are mandated to be far higher than normally encountered in other occupancies. This high density of outlets is intended to allow clinicians the flexibility to provide care in multiple case scenarios within the same space. In addition, many of these spaces are required to have a set of completely redundant electrical outlets to accommodate medical equipment in the event of an isolated electrical failure. In nearly all of these spaces, the outlets are not intended for simultaneous use.

Currently the calculated sizing of the distribution systems serving these outlets fall under the 180VA requirement outlined in NFPA 70 Article 220.14(L). Adherence to this requirement necessitates the calculation of exceedingly high load densities for typical clinical spaces. For example:

Article 517.19(C) (1) requires that a minimum of 36 receptacles be provided in each operating room. Per Article 220.14(L) a 400-square foot operating room will have a plug load density of 8.1VA / square foot (if duplex receptacles are used) or as high as 16.2VA / square foot if simplex receptacles are used. These load densities are significantly higher than the actual loads that are encountered in these spaces.

Several recent comprehensive studies including; *Plug and Process Loads in Medical Office Buildings*, *Quantifying Hospital Cord Connected Plug Loads in Inpatient Areas*, and *Healthcare Energy End-Use Monitoring* have concluded that the receptacle load densities in even the most acute healthcare spaces are far less than the presently mandated load densities. These studies have been provided as reference in this proposal.

The requirements of 220.14(L) lead to mandatory oversizing of the distribution components including, feeders, transformers and overcurrent protective devices. This larger equipment introduces several operational issues including higher arc-flash hazards in the clinical care environment.

This proposal is intended to seek relieve healthcare facilities from the mandatory requirements of Article 220.14(L) and place the minimum calculated load densities under the purview of Article 517. This Public Input proposal is intended to be accepted with a companion proposal to Article 517 which will introduce a new section 517.23 which will provide plug load densities for healthcare facilities.

**Public Comment No. 1235-NFPA 70-2018 [Section No. 220.14(J)]****(J) Dwelling Occupancies.**

In one-family, two-family, and multifamily dwellings, the minimum unit load shall be not less than 33 VA/m² (3 VA/ft²). The lighting and receptacle outlets specified in 220.14(J)(1), (J)(2), and (J)(3) are included in the minimum unit load. No additional load calculations shall be required for such outlets. The minimum lighting load shall be determined using the minimum unit load and the floor area as determined in 220.11 for dwelling occupancies. Motors rated less than 1/2 HP and connected to a lighting circuit shall be considered part of the minimum lighting load.

- (1) All general-use receptacle outlets of 20-ampere rating or less, including receptacles connected to the circuits in 210.11(C)(3) and 210.11(C)(4)
- (2) The receptacle outlets specified in 210.52(E) and (G)
- (3) The lighting outlets specified in 210.70(A) and ~~(B)~~ _

Statement of Problem and Substantiation for Public Comment

The restructuring of 220.14 extracted Hotel and Motel Occupancies from the 2017 article 220.14(J) which was shared with one, two and multifamily dwellings. List item (3) should remove the reference to 210.70(B) which only applies to Guest Rooms or Guest Suites.

The title "Dwelling Occupancies" should be changed to Dwelling Units to better correlate with language in Article 210.

Related Item

- FR 8076

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Public Comment No. 2192-NFPA 70-2018 [New Section after 220.44]

TITLE OF NEW CONTENT

220.45 Receptacle and Corded Connected Equipment Loads for Health Care Facilities

(A) **Receptacles in Health Care Facilities** . Rating of feeders, busses, transformers, generators, and services shall be calculated in accordance with Table 220.45(A), with respect to receptacles

Table 220.45(A) Receptacle Outlet Demand Factors for Health Care Facilities

<u>Portion of Receptacle Load to Which Demand Factor Applies (Volt-Amperes)</u>	<u>Demand Factor (%)</u>
First 5.0 kVA or less at	100
Second 5.0 kVA to 10 kVA at	50
Remainder over 10 kVA at	25

(B) **Receptacle Outlets in Health Care Facilities**. The maximum number of receptacle outlets connected to a 15 ampere branch circuit shall not exceed 6 outlets. The maximum number of receptacle outlets connected to a 20 ampere branch circuit shall not exceed 8 outlets.

(C) **Cord Connected Equipment Demand Factors** . Rating of feeders, busses, transformers, generators, and services shall be calculated in accordance with Table 220.45 (C) with respect to cord-connected equipment.

Table 220.45(C) Cord Connected Equipment Demand Factors for Health Care Facilities

<u>Number of Cord Connected Equipment</u>	<u>Percent of Full Load</u>
Largest 1 to 5 pieces	100
Additional (more than 5)	50

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
HospitalPowerUseStudy.xlsx	Study showing actual hospital demand and demand calculated using current NEC procedure and other potential options. Bourgault 1.1&2 is best option and is basis for proposed changes.	
NFPA_70_New_Section_517.23_B_Bourgault_Submission.pdf	Provides substantiation for Receptacle Outlets Maximum. (From Public Inputs)	
NFPA_70_New_Section_517.22_Bourgault_Submission.1504720288468-1.pdf	Provides substantiation for demand factors for receptacle loads. [This is what was submitted during public input.]	

Statement of Problem and Substantiation for Public Comment

I made several public inputs aimed at updating health care demand factors to more accurately reflected actual healthcare loads. These include 3565-NFPA 70-2017 [New Section after 517.21], 3583-NFPA 70-2017 [New Section after 517.21], 3577-NFPA 70-2017 [New Section after 517.21], 3588-NFPA 70-2017, 3585-NFPA 70-2017.

The response of the committee suggested that these proposals may belong in the 200 section instead of in the 517 section.

Sine the initial public input was submitted, we have completed a study on loading in hospitals and have updated (through public comments) the proposal to reflect this updated information.

This public comment is meant to serve the same purpose as the public comments associated with the original public inputs - to revise the healthcare demand factors. The substantiation for this comment is the same as for the public input and for the other public comments.

If it is ultimately decided that demand factors for healthcare are under the purview of section 200, instead of section 517, this proposal serves to effectuate the same outcome. If, on the other hand, it is decided that the demand factor content is appropriate in section 517 (where we originally proposed most of it) then this public comment will not be necessary.

Substantiation for these proposals is the same as for the associated public inputs and comments.

Related Public Comments for This Document

<u>Related Comment</u>		<u>Relationship</u>
<u>Public Comment No. 2165-NFPA 70-2018 [New Section after 517.21]</u>		This comment effectuates same result, but resides in section 220.
<u>Public Comment No. 2172-NFPA 70-2018 [New Section after 517.21]</u>		This comment effectuates same result, but resides in section 220.
<u>Related Item</u>		
• 3565-NFPA 70-2017 [New Section after 517.21]	• 3583-NFPA 70-2017 [New Section after 517.21]	• 3573-NFPA 70-2017 [New Section after 517.21]
		• 3577-NFPA 70-2017 [New Section after 517.21]
		• 3588-NFPA 70-2017
		• 3585-NFPA 70-2017

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Definitions

Method	Receptacle Loads
Current NEC	1st 10kVA @ 100% Remainder @ 50%
Bourgault 1.0	1st 10kVA @ 100% Remainder @ 50%
Bourgault 1.1	1st 10kVA @ 100% Remainder @ 50%
Bourgault 2	1st 5kVA @ 100% 2nd 5kVA @ 50% Remainder @ 25%
Bourgaut 1.1 & 2	1st 5kVA @ 100% 2nd 5kVA @ 50% Remainder @ 25%

TAB Summary:

Tab 1

Definitions

Tab 2

Current NEC

Tab 3	Bourgault 1.0
Tab 4	Bourgault 1.1
Tab 5	Bourgault 2
Tab 6	Bourgault 1.1 & 2
Tab 7	All Methods

Cord Connected Equipment
Nameplate Values
pieces <=5: all equip. @ 100% of nameplate value. 6 <= # pieces <= 10: all equip. @ 50% of nameplate value. # pieces > 10: all equip. @ 25% of nameplate value.
pieces <=5: all equip. @ 100% of nameplate value. # pieces > 5: all equip. @ 50% of nameplate value.
Nameplate Values
pieces <=5: all equip. @ 100% of nameplate value. # pieces > 5: all equip. @ 50% of nameplate value.

Definitions:

Current NEC
Cord

Bourgault 1 -

Bourgault 1.1

Bourgault 2 -

Bourgault 1.1

definitions of the different methods
comparison of connected to NEC to actual, including
safety factor

comparison of the NEC for recepts plus the proposed formula for medical equipment. You will see, from line 1, this method does not work in all cases.

Comparison of NEC for recepts and the REVISED formula for medical equipment, including safety factors

comparison of Nameplate for medical equipment, and the revised recep table we proposed, including safety factors.

revised recep table AND the revised formula for medical equipment

Depicts All Methods

- Recep Loads: 1st 10kVA @ 100%, remainder @ 50%
connected equipment: Nameplate values.

Recep Loads: 1st 10kVA @ 100%, remainder @ 50%;
Cord connected equipment: Less than 6 pieces @ 100%
pieces @ 50%, greater than 10 pieces @ 25% of namep

- Recep Loads: 1st 10kVA @ 100%, remainder @ 50%;
Cord connected equipment: Less than or equal to 5 piec
than 5 pieces @ 50% of nameplate values.

Recep Loads: 1st 5kVA @ 100%, 2nd 5kVA @ 50% rem
connected equipment: Nameplate Values.

- &2 - Recep Loads: 1st 5kVA @ 100%, 2nd 5kVA @ 50%
Cord connected equipment: Less than or equal to 5 pi
greater than 5 pieces @ 50% of nameplate values.

;

, btwn 6 and 10
plate values.

es @ 100%, greater

remainder at 25%; Cord

% remainder at 25%;
ieces @ 100%,

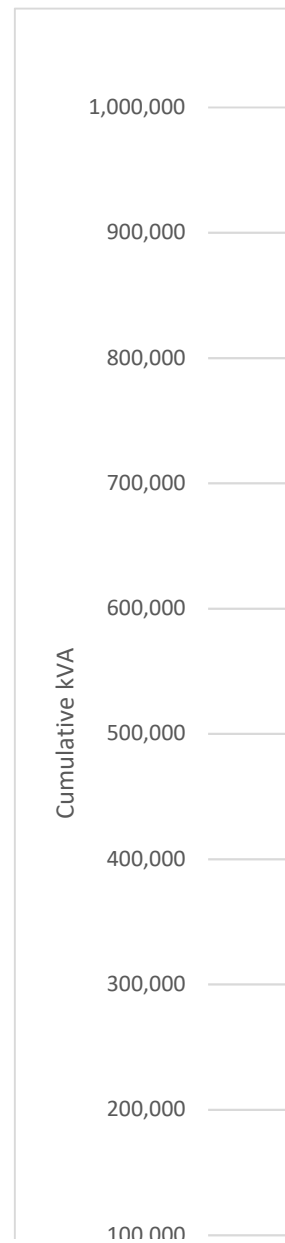
Row #	Connected Load (VA)					Measured Peak VA	NEC DEMAND LOAD	Safety Factor Above Measured Demand	Measured peak demand
	# Recepts	Recep load	# CORD CONN EQP	Cord Con Load (nameplate)	Total Conn. Load, equip at nameplate		CORD CONN AT nameplate	NEC (w/ eqp at nameplate)	
22	22	3,960	8	4,681	8,641	3,290	8,641	163%	3,290
37	113	20,340	5	5,080	25,420	7,550	20,250	168%	10,840
34	28	5,040	7	5,843	10,883	3,790	10,883	187%	14,630
26	47	8,460	7	8,302	16,762	5,760	16,762	191%	20,390
35	28	5,040	7	5,663	10,703	3,670	10,703	192%	24,060
16	3	540	23	16,712	17,252	5,780	17,252	198%	29,840
25	50	9,000	13	11,302	20,302	6,420	20,302	216%	36,260
21	92	16,560	9	7,602	24,162	6,140	20,882	240%	42,400
8	118	21,240	11	11,326	32,566	7,680	26,946	251%	50,080
9	107	19,260	14	8,976	28,236	6,620	23,606	257%	56,700
1	164	29,520	4	3,400	32,920	6,240	23,160	271%	62,940
20	102	18,360	1	360	18,720	3,850	14,540	278%	66,790
5	111	19,980	17	12,914	32,894	7,230	27,904	286%	74,020
7	147	26,460	10	7,007	33,467	5,950	25,237	324%	79,970
30	76	13,680	7	5,584	19,264	4,000	17,424	336%	83,970
15	110	19,800	6	2,310	22,110	3,880	17,210	344%	87,850
31	66	11,880	13	15,805	27,685	5,920	26,745	352%	93,770
10	28	5,040	21	8,716	13,756	3,010	13,756	357%	96,780
32	113	20,340	7	7,837	28,177	4,750	23,007	384%	101,530
24	119	21,420	5	3,620	25,040	3,710	19,330	421%	105,240
14	128	23,040	0	0	23,040	3,150	16,520	424%	108,390
27	57	10,260	18	12,767	23,027	4,350	22,897	426%	112,740

17	138	24,840	4	3,333	28,173	3,650	20,753	469%	116,390
12	147	26,460	0	0	26,460	3,170	18,230	475%	119,560
11	148	26,640	8	6,205	32,845	4,160	24,525	490%	123,720
23	136	24,480	0	0	24,480	2,890	17,240	497%	126,610
19	114	20,520	5	6,704	27,224	3,410	21,964	544%	130,020
18	117	21,060	8	9,165	30,225	3,740	24,695	560%	133,760
13	95	17,100	1	500	17,600	2,000	14,050	603%	135,760
28	112	20,160	8	5,728	25,888	2,930	20,808	610%	138,690
2	164	29,520	0	0	29,520	2,780	19,760	611%	141,470
29	106	19,080	2	2,522	21,602	2,350	17,062	626%	143,820
36	97	17,460	11	10,372	27,832	2,870	24,102	740%	146,690
4	156	28,080	0	0	28,080	2,170	19,040	777%	148,860
3	119	21,420	10	6,883	28,303	2,170	22,593	941%	151,030
33	87	15,660	0	0	15,660	1,030	12,830	1146%	152,060
6	156	28,080	9	5,101	33,181	1,900	24,141	1171%	153,960

Cumulative Loads			
Recep Load	Cord Conn Load (nameplate)	Total Load (w/ eqp at nameplate)	NEC (w/ eqp at nameplate)
3,960	4,681	8,641	8,641
24,300	9,761	34,061	26,911
29,340	15,604	44,944	35,274
37,800	23,906	61,706	47,806
42,840	29,569	72,409	55,989
43,380	46,281	89,661	72,971
52,380	57,583	109,963	88,773
68,940	65,185	134,125	104,655
90,180	76,511	166,691	126,601
109,440	85,487	194,927	145,207
138,960	88,887	227,847	163,367
157,320	89,247	246,567	172,907
177,300	102,161	279,461	195,811
203,760	109,168	312,928	216,048
217,440	114,752	332,192	228,472
237,240	117,062	354,302	240,682
249,120	132,867	381,987	262,427
254,160	141,583	395,743	273,663
274,500	149,420	423,920	291,670
295,920	153,040	448,960	306,000
318,960	153,040	472,000	317,520
329,220	165,807	495,027	335,417

Data For Graph:

Cumulative Loads		
Total Load (w/ eqp at nameplate)	NEC (eqp at nameplate)	Measured peak demand
8,641	8,641	3,290
34,061	26,911	10,840
44,944	35,274	14,630
61,706	47,806	20,390
72,409	55,989	24,060
89,661	72,971	29,840
109,963	88,773	36,260
134,125	104,655	42,400
166,691	126,601	50,080
194,927	145,207	56,700
227,847	163,367	62,940
246,567	172,907	66,790
279,461	195,811	74,020
312,928	216,048	79,970
332,192	228,472	83,970
354,302	240,682	87,850
381,987	262,427	93,770
395,743	273,663	96,780
423,920	291,670	101,530
448,960	306,000	105,240
472,000	317,520	108,390
495,027	335,417	112,740



354,060	169,140	523,200	351,170
380,520	169,140	549,660	364,400
407,160	175,345	582,505	383,925
431,640	175,345	606,985	396,165
452,160	182,049	634,209	413,129
473,220	191,214	664,434	432,824
490,320	191,714	682,034	441,874
510,480	197,442	707,922	457,682
540,000	197,442	737,442	472,442
559,080	199,964	759,044	484,504
576,540	210,336	786,876	503,606
604,620	210,336	814,956	517,646
626,040	217,219	843,259	535,239
641,700	217,219	858,919	543,069
669,780	222,320	892,100	562,210

523,200	351,170	116,390
549,660	364,400	119,560
582,505	383,925	123,720
606,985	396,165	126,610
634,209	413,129	130,020
664,434	432,824	133,760
682,034	441,874	135,760
707,922	457,682	138,690
737,442	472,442	141,470
759,044	484,504	143,820
786,876	503,606	146,690
814,956	517,646	148,860
843,259	535,239	151,030
858,919	543,069	152,060
892,100	562,210	153,960

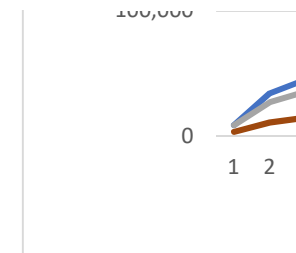
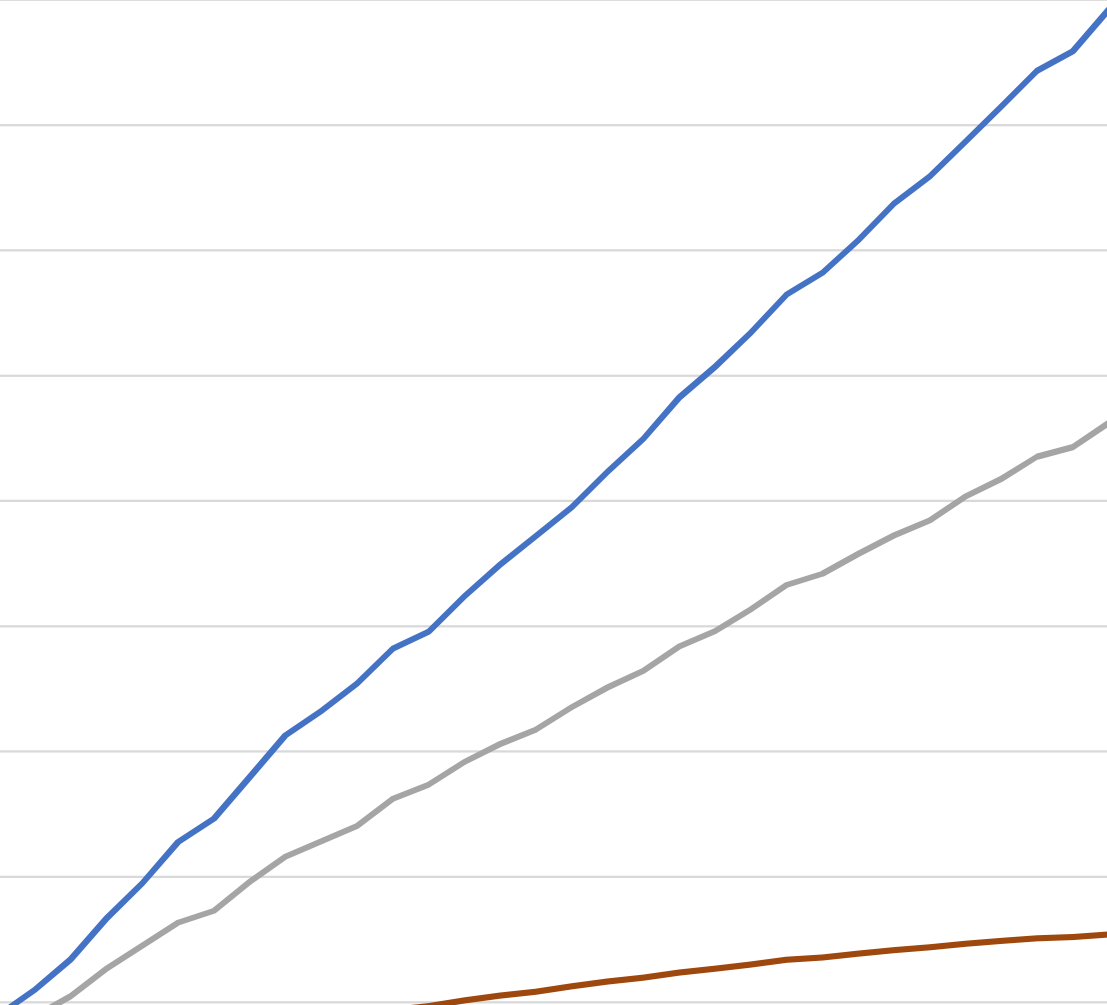


Chart Title

- Cumulative Loads Total Load (w/ eqp at
- Cumulative Loads NEC (eqp at nameplat
- Cumulative Loads Measured peak dema

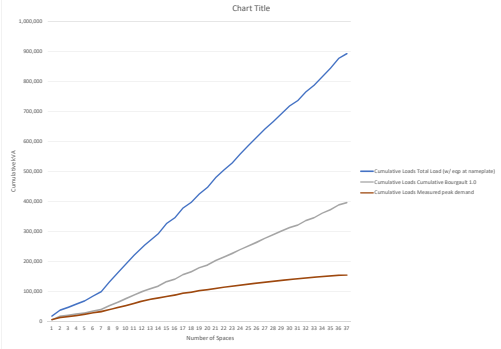




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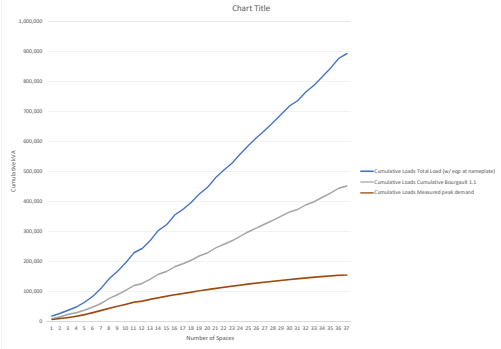
Row #	Connected Load (VA)					Measure Peak VA	Bourgauff 1.0		Safety Factor Above Measured Demand	Cumulative Loads					Cumulative Loads		
	# Phases	Recept Load	# COND Connected	Cond Conn Load (nameplate)	Total Cond. Load, eqpt at nameplate		% of REC, eqpt at Bourgauff	Bourgauff 1.0		Measured peak demand	Recept Load	Cond Conn Load (nameplate)	Total Load (w/ eqpt at nameplate)	Cumulative Bourgauff 1.0	Total Load (w/ eqpt at nameplate)	Cumulative Bourgauff 1.0	Measured peak demand
16	3	540	23	16,712	17,252	1,760	4,718	18%	5,760	140	16,712	17,252	4,718	17,252	4,718	5,760	
20	3	9,000	11	11,000	20,000	4,400	11,000	4%	11,000	1,600	16,600	17,200	11,000	17,200	16,600	11,000	
22	22	3,960	6	4,681	8,641	8,260	6,501	82%	15,480	11,500	32,695	46,195	19,924	46,195	19,924	15,480	
24	24	6,940	7	3,463	10,403	8,790	7,962	110%	10,260	16,540	18,538	17,018	23,905	17,018	23,905	10,260	
35	24	5,940	7	3,663	10,703	9,070	7,972	114%	11,950	21,600	44,551	67,761	27,840	67,761	27,840	11,950	
26	47	8,460	7	8,382	16,762	8,760	12,611	110%	26,710	11,040	52,593	84,543	34,546	84,543	34,546	26,710	
10	28	5,940	21	8,756	13,756	1,000	7,819	146%	11,720	17,080	61,119	98,339	38,405	98,339	38,405	11,720	
8	118	21,240	11	11,326	32,566	7,680	16,452	140%	39,400	58,320	72,145	130,865	52,296	130,865	52,296	39,400	
15	82	14,860	21	12,696	27,556	7,260	14,860	132%	46,700	29,200	68,360	128,560	49,400	128,560	49,400	46,700	
5	111	19,980	17	12,604	32,584	7,260	18,210	132%	52,350	60,180	101,364	161,444	71,406	161,444	71,406	52,350	
9	107	19,250	14	8,076	26,326	6,520	16,874	155%	35,170	105,480	116,240	218,680	87,380	218,680	87,380	35,170	
37	111	20,340	5	3,980	24,320	7,950	20,520	108%	46,700	129,780	115,300	245,300	86,750	245,300	86,750	46,700	
21	87	16,550	9	7,682	24,232	6,340	17,081	138%	72,880	146,340	112,022	265,262	108,005	265,262	108,005	72,880	
27	57	16,340	16	12,767	29,107	8,500	18,352	206%	77,210	158,400	135,680	292,380	117,221	292,380	117,221	77,210	
7	147	26,460	10	7,687	34,147	9,500	21,714	265%	81,180	183,060	142,696	325,756	132,204	325,756	132,204	81,180	
30	76	13,680	7	3,364	17,044	4,000	14,612	260%	87,180	136,740	148,261	245,101	100,440	245,101	100,440	87,180	
1	164	26,320	4	8,460	34,780	4,940	23,160	271%	91,400	234,360	151,480	377,940	150,620	377,940	150,620	91,400	
20	102	18,160	3	3,802	21,962	3,850	14,540	238%	37,710	244,630	152,040	396,660	165,120	396,660	165,120	37,710	
12	111	20,160	7	7,817	27,977	9,750	19,089	325%	107,000	264,760	159,877	424,817	177,499	424,817	177,499	107,000	
15	110	19,800	6	2,100	21,900	4,880	16,005	314%	109,880	264,760	162,187	446,047	187,817	446,047	187,817	109,880	
11	108	26,440	8	6,201	32,640	4,160	21,413	412%	110,000	111,400	168,392	478,792	202,708	478,792	202,708	110,000	
24	119	21,420	5	8,620	25,040	9,710	19,100	421%	119,700	112,820	172,012	504,812	214,413	504,812	214,413	119,700	
14	116	21,040	0	0	21,040	6,100	16,120	449%	116,960	165,880	172,012	527,872	225,913	527,872	225,913	116,960	
18	117	21,000	8	8,385	29,385	7,760	20,111	458%	119,400	154,800	181,177	538,007	238,764	538,007	238,764	119,400	
17	118	24,840	4	3,183	28,023	8,600	20,753	488%	124,260	461,760	184,510	586,770	252,068	586,770	252,068	124,260	
36	87	17,460	11	10,172	27,632	4,870	16,511	469%	117,480	419,220	194,882	614,102	263,311	614,102	263,311	117,480	
12	147	26,460	0	0	26,460	8,170	18,130	470%	130,100	461,680	194,882	640,562	276,561	640,562	276,561	130,100	
23	106	26,460	0	0	26,460	8,900	22,460	490%	133,200	431,580	194,882	659,562	286,800	659,562	286,800	133,200	
28	111	20,160	8	9,708	25,868	4,900	17,044	525%	136,170	400,320	200,010	680,500	300,311	680,500	300,311	136,170	
10	114	20,520	5	6,794	27,314	8,450	21,864	548%	139,560	510,840	207,314	718,154	312,240	718,154	312,240	139,560	
13	95	17,100	1	360	17,460	4,000	14,060	689%	141,560	527,940	207,814	735,754	320,924	735,754	320,924	141,560	
3	164	26,320	0	0	26,320	9,780	19,760	611%	144,540	557,460	207,814	763,274	335,684	763,274	335,684	144,540	
26	105	19,080	1	1,513	21,593	3,500	17,081	626%	146,000	536,540	210,106	766,616	341,614	766,616	341,614	146,000	
4	164	26,080	0	0	26,080	9,170	19,040	777%	148,880	604,620	210,316	814,956	359,884	814,956	359,884	148,880	
6	119	21,420	10	6,880	28,300	9,170	19,152	789%	151,000	626,040	212,219	844,219	372,425	844,219	372,425	151,000	
5	116	26,080	9	3,761	31,181	9,900	21,501	1038%	151,500	654,120	222,100	876,440	387,640	876,440	387,640	151,500	
83	87	15,460	0	0	15,460	4,030	12,830	1146%	155,960	660,780	222,100	892,100	395,470	892,100	395,470	155,960	

Data For Graph:



Row #	Connected Load (VA)					Measure Peak VA	Bourgauff 1.1		Safety Factor Above Measured Demand		Cumulative Loads					Cumulative Loads		
	# Phases	Recept Load	# COND. CONNS (2P)	Cond Conn Load (nameplate)	Total Conn. Load, eqpt at nameplate		req at BEC, eqpt at Bourgauff	Bourgauff 1.1	Measured peak demand	Recept Load	Cond Conn Load (nameplate)	Total Load (w/ eqpt at nameplate)	Cumulative Bourgauff 1.1	Total Load (w/ eqpt at nameplate)	Cumulative Bourgauff 1.1	Measured peak demand		
16	3	540	23	16,712	17,252	5,760	8,806	54%	5,780	340	16,712	17,252	8,806	17,252	8,806	5,780		
22	21	3,060	8	4,881	8,441	3,200	6,301	97%	6,070	4,000	21,381	25,881	23,227	23,881	23,227	6,070		
34	28	5,040	7	3,843	10,883	5,790	7,062	100%	12,860	0,540	27,236	36,776	23,518	36,776	23,518	12,860		
35	28	5,040	7	3,843	10,793	5,670	7,072	114%	10,530	14,080	32,699	47,479	28,740	47,479	28,740	10,530		
26	41	8,460	7	8,362	15,762	7,760	12,613	135%	17,250	23,040	45,301	64,341	37,121	64,341	37,121	17,250		
25	50	9,000	13	13,802	20,302	8,400	14,051	128%	28,720	33,040	52,503	84,543	42,272	84,543	42,272	28,720		
17	111	20,340	5	5,080	25,420	1,550	20,250	148%	36,260	52,380	57,583	109,963	51,880	109,963	50,960	36,260		
8	118	21,240	11	11,326	32,566	7,680	21,383	177%	43,940	71,620	68,909	142,320	76,265	142,320	76,265	43,940		
24	82	16,560	7	7,642	24,202	4,480	17,080	176%	35,680	40,880	45,344	86,560	46,740	86,560	46,740	35,680		
9	107	19,260	14	8,976	28,236	6,620	16,118	188%	36,300	400,440	85,487	384,927	102,454	384,927	102,454	36,300		
5	111	19,980	17	13,054	32,894	7,230	21,467	197%	45,830	129,430	98,401	247,577	118,911	247,577	118,911	45,830		
10	28	5,040	21	8,756	13,796	3,010	9,388	222%	46,360	134,400	107,117	245,777	125,709	245,777	125,709	46,360		
31	66	11,880	13	15,805	27,685	6,520	18,841	218%	72,860	146,340	122,022	265,262	138,615	265,262	138,615	72,860		
7	101	26,440	10	1,007	27,447	3,960	25,734	265%	58,810	173,800	128,009	302,129	156,365	302,129	156,365	58,810		
30	76	13,680	7	5,584	19,264	4,000	14,632	260%	82,812	186,480	135,513	321,993	165,997	321,993	165,997	82,812		
1	165	29,520	4	4,800	34,320	6,480	21,360	271%	89,020	218,001	138,513	354,513	182,457	354,513	182,457	89,020		
12	102	18,000	1	860	18,760	4,800	14,460	276%	91,960	234,360	139,773	373,533	191,817	373,533	191,817	91,960		
27	117	30,240	18	12,367	42,607	8,350	16,514	280%	17,710	244,630	152,040	424,817	217,419	424,817	217,419	17,710		
13	111	20,340	7	7,017	27,357	9,750	19,089	302%	107,000	264,760	158,977	424,817	217,419	424,817	217,419	107,000		
15	110	19,800	6	2,101	22,101	4,880	16,005	314%	108,880	384,760	162,187	446,047	228,474	446,047	228,474	108,880		
11	108	26,440	8	6,201	32,641	4,160	21,433	421%	110,000	313,400	168,392	478,792	244,808	478,792	244,808	110,000		
24	119	21,420	5	8,620	29,040	5,710	19,100	421%	118,700	312,820	172,012	504,812	257,438	504,812	257,438	118,700		
14	118	21,040	0	0	21,040	6,100	16,320	449%	116,960	355,880	172,012	527,872	268,296	527,872	268,296	116,960		
18	117	21,000	8	3,385	24,225	5,760	20,113	489%	109,620	158,920	181,177	558,097	288,609	558,097	288,609	109,620		
17	118	26,840	4	3,883	28,173	6,650	20,753	489%	124,260	401,760	184,510	586,270	298,135	586,270	298,135	124,260		
12	107	26,460	0	0	26,460	1,170	18,330	475%	117,460	408,220	184,510	612,190	313,365	612,190	313,365	117,460		
23	116	24,480	0	0	24,480	4,880	17,440	497%	130,320	451,700	184,510	637,210	323,695	637,210	323,695	130,320		
26	102	26,160	6	6,320	32,480	4,920	21,044	524%	113,000	427,600	196,238	653,898	335,548	653,898	335,548	113,000		
10	114	20,320	5	6,704	27,024	4,420	21,064	544%	116,390	401,380	196,942	680,122	336,141	680,122	336,141	116,390		
36	97	17,460	11	10,372	27,832	6,070	18,916	559%	120,560	510,840	207,314	718,154	364,077	718,154	364,077	120,560		
13	95	17,100	1	369	17,469	4,000	14,069	609%	141,560	327,480	207,814	735,764	372,877	735,764	372,877	141,560		
3	164	29,520	0	0	29,520	4,780	19,760	611%	144,540	157,460	207,814	763,274	387,637	763,274	387,637	144,540		
28	105	19,080	1	1,523	21,063	3,350	17,063	626%	146,000	358,540	210,106	786,616	388,438	786,616	388,438	146,000		
4	164	28,080	0	0	28,080	2,170	19,040	777%	148,880	404,620	210,106	814,956	412,478	814,956	412,478	148,880		
1	119	21,420	10	6,881	28,301	2,170	19,152	789%	151,000	406,040	217,219	844,219	426,630	844,219	426,630	151,000		
6	116	26,080	9	3,351	31,181	3,900	21,501	838%	153,500	604,120	222,101	876,441	441,221	876,441	441,221	153,500		
33	87	15,460	0	0	15,460	2,170	12,830	1146%	235,960	660,780	222,101	892,101	461,020	892,101	461,020	235,960		

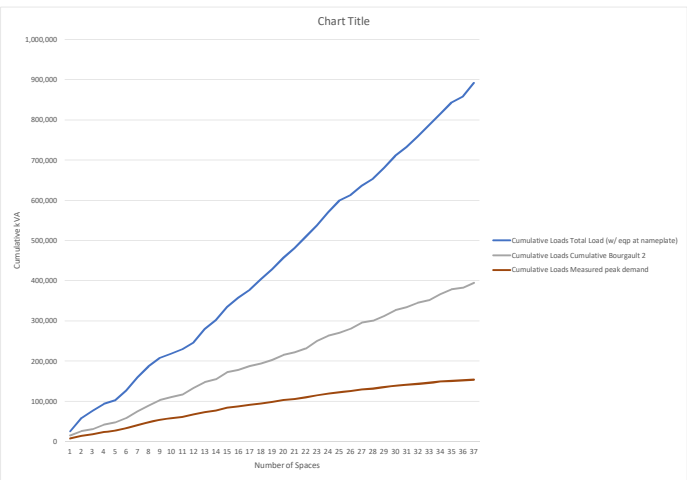
Data For Graph:



Row #	Connected Load (VA)					Measured Peak VA	Bourgault 2	Safety Factor Above Measured Demand	Cumulative Loads				
	# Recepts	Recept load	# CORD CONN ECP	Cord Con Load (nameplate)	Total Conn. Load, equip at nameplate		rec at Bourgault, eqp at nameplate	Bourgault 2	Measured peak demand	Recept Load	Cord Conn Load (nameplate)	Total Load (w/ eqp at nameplate)	Cumulative Bourgault 2
37	113	20,340	5	5,080	25,420	7,550	15,165	101%	7,550	20,340	5,080	25,420	15,165
1	164	29,520	4	3,400	32,920	6,240	15,780	153%	13,790	49,860	8,480	58,340	25,945
20	102	18,360	1	360	18,720	3,850	9,950	158%	17,640	68,220	8,840	77,060	30,895
26	47	8,460	7	8,302	16,762	5,760	15,032	161%	23,400	76,680	17,142	93,822	41,312
22	22	3,960	8	4,681	8,641	3,290	8,641	163%	26,690	80,640	21,823	102,463	46,983
21	92	16,560	9	7,602	24,162	6,140	16,742	173%	32,830	97,200	29,425	126,625	58,725
8	118	21,240	11	11,326	32,566	7,680	21,636	182%	40,510	118,440	40,751	159,191	75,361
9	107	19,260	14	8,976	28,236	6,620	18,791	184%	47,130	137,700	45,727	187,427	89,152
25	50	9,000	13	11,302	20,302	6,420	18,302	185%	53,550	146,700	61,049	207,729	102,704
34	28	5,040	7	5,843	10,883	3,790	10,863	187%	57,240	151,740	66,872	218,612	109,807
35	28	5,040	7	5,663	10,703	3,670	10,683	191%	61,010	156,780	72,535	229,315	116,730
16	3	540	23	16,712	17,252	5,780	17,252	198%	66,790	157,320	89,247	246,567	133,577
7	147	26,460	10	7,007	33,467	5,950	18,622	213%	72,740	183,780	96,254	280,034	147,199
15	110	19,800	6	2,310	22,110	3,880	12,260	216%	76,620	203,580	98,564	302,144	154,459
5	111	19,980	17	12,914	32,894	7,230	22,909	217%	83,850	223,560	111,478	335,038	172,368
14	128	23,040	0	0	23,040	3,150	10,760	242%	87,000	246,600	111,478	358,078	178,128
30	76	13,680	7	5,584	19,264	4,000	14,004	250%	91,000	260,280	117,062	377,342	187,132
12	147	26,460	0	0	26,460	3,170	11,615	266%	94,170	286,740	117,062	403,802	193,747
24	119	21,420	5	3,620	25,040	3,710	13,975	277%	97,880	308,160	120,682	428,842	202,722
32	113	20,340	7	7,837	28,177	4,750	17,922	277%	102,630	328,500	128,519	457,019	215,644
23	136	24,480	0	0	24,480	2,890	11,120	285%	105,520	352,980	128,519	481,499	221,764
17	138	24,840	4	3,333	28,173	3,650	14,543	298%	109,170	377,820	131,852	509,672	231,307
31	66	11,880	13	15,805	27,685	5,920	23,775	302%	115,090	389,700	147,697	537,357	250,082
11	148	26,640	8	6,205	32,845	4,160	17,865	329%	119,250	416,340	153,862	570,202	282,947
2	164	29,520	0	0	29,520	2,780	12,380	345%	122,030	445,860	153,862	599,722	270,327
10	28	5,040	21	8,716	13,756	3,010	13,736	356%	125,040	450,900	162,578	613,478	280,303
27	57	10,260	18	12,767	23,027	4,350	20,332	367%	129,390	461,160	175,345	636,505	295,635
13	95	17,100	1	500	17,600	2,000	9,775	389%	131,390	478,260	175,845	654,105	300,410
19	114	20,520	5	6,704	27,224	3,410	16,834	394%	134,800	498,780	182,549	681,329	312,244
18	117	21,060	8	9,165	30,225	3,740	19,430	420%	138,540	510,840	191,714	711,554	326,674
29	106	19,080	2	2,522	21,602	2,350	12,292	423%	140,890	538,920	194,236	733,156	333,966
28	112	20,160	8	5,728	25,888	2,930	15,768	438%	143,820	559,080	199,964	759,044	344,734
4	156	28,080	0	0	28,080	2,170	12,020	454%	145,990	587,160	199,964	787,124	351,754
36	97	17,460	11	10,372	27,832	2,870	19,737	588%	148,860	604,620	210,336	814,956	366,491
3	119	21,420	10	6,883	28,303	2,170	17,238	694%	151,030	626,040	217,219	843,259	378,729
33	87	15,660	0	0	15,660	1,030	8,915	766%	152,060	641,700	217,219	858,919	382,644
6	156	28,080	9	5,101	33,181	1,900	17,121	801%	153,960	669,780	222,320	892,100	394,765

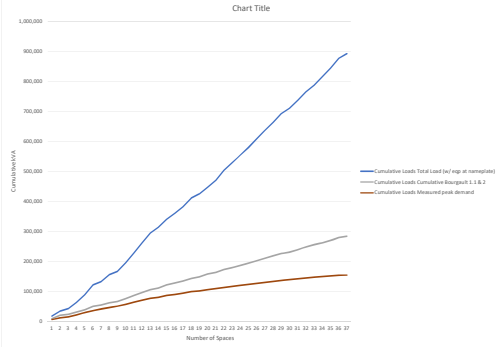
Data For Graph:

Cumulative Loads		
Total Load (w/ eqp at nameplate)	Cumulative Bourgault 2	Measured peak demand
25,420	15,165	7,550
58,340	25,945	13,790
77,060	30,895	17,640
93,822	41,312	23,400
102,463	46,983	26,690
126,625	58,725	32,830
159,191	75,361	40,510
187,427	89,152	47,130
207,729	102,704	53,550
218,612	109,807	57,240
229,315	116,730	61,010
246,567	133,577	66,790
280,034	147,199	72,740
302,144	154,459	76,620
315,038	172,368	83,850
358,078	178,128	87,000
377,342	187,132	91,000
403,802	193,747	94,170
428,842	202,722	97,880
457,019	215,644	102,630
481,499	221,764	105,520
509,672	231,307	109,170
537,357	250,082	115,090
570,202	262,947	119,250
599,722	270,327	122,030
613,478	280,303	125,040
636,505	295,635	129,390
654,105	300,410	131,390
681,329	312,244	134,800
711,554	326,674	138,540
733,156	333,966	140,890
759,044	344,734	143,820
787,124	351,754	145,990
814,956	366,491	148,860
843,259	378,729	151,030
858,919	382,644	152,060
892,100	394,765	153,960



Row #	Connected Load (VA)					Measured Peak VA	Bourgauf 1.1 & 2		Safety Factor Above Measured Demand	Cumulative Loads					Cumulative Loads			
	# Phases	Recept Load	# COMB COMB USE	Cent Com Load (nameplate)	Total Com. Load, (recept at nameplate)		recept at Bourgauf 1.1	recept at Bourgauf 1.2		Recept Load	Cent Com Load (nameplate)	Total Load (recept at nameplate)	Cumulative Bourgauf 1.1 & 2	Total Load (recept at nameplate)	Cumulative Bourgauf 1.1 & 2	Measured peak demand		
16	3	540	23	16,712	17,252	5,760	8,806	546	5,760	140	16,712	17,252	8,806	17,252	8,806	5,760		
26	47	8,460	7	8,301	16,761	3,760	10,881	876	33,460	3,000	23,414	34,014	33,027	34,014	33,027	33,460		
22	22	3,960	8	4,681	8,641	3,260	6,301	926	14,830	12,060	20,695	42,655	23,088	42,655	23,088	14,830		
25	100	9,000	13	11,802	20,802	6,400	12,653	876	21,250	21,900	40,897	62,857	30,989	62,857	30,989	21,250		
17	111	20,140	5	5,060	25,200	4,000	15,305	1035	36,360	43,360	46,377	86,377	36,377	86,377	36,377	25,200		
8	118	21,240	11	11,376	32,616	7,680	15,873	1080	36,480	63,540	57,403	120,943	49,587	120,943	49,587	32,616		
14	28	5,640	7	5,881	10,881	3,760	7,862	1,100	40,270	68,580	63,346	111,626	53,708	111,626	53,708	40,270		
21	92	16,560	9	7,602	24,162	6,340	12,941	1,116	46,420	81,140	70,848	155,988	62,709	155,988	62,709	24,162		
36	28	5,640	7	5,881	10,881	3,760	7,862	1,100	40,270	68,580	63,346	111,626	53,708	111,626	53,708	40,270		
39	107	19,260	14	8,976	28,236	6,620	14,303	1,305	56,300	100,440	85,487	194,927	75,304	194,927	75,304	28,236		
5	111	19,880	17	13,854	33,734	7,230	16,462	1,188	61,930	129,420	98,401	227,821	86,536	227,821	86,536	33,734		
1	164	29,320	4	3,960	33,280	6,240	15,780	1,036	76,170	154,460	171,803	266,741	76,836	266,741	76,836	33,280		
7	147	26,460	10	7,680	34,140	6,960	15,118	1,046	76,120	185,460	108,808	284,268	106,754	284,268	106,754	34,140		
20	103	18,360	1	960	19,320	1,800	9,566	1,080	78,870	203,760	109,148	312,908	103,524	312,908	103,524	19,320		
31	66	11,880	13	15,955	27,835	6,520	15,873	1,080	81,800	215,640	124,873	340,513	121,397	340,513	121,397	27,835		
36	16	13,680	7	5,384	19,064	4,000	11,212	1,060	89,890	228,310	135,557	359,877	127,809	359,877	127,809	19,064		
15	110	19,800	9	2,930	22,730	4,880	15,105	1,060	81,770	249,110	132,407	381,507	133,714	381,507	133,714	22,730		
12	113	20,140	7	7,817	27,957	6,750	14,004	1,090	86,320	269,460	140,704	410,164	142,717	410,164	142,717	27,957		
10	8	5,640	21	8,716	14,356	1,070	9,718	2,126	101,130	274,500	149,420	423,520	148,130	423,520	148,130	14,356		
27	17	10,260	18	13,797	24,057	4,800	13,049	2,210	100,480	284,760	162,187	446,947	157,284	446,947	157,284	24,057		
14	128	17,040	0	0	17,040	4,110	18,760	1,420	109,020	327,800	162,187	489,987	163,594	489,987	163,594	17,040		
11	148	26,640	8	6,206	32,846	4,460	14,763	2,006	113,100	334,440	168,392	502,832	172,836	502,832	172,836	32,846		
12	147	26,460	0	0	26,460	4,170	11,615	2,060	116,360	360,900	168,392	529,292	179,421	529,292	179,421	26,460		
24	118	21,420	5	3,620	25,040	4,710	13,676	2,776	119,070	363,330	172,012	554,312	186,386	554,312	186,386	25,040		
23	136	24,480	0	0	24,480	4,890	11,120	2,806	122,960	406,800	172,012	578,812	182,206	578,812	182,206	24,480		
18	117	21,060	8	5,885	26,945	3,940	14,644	2,076	126,700	421,800	184,177	605,977	202,524	605,977	202,524	26,945		
17	118	24,840	4	3,333	28,173	4,600	14,543	2,080	130,320	453,700	184,510	637,210	210,430	637,210	210,430	28,173		
28	127	26,560	8	5,214	31,774	4,930	14,364	2,100	133,280	479,680	196,239	659,919	224,334	659,919	224,334	31,774		
13	85	17,100	1	500	17,600	2,000	9,775	3,080	138,660	510,480	190,738	710,218	230,230	710,218	230,230	17,600		
19	144	26,320	5	6,504	32,824	4,450	16,814	3,060	144,470	560,000	197,442	737,442	238,721	737,442	238,721	32,824		
36	97	17,460	11	15,873	33,333	4,870	14,551	4,076	144,340	557,460	207,814	765,274	248,272	765,274	248,272	33,333		
29	106	19,080	1	1,507	20,587	3,760	12,393	4,036	146,020	556,540	210,316	786,856	254,330	786,856	254,330	20,587		
4	146	28,080	0	0	28,080	4,170	12,020	4,046	148,890	604,620	210,316	814,956	261,321	814,956	261,321	28,080		

Data For Graph:



The graph illustrates the performance of various cut selection methods in terms of the number of cuts generated over 37 iterations. The proposed method (all stage cut selection) generates the most cuts, while the proposed method (all stage cut selection) + 31.25 iterations generates the fewest cuts.

Number of cuts	Proposed method (all stage cut selection)	Proposed method (all stage cut selection) + 1000 iterations	Proposed method (all stage cut selection) + 500 iterations	Proposed method (all stage cut selection) + 250 iterations	Proposed method (all stage cut selection) + 125 iterations	Proposed method (all stage cut selection) + 62.5 iterations	Proposed method (all stage cut selection) + 31.25 iterations
0	0	0	0	0	0	0	0
5000	5	2	1	0.5	0.2	0.1	0.05
10000	10	4	2	1	0.5	0.2	0.1
15000	15	6	3	1.5	0.7	0.3	0.15
20000	20	8	4	2	1	0.4	0.2
25000	25	10	5	2.5	1.2	0.5	0.25
30000	30	12	6	3	1.5	0.6	0.3

New Section

517.23 (B) **Receptacle Outlets.** The maximum number of receptacle outlets connected to a 15 ampere branch circuit shall not exceed 6 outlets. The maximum number of receptacle outlets connected to a 20 ampere branch circuit shall not exceed 8 outlets.

Substantiation

This section is needed to support new section 517.23 (A). It establishes necessary limits for the number of receptacles permitted on a branch circuit.

Due to the requirements of NFPA 99 and FGI Guidelines (which are enforced through the Federal Centers of Medicare & Medicaid Services) the outlet quantity in health care facilities are mandated to be far higher than normally encountered in other occupancies. This high density of outlets is intended to allow clinicians the flexibility to provide care in multiple case scenarios within the same space. In addition, many of these spaces are required to have a set of completely redundant electrical outlets to accommodate medical equipment in the event of an isolated electrical failure. In nearly all of these spaces, the outlets are not intended for simultaneous use.

Currently the calculated sizing of the distribution systems serving these outlets fall under the 180VA requirement outlined in NFPA 70 Article 220.14(L). Adherence to this requirement necessitates the calculation of exceedingly high load densities for typical clinical spaces. For example:

Article 517.19(C) (1) requires that a minimum of 36 receptacles be provided in each operating room. Per Article 220.14(L) a 400-square foot operating room will have a plug load density of 8.1VA / square foot (if duplex receptacles are used) or as high as 16.2VA / square foot if simplex receptacles are used. These load densities are significantly higher than the actual loads that are encountered in these spaces.

Several recent comprehensive studies including; *Plug and Process Loads in Medical Office Buildings*, *Quantifying Hospital Cord Connected Plug Loads in Inpatient Areas*, and *Healthcare Energy End-Use Monitoring* have concluded that the receptacle load densities in even the most acute healthcare spaces are far less than the presently mandated load densities. These studies have been provided as reference in this proposal.

The requirements of 220.14(L) lead to mandatory oversizing of the distribution components including, feeders, transformers and overcurrent protective devices. This larger equipment introduces several operational issues including higher arc-flash hazards in the clinical care environment.

This proposal is intended to seek relieve healthcare facilities from the mandatory requirements of Article 220.14(L) and place the minimum calculated load densities under the purview of Article 517. This Public Input proposal is intended to be accepted with a companion proposal to Article 517 which will introduce a new section 517.25 which will provide plug load densities for healthcare facilities.

New Section

517.22 Health Care Facilities. Rating of feeders, busses, transformers, generators, and services shall be calculated in accordance with Table 517.22, with respect to receptacles and cord-connected equipment.

Table 517.22 Receptacle Outlet and Cord Connected Equipment Demand Factors for Health Care Facilities

Portion of Receptacle Load to Which Demand Factor Applies (Volt-Amperes)	Demand Factor (%)
First 5.0 kVA or less at	100
Second 5.0 kVA to 10 kVA at	50
Remainder over 10 kVA at	25

Substantiation

Due to the requirements of NFPA 99 and FGI Guidelines (which are enforced through the Federal Centers of Medicare & Medicaid Services) the outlet quantity in health care facilities are mandated to be far higher than normally encountered in other occupancies. This high density of outlets is intended to allow clinicians the flexibility to provide care in multiple case scenarios within the same space. In addition, many of these spaces are required to have a set of completely redundant electrical outlets to accommodate medical equipment in the event of an isolated electrical failure. In nearly all of these spaces, the outlets are not intended for simultaneous use.

Currently the calculated sizing of the distribution systems serving these outlets fall under the 180VA requirement outlined in NFPA 70 Article 220.14(L). Adherence to this requirement necessitates the calculation of exceedingly high load densities for typical clinical spaces. For example:

Article 517.19(C) (1) requires that a minimum of 36 receptacles be provided in each operating room. Per Article 220.14(L) a 400-square foot operating room will have a plug load density of 8.1VA / square foot (if duplex receptacles are used) or as high as 16.2VA / square foot if simplex receptacles are used. These load densities are significantly higher than the actual loads that are encountered in these spaces.

Several recent comprehensive studies including; *Plug and Process Loads in Medical Office Buildings*, *Quantifying Hospital Cord Connected Plug Loads in Inpatient Areas*, and *Healthcare Energy End-Use Monitoring* have concluded that the receptacle load densities in even the most acute healthcare spaces are far less than the presently mandated load densities. These studies have been provided as reference in this proposal.

The requirements of 220.14(L) lead to mandatory oversizing of the distribution components including, feeders, transformers and overcurrent protective devices. This larger equipment introduces several operational issues including higher arc-flash hazards in the clinical care environment.

This proposal is intended to seek relieve healthcare facilities from the mandatory requirements of Article 220.14(L) and place the minimum calculated load densities under the purview of Article 517. This Public Input proposal is intended to be accepted with a companion proposal to Article 517 which will introduce a new section 517.22 which will provide plug load densities for healthcare facilities.

Additional Input:

Change to 220.44: Receptacle Loads -- Other Than Dwelling Units and **Health Care Facilities**. A separate submission has been made to Article 220 for this change.

Substantiation:

By adding Health Care Facilities to the title of this section, this table no longer applies to health care facilities and it allows for different demand factors as identified in new section 517.22.

**Public Comment No. 2178-NFPA 70-2018 [Section No. 220.44]****220.44 Receptacle Loads — Other Than Dwelling Units and Health Care Facilities .**

Receptacle loads calculated in accordance with 220.14(H) and (I) shall be permitted to be made subject to the demand factors given in Table 220.42 or Table 220.44.

Table 220.44 Demand Factors for Non-Dwelling Receptacle Loads

<u>Portion of Receptacle Load to Which Demand Factor Applies (Volt-Amperes)</u>	<u>Demand Factor (%)</u>
First 10 kVA or less at	100
Remainder over 10 kVA at	50

Statement of Problem and Substantiation for Public Comment

Necessary so that healthcare facilities can use different demand factors as identified in section 517.22 and 517.23

By adding Health Care Facilities to the title, this table no longer applies to health care facilities and it allows for different demand factors as identified in new section 517.22 and 517.23

Due to the requirements of NFPA 99 and FGI Guidelines (which are enforced through the Federal Centers of Medicare & Medicaid Services) the outlet quantity in health care facilities are mandated to be far higher than normally encountered in other occupancies. This high density of outlets is intended to allow clinicians the flexibility to provide care in multiple case scenarios within the same space. In addition, many of these spaces are required to have a set of completely redundant electrical outlets to accommodate medical equipment in the event of an isolated electrical failure. In nearly all of these spaces, the outlets are not intended for simultaneous use.

Currently the calculated sizing of the distribution systems serving these outlets fall under the 180VA requirement outlined in NFPA 70 Article 220.14(L). Adherence to this requirement necessitates the calculation of exceedingly high load densities for typical clinical spaces. For example:

Article 517.19(C) (1) requires that a minimum of 36 receptacles be provided in each operating room. Per Article 220.14(L) a 400-square foot operating room will have a plug load density of 8.1VA / square foot (if duplex receptacles are used) or as high as 16.2VA / square foot if simplex receptacles are used. These load densities are significantly higher than the actual loads that are encountered in these spaces.

Several recent comprehensive studies including; Plug and Process Loads in Medical Office Buildings, Quantifying Hospital Cord Connected Plug Loads in Inpatient Areas, and Healthcare Energy End-Use Monitoring, have concluded that the receptacle load densities in even the most acute healthcare spaces are far less than the presently mandated load densities. These studies have been provided as reference in this proposal.

The requirements of 220.14(L) lead to mandatory oversizing of the distribution components including, feeders, transformers and overcurrent protective devices. This larger equipment introduces several operational issues including higher arc-flash hazards in the clinical care environment.

This proposal is intended to seek relieve healthcare facilities from the mandatory requirements of Article 220.14(L) and place the minimum calculated load densities under the purview of Article 517. This Public Input proposal is intended to be accepted with a companion proposal to Article 517 which will introduce a new section 517.22 which will provide plug load densities for healthcare facilities.

If the committee ultimately concludes that hospital load demand factors belong in 220 instead of in 517, these proposals can be place in 220 as well.

Related Public Comments for This Document**Related Comment**

Public Comment No. 2165-NFPA 70-2018 [New Section after 517.21]

Public Comment No. 2172-NFPA 70-2018 [New Section after 517.21]

Relationship

this proposal is made in order to permit PC 2165.

this prposal is made to permit PC 2172

Related Item

- 3583-NFPA 70-2017 [New Section after 517.21]

Submitter Information Verification

Submitter Full Name: Ron Bourgault

Organization: Mazzetti

Street Address:

City:**State:****Zip:****Submittal Date:** Thu Aug 30 22:01:11 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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**Public Comment No. 1011-NFPA 70-2018 [Section No. 220.53]****220.53 Appliance Load — Dwelling Unit(s).**

It shall be permissible to apply a demand factor of 75 percent to the nameplate rating load of four or more appliances rated ¼ hp or greater, or 500 watts or greater, that are fastened in place, ~~other than electric ranges, ovens and cooktop cooking appliances, clothes dryers, space heating equipment, or air conditioning equipment, that and that~~ are served by the same feeder or service in a one-family, two-family, or multifamily dwelling. This demand factor shall not apply to:

- A) Household electric cooking equipment that is fastened in place
- B) Clothes dryers
- C) Space heating equipment
- D) Air-conditioning equipment

Statement of Problem and Substantiation for Public Comment

Substantiation: This comment attempts to clarify the intent and language of the FR. The language in this section has been somewhat cumbersome and became even moreso during the first revision. Additionally, cooktops are typically just called “cooktops” in manufacturer literature (an internet search for cooking appliance product data can confirm this) and not “cooktop cooking appliances”.

Related Item

- FR 8057

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz

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Submittal Date: Tue Aug 21 12:24:52 EDT 2018

Committee: NEC-P02

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Public Comment No. 357-NFPA 70-2018 [Section No. 220.60]

220.60 Noncoincident Loads.

Where it is unlikely that two or more noncoincident loads will be in use simultaneously, it shall be permissible to use only the largest load(s) that will be used at one time for calculating the total load of a feeder or service. ~~Where a motor is part of the noncoincident load and is not the largest of the noncoincident loads, 125 percent of the motor load shall be used in the calculation if it is the largest motor.~~

Statement of Problem and Substantiation for Public Comment

Delete proposed text as is for two reasons:

1. It appears that the code panel intends that this rule apply to air-conditioning loads (Article 440), but the text only applies to motors (Article 430).
2. Years ago the code panel removed the 125% stuff from Article 220 and allowed this factor to be considered in Article 210 for branch circuits, Article 215 for feeders, and Article 230 for services.

Related Item

- Fr-8062

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

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Submittal Date: Thu Aug 02 15:57:13 EDT 2018

Committee: NEC-P02

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**Public Comment No. 855-NFPA 70-2018 [Section No. 220.87]****220.87** 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 may be periodic in nature due to seasonal or similar conditions.

- (2) The maximum demand at 125 percent plus the new load 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.

Exception: If the feeder or service has any renewable energy system (i.e., solar photovoltaic systems or wind electric systems) or employs any form of peak load shaving, this calculation method shall not be used.

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
CN_162.pdf	70_CN 162

Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No.162 in the First Draft Report on First Revision No. 8081.

The Correlating Committee directs that the panel reconsider the use of the phrase "shall not be used" as compared to "shall not be permitted".

This action will be considered as a public comment.

Related Item

- FR 8081

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC

Organization: NEC Correlating Committee

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Submission Date: Mon Aug 20 12:06:01 EDT 2018

Committee: NEC-P02

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Correlating Committee Note No. 162-NFPA 70-2018 [Section No. 220.87]

Submitter Information Verification

Submitter Full Name: Erik Hohengasser

Committee:

Submittal Date: Fri May 11 09:28:39 EDT 2018

Committee Statement and Meeting Notes

Committee Statement: The Correlating Committee directs that the panel reconsider the use of the phrase "shall not be used" as compared to "shall not be permitted".

This action will be considered as a public comment.

[First Revision No. 8081-NFPA 70-2018 \[Section No. 220.87\]](#)

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.



Public Comment No. 1017-NFPA 70-2018 [Annex D]

Informative Annex D Examples

This informative annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

Selection of Conductors. In the following examples, the results are generally expressed in amperes (A). To select conductor sizes, refer to the 0 through 2000 volt (V) ampacity tables of Article 310 and the rules of 310.14 that pertain to these tables.

Voltage. For uniform application of Articles 210, 215, and 220, a nominal voltage of 120, 120/240, 240, and 208Y/120 V is used in calculating the ampere load on the conductor.

Fractions of an Ampere. Except where the calculations result in a major fraction of an ampere (0.5 or larger), such fractions are permitted to be dropped.

Power Factor. Calculations in the following examples are based, for convenience, on the assumption that all loads have the same power factor (PF).

Ranges. For the calculation of the range loads in these examples, Column C of Table 220.55 has been used. For optional methods, see Columns A and B of Table 220.55. Except where the calculations result in a major fraction of a kilowatt (0.5 or larger), such fractions are permitted to be dropped.

SI Units. For metric conversions, $0.093 \text{ m}^2 = 1 \text{ ft}^2$ and $0.3048 \text{ m} = 1 \text{ ft}$.

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 range and a 5.5-kW, 240-V dryer. Assume range and dryer kW ratings equivalent to kVA ratings in accordance with 220.54 and 220.55.

Calculated Load

(see 220.40)

General Lighting Load

$$1500 \text{ ft}^2 \text{ at } 3 \text{ VA/ft}^2 = 4500 \text{ VA}$$

Minimum Number of Branch Circuits Required

[see 210.11(A)]

General Lighting Load:

$$4500 \text{ VA} \div 120 \text{ V} = 38 \text{ A}$$

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 220.40]

General Lighting	4,500 VA
Small Appliance	3,000 VA
Laundry	1,500 VA
Total	9,000 VA
3000 VA at 100%	3,000 VA
9000 VA – 3000 VA = 6000 VA at 35%	2,100 VA
Net Load	5,100 VA
Range (see Table 220.55)	8,000 VA
Dryer Load (see Table 220.54)	5,500 VA
Net Calculated Load	18,600 VA

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

$$18,600 \text{ VA} \div 240 \text{ V} = 78 \text{ A}$$

Sections 230.42(B) and 230.79 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 VA
Range: 8000 VA at 70% (see 220.61)	5,600 VA
Dryer: 5500 VA at 70% (see 220.61)	3,850 VA
Total	14,550 VA

Calculated Load for Neutral

$$14,550 \text{ VA} \div 240 \text{ V} = 61 \text{ A}$$

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 (3-wire, 240 V).

	<u>Line A</u>	<u>Neutral</u>	<u>Line B</u>
-			
Amperes from Example D1(a)	78	61	78
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 largest motor (see 430.24)	3	3	2
Total amperes per conductor	99	84	104

Therefore, the service would be rated 110 A.

Example D2(a) Optional Calculation for One-Family Dwelling, Heating Larger Than Air Conditioning

(see 220.82) The dwelling has a floor area of 1500 ft², 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

$6 \text{ A} \times 230 \text{ V} \div 1000 = 1.38 \text{ kVA}$ This 1.38 kVA [item 1 from 220.82(C)] is less than 40% of 9 kVA of separately controlled electric heat [item 6 from 220.82(C)], so the 1.38 kVA need not be included in the service calculation.

General Load

1500 ft ² at 3 VA	4,500 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 VA

Application of Demand Factor

[see 220.82(B)]

First 10 kVA of general load at 100%	10,000 VA
Remainder of general load at 40% (19.7 kVA $\times$ 0.4)	7,880 VA
Total of general load	17,880 VA
9 kVA of heat at 40% (9000 VA $\times$ 0.4) =	3,600 VA
Total	21,480 VA

Calculated Load for Service Size

$$21.48 \text{ kVA} = 21,480 \text{ VA}$$

$$21,480 \text{ VA} \div 240 \text{ V} = 90 \text{ A}$$

Therefore, the minimum service rating would be 100 A in accordance with 230.42 and 230.79.

Feeder Neutral Load in Accordance with 220.61

1500 ft ² at 3 VA	4,500 VA
Three 20-A circuits at 1500 VA	4,500 VA
Total	9,000 VA
3000 VA at 100%	3,000 VA
9000 VA - 3000 VA = 6000 VA at 35%	2,100 VA
Subtotal	5,100 VA
Range: 8 kVA at 70%	5,600 VA
Clothes dryer: 5 kVA at 70%	3,500 VA
Dishwasher	1,200 VA
Total	15,400 VA

Calculated Load for Neutral

$$15,400 \text{ VA} \div 240 \text{ V} = 64 \text{ A}$$

Example D2(b) Optional Calculation for One-Family Dwelling, Air Conditioning Larger Than Heating

[see 220.82(A) and 220.82(C)] The dwelling has a floor area of 1500 ft², 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

$$\text{Total amperes} = 6 \text{ units} \times 7 \text{ A} = 42 \text{ A}$$

$$42 \text{ A} \times 240 \text{ V} \div 1000 = 10.08 \text{ kVA (assume PF} = 1.0)$$

Load Included at 100%

Air Conditioning: Included below [see item 1 in 220.82(C)]

Space Heater:

Omit [see item 5 in 220.82(C)]

General Load

1500 ft ² at 3 VA	4,500 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	5,000 VA
Total general load	32,800 VA
First 10 kVA at 100%	10,000 VA
Remainder at 40%	
(22.8 kVA $\times$ 0.4 $\times$ 1000)	9,120 VA
Subtotal general load	19,120 VA
Air conditioning	10,080 VA
Total	29,200 VA

Calculated Load for Service

$$29,200 \text{ VA} \div 240 \text{ V} = 122 \text{ A (service rating)}$$

Feeder Neutral Load, in accordance with 220.61

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	4,500 VA
Three 20-A circuits at 1500 VA	4,500 VA
Subtotal	9,000 VA
3000 VA at 100%	3,000 VA
9000 VA - 3000 VA = 6000 VA at 35%	2,100 VA
Subtotal	5,100 VA
Two 4-kVA ovens plus one 5.1-kVA cooking unit = 13.1 kVA. Table 220.55 permits 55% demand factor or 13.1 kVA × 0.55 = 7.2 kVA feeder capacity.	
Subtotal from above	5,100 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

Calculated Load for Neutral

$$14,840 \text{ VA} \div 240 \text{ V} = 62$$

Example D2(c) Optional Calculation for One-Family Dwelling with Heat Pump (Single-Phase, 240/120-Volt Service)

(see 220.82) The dwelling has a floor area of 2000 ft², 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 heat.

Heat Pump kVA Calculation

$24 \text{ A} \times 240 \text{ V} \div 1000 = 5.76 \text{ kVA}$ 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 220.82(C)].

General Load

2000 ft ² at 3 VA	6,000 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 VA
First 10 kVA at 100%	10,000 VA
Remainder of general load at 40% (23,200 VA × 0.4)	9,280 VA
Total net general load	19,280 VA

Heat Pump and Supplementary Heat*

$$240 \text{ V} \times 24 \text{ A} = 5760 \text{ VA}$$

15 kW Electric Heat:

$$5760 \text{ VA} + (15,000 \text{ VA} \times 65\%) = 5.76 \text{ kVA} + 9.75 \text{ kVA} = 15.51 \text{ kVA}$$

***If supplementary heat is not on at same time as heat pump, heat pump kVA need not be added to total.**

Totals

Net general load	19,280 VA
Heat pump and supplementary heat	15,510 VA
Total	34,790 VA

Calculated Load for Service

$$34.79 \text{ kVA} \times 1000 \div 240 \text{ V} = 145 \text{ A}$$

Therefore, this dwelling unit would be permitted to be served by a 150-A service.

Example D3 Store Building

A store 50 ft by 60 ft, or 3000 ft², 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 8500 VA.

Calculated Load

(see 220.40)

Noncontinuous Loads

Receptacle Load (see 220.44)

80 receptacles at 180 VA	14,400 VA
10,000 VA at 100%	10,000 VA
14,400 VA - 10,000 VA = 4400 at 50%	2,200 VA
Subtotal	12,200 VA

Continuous Loads

General Lighting*

3000 ft² at 3 VA/ft² 9,000 VA

Show Window Lighting Load

30 ft at 200 VA/ft [see 220.14(G)] 6,000 VA

Outside Sign Circuit [see 220.14(F)] 1,200 VA

Subtotal 16,200 VA

Subtotal from noncontinuous 12,200 VA

Total noncontinuous loads + continuous loads = 28,400 VA

*In the example, the actual connected lighting load (8500 VA) is less than the load from Table 220.12, so the minimum lighting load from Table 220.12 is used in the calculation. Had the actual lighting load been greater than the value calculated from Table 220.12, 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)].

8500 VA × 1.25 = 10,625 VA

10,625 VA ÷ 240 V = 44 A for 3-wire, 120/240 V

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 44 A or greater for 3-wire circuits or 88 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 9000 VA × 1.25 = 11,250 VA.

Show Window

6000 VA × 1.25 = 7500 VA

7500 VA ÷ 240 V = 31 A for 3-wire, 120/240 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 62 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

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

(see 215.3 or 230.90)

Subtotal noncontinuous loads	12,200 VA
Subtotal continuous load at 125% (16,200 VA × 1.25)	20,250 VA
Total	32,450 VA

32,450 VA ÷ 240 V = 135 A

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

Minimum Size Feeders (or Service Conductors) Required

[see 215.2, 230.42(A)] For 120/240 V, 3-wire system, $32,450 \text{ VA} \div 240 \text{ V} = 135 \text{ A}$ Service or feeder conductor is 1/0 Cu in accordance with 215.3 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 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 220.5(B)]}.

Noncontinuous Loads

Receptacle Load (see 220.44)

22 receptacles at 180 VA 3,960 VA

Welder Load [see 630.11(A), Table 630.11(A)]

Each welder: $480 \text{ V} \times 23 \text{ A} \times 0.78 = 8,610 \text{ VA}$

All 3 welders [see 630.11(B)] (demand factors 100%, 100%, 85% respectively)

$8,610 \text{ VA} + 8,610 \text{ VA} + 7,320 \text{ VA} =$ 24,500 VA

Subtotal, Noncontinuous Loads **28,500 VA**

Motor Loads (see 430.24, Table 430.250)

Air compressor: $7.6 \text{ A} \times 480 \text{ V} \times \sqrt{3} =$ 6,310 VA

Grinder: $3 \text{ A} \times 480 \text{ V} \times \sqrt{3} =$ 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

(see 215.3) The overcurrent protective device must accommodate 125% 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] $[99,000 \text{ VA} \div (480\text{V} \times \sqrt{3}) = 119 \text{ A}]$	95,500 VA
(25% of 56,600 VA) (See 215.3)	14,200 VA
Total VA	109,700 VA

Conversion to amperes using three significant figures: $109,700 \text{ VA} / (480\text{V} \times \sqrt{3}) = 132 \text{ A}$

Minimum size overcurrent protective device: 132 A

Minimum standard size overcurrent protective device (see 240.6): 150 amperes

Where the overcurrent protective device and its assembly are listed for operation at 100 percent of its rating, a 125 ampere overcurrent protective device would be permitted. However, overcurrent protective device assemblies listed for 100 percent of their rating are typically not available at the 125-ampere rating. (See 215.3 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 overcurrent device termination [see 110.14(C) and 215.2(A)(1), 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, Ampacity, and 310.15(C)(a) and correction factors to Table 310.16]:

$$95,500 \text{ VA} / 0.7 / 0.96 = 142,000 \text{ VA}$$

$$[70\% = 310.15(C)(a)] \text{ \& } [0.96 = \text{Correction factors to Table 310.16}]$$

Conversion to amperes:

$$142,000 \text{ VA} / (480\text{V} \times \sqrt{3}) = 171 \text{ A}$$

Note that the neutral conductors are counted as current-carrying conductors [see 310.15(E)(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 ($95,500 \text{ VA} / 0.8 = 119,000 \text{ VA}$; $119,000 \text{ VA} / (480\text{V} \times \sqrt{3}) = 143 \text{ A}$, 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 overcurrent protective device 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),

$$195 \text{ amperes} \times 0.96 \times 0.7 = 131 \text{ A}$$

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 overcurrent protective device. Note that the feeder layout precludes the application of 310.14(A)(2) Exception.

Feeder Neutral Conductor

(see 220.61)

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. ($11,600 \text{ VA} / 277\text{V} = 42 \text{ amperes}$.) 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 overcurrent devices, the effects of continuous loading can be disregarded in evaluating its terminations [see 215.2(A)(1) Exception No. 2]. That calculation is ($11,600 \text{ VA} \div 277\text{V} = 42 \text{ amperes}$), 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 215.2(A)(1), second paragraph]. Therefore, because the minimum size equipment grounding conductor for a 150 ampere circuit, as covered in Table 250.122, is 6 AWG, that is the minimum neutral size required for this feeder.

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 electric ranges not exceeding 12 kW each. Assume range kW rating equivalent to kVA rating in accordance with 220.55. Other half of ranges are gas ranges. Area of each dwelling unit is 840 ft². Laundry facilities on premises are available to all tenants. Add no circuit to individual dwelling unit.

Calculated Load for Each Dwelling Unit

(see Article 220) General Lighting: 840 ft² at 3 VA/ft² = 2520 VA Special Appliance: Electric range (see 220.55) = 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(A)(3)

Minimum Size Feeder Required for Each Dwelling Unit

(see 215.2)

Calculated Load (see Article 220):

General Lighting	2,520 VA
Small Appliance (two 20-ampere circuits)	3,000 VA
Subtotal Calculated Load (without ranges)	5,520 VA

Application of Demand Factor

(see Table 220.42)

First 3000 VA at 100%	3,000 VA
5520 VA - 3000 VA = 2520 VA at 35%	882 VA
Net Calculated Load (without ranges)	3,882 VA
Range Load	8,000 VA
Net Calculated Load (with ranges)	11,882 VA

Size of Each Feeder

(see 215.2) For 120/240-V, 3-wire system (without ranges) Net calculated load of 3882 VA ÷ 240 V = 16 A For 120/240-V, 3-wire system (with ranges) Net calculated load, 11,882 VA ÷ 240 V = 50 A

Feeder Neutral

Lighting and Small-Appliance Load	3,882 VA
Range Load: 8000 VA at 70% (see 220.61)	5,600 VA
(only for apartments with electric range)	5,600 VA
Net Calculated Load (neutral)	9,482 VA

Calculated Load for Neutral

9482 VA ÷ 240 V = 39.5 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	110,400 VA
Application of Demand Factor	
First 3000 VA at 100%	3,000 VA
110,400 VA - 3000 VA = 107,400 VA at 35%	37,590 VA
Net Calculated Load	40,590 VA
Range Load: 10 ranges (not over 12 kVA) (see Col. C, Table 220.55, 25 kW)	25,000 VA
Net Calculated Load (with ranges)	65,590 VA

Net calculated load for 120/240-V, 3-wire system,

65,590 VA ÷ 240 V = 273 A

Feeder Neutral

Lighting and Small-Appliance Load	40,590 VA
Range Load: 25,000 VA at 70% [see 220.61(B)]	17,500 VA
Calculated Load (neutral)	58,090 VA

Calculated Load for Neutral

$$58,090 \text{ VA} \div 240 \text{ V} = 242 \text{ A}$$

Further Demand Factor

[220.61(B)]

200 A at 100%	200 A
242 A - 200 A = 42 A at 70%	29 A
Net Calculated Load (neutral)	229 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 $\times$ 5520 V	220,800 VA

Application of Demand Factor

(from Table 220.42)

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 VA - 120,000 VA = 100,800 VA at 25%	25,200 VA
Net Calculated Load	69,150 VA

Range Load: 20 ranges (less than 12 kVA)

(see Col. C, Table 220.55)

	35,000 VA
Net Calculated Load	104,150 VA

For 120/240-V, 3-wire system

$$\text{Net calculated load of } 104,150 \text{ VA} \div 240 \text{ V} = 434 \text{ A}$$

Feeder Neutral

Lighting and Small-Appliance Load	69,150 VA
Range: 35,000 VA at 70% [see 220.61(B)]	24,500 VA
Calculated Load (neutral)	93,650 VA

$$93,650 \text{ VA} \div 240 \text{ V} = 390 \text{ A}$$

Further Demand Factor

[see 220.61(B)]

200 A at 100%	200 A
390 A - 200 A = 190 A at 70%	133 A
Net Calculated Load (neutral)	333 A

[See Table 310.16 through Table 310.21, and 310.15(B), (B)(3), and (B)(5).]

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 nameplate rating, four 1.5-kW separately controlled 240-V electric space heaters, and a 2.5-kW, 240-V 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 (Part III of Article 220).

A common laundry facility is available to all tenants [see 210.52(F), Exception No. 1].

Area of each dwelling unit is 840 ft².

Calculated Load for Each Dwelling Unit

(see Part II and Part III of Article 220)

General Lighting Load:

840 ft² at 3 VA/ft² 2,520 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

Appliance Load: Two 2-wire circuits of 12 AWG [see 210.11(C)(1)] Range Circuit (See Table 220.55, Column B):

8000 VA × 80% ÷ 240 V = 27 A on a circuit of three

10 AWG conductors in accordance with 210.19(A)(3) Space Heating: 6000 VA ÷ 240 V = 25 A Number of circuits (see 210.11)

Minimum Size Feeder Required for Each Dwelling Unit

(see 215.2)

Calculated Load (see Article 220):

General Lighting 2,520 VA

Small Appliance (two 20-A circuits) 3,000 VA

Subtotal Calculated Load (without range and space heating) 5,520 VA

Application of Demand Factor

First 3000 VA at 100% 3,000 VA

5520 VA - 3000 VA = 2520 VA at 35% 882 VA

Net Calculated Load 3,882 VA

(without range and space heating)

Range 6,400 VA

Space Heating (see 220.51) 6,000 VA

Water Heater 2,500 VA

Net Calculated Load (for individual dwelling unit) 18,782 VA

Size of Each Feeder

For 120/240-V, 3-wire system,

Net calculated load of 18,782 VA ÷ 240 V = 78 A

Feeder Neutral

(see 220.61)

Lighting and Small Appliance 3,882 VA

Range Load: 6400 VA at 70% [see 220.61(B)] 4,480 VA

Space and Water Heating (no neutral): 240 V 0 VA

Net Calculated Load (neutral) 8,362 VA

Calculated Load for Neutral

8362 VA ÷ 240 V = 35 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 110,400 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 VA

Net Calculated Load Using Optional Calculation (see Table 220.84)

440,400 VA × 0.38 167,352 VA

167,352 VA ÷ 240 V = 697 A

Minimum Size Main Feeder Required (Less House Load) (For 40 Dwelling Units)

Calculated Load:

Lighting and Small-Appliance Load

40 units × 5520 V 220,800 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 VA

Net Calculated Load Using Optional Calculation (see Table 220.84)

880,800 VA × 0.28 = 246,624 VA

246,624 VA ÷ 240 V = 1028 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 110,400 VA

First 3000 VA at 100% 3,000 VA

110,400 VA - 3000 VA = 107,400 VA at 35% 37,590 VA

Net Calculated Load 40,590 VA

20 ranges: 35,000 VA at 70% [see Table 220.55 and 220.61(B)] 24,500 VA

Total 65,090 VA

65,090 VA ÷ 240 V = 271 A

Further Demand Factor

[see 220.61(B)]

First 200 A at 100% 200 A

Balance: 271 A - 200 A = 71 A at 70% 50 A

Total 250 A

Feeder Neutral Load of Main Feeder (Less House Load) (For 40 Dwelling Units)

Lighting and Small-Appliance Load

40 units × 5520 V 220,800 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 VA - 120,000 VA = 100,800 VA at 25% 25,200 VA

Net Calculated Load 69,150 VA

40 ranges: 55,000 VA at 70% [see Table 220.55 and 220.61(B)] 38,500 VA

Total 107,650 VA

107,650 VA ÷ 240 V = 449 A

Further Demand Factor*[see 220.61(B)]*

First 200 A at 100%	200 A
Balance: 449 - 200 A = 249 A at 70%	174 A
Total	374 A

Example D5(a) Multifamily Dwelling Served at 208Y/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: $8000 \text{ VA} \div 208 \text{ V} = 38 \text{ A}$ or a circuit of two 8 AWG conductors and one 10 AWG conductor in accordance with 210.19(A)(3)

Minimum Size Feeder Required for Each Dwelling Unit

(see 215.2)

For 120/208-V, 3-wire system (without ranges),

Net calculated load of $3882 \text{ VA} \div 2 \text{ legs} \div 120 \text{ V/leg} = 16 \text{ A}$

For 120/208-V, 3-wire system (with ranges),

Net calculated load (range) of $8000 \text{ VA} \div 208 \text{ V} = 39 \text{ A}$

Total load (range + lighting) = $39 \text{ A} + 16 \text{ A} = 55 \text{ A}$

Reducing the neutral load on the feeder to each dwelling unit is not permitted *[see 220.61(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

$2 \times 4 = 8$.

Table 220.55 demand = 23,000 VA

Per phase demand = $23,000 \text{ VA} \div 2 = 11,500 \text{ VA}$

Equivalent 3-phase load = 34,500 VA

Net Calculated Load (total):

$40,590 \text{ VA} + 34,500 \text{ VA} = 75,090 \text{ VA}$

$75,090 \text{ VA} \div (208 \text{ V})(1.732) = 208 \text{ A}$

Feeder Neutral Size

Net Calculated Lighting and Appliance Load & Equivalent Range Load:

$40,590 \text{ VA} + (34,500 \text{ VA at } 70\%) = 64,700 \text{ VA}$

Net Calculated Neutral Load:

$64,700 \text{ VA} \div (208 \text{ V})(1.732) = 180 \text{ A}$

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

$$2 \times 7 = 14.$$

Table 220.55 demand = 29,000 VA

Per phase demand = $29,000 \text{ VA} \div 2 = 14,500 \text{ VA}$

Equivalent 3-phase load = 43,500 VA

Net Calculated Load (total):

$$69,150 \text{ VA} + 43,500 \text{ VA} = 112,650 \text{ VA}$$

$$112,650 \text{ VA} \div (208 \text{ V})(1.732) = 313 \text{ A}$$

Main Feeder Neutral Size:

$$69,150 \text{ VA} + (43,500 \text{ VA at } 70\%) = 99,600 \text{ VA}$$

$$99,600 \text{ VA} \div (208 \text{ V})(1.732) = 277 \text{ A}$$

Further Demand Factor

(see 220.61)

200 A at 100%

200.0 A

277 A - 200 A = 77 A at 70%

54 A

Net Calculated Load (neutral)

254 A

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 220.55, Column B): $8000 \text{ VA at } 80\% + 208 \text{ V} = 31 \text{ A}$ or a circuit of two 8 AWG conductors and one 10 AWG conductor in accordance with 210.19(A)(3)

Space Heating: $6000 \text{ VA} \div 208 \text{ V} = 29 \text{ A}$

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 $\div 208 \text{ V} = 90 \text{ A}$

Net calculated load (lighting line to neutral):

$$3882 \text{ VA} \div 2 \text{ legs} \div 120 \text{ V per leg} = 16 \text{ amperes}$$

$$\text{Line to line} = 14,900 \text{ VA} \div 208 \text{ V} = 72 \text{ A}$$

$$\text{Total load} = 16.2 \text{ A} + 71.6 \text{ A} = 88 \text{ A}$$

Minimum Size Feeder Required for Service Equipment to Meter Bank (For 20 Dwelling Units)**Net Calculated Load**

$$167,352 \text{ VA} \div (208 \text{ V})(1.732) = 465 \text{ A}$$

Feeder Neutral Load

$$65,080 \text{ VA} \div (208 \text{ V})(1.732) = 181 \text{ A}$$

Minimum Size Main Feeder Required (Less House Load) (For 40 Dwelling Units)**Net Calculated Load**

$$246,624 \text{ VA} \div (208 \text{ V})(1.732) = 685 \text{ A}$$

Main Feeder Neutral Load

$$107,650 \text{ VA} \div (208 \text{ V})(1.732) = 299 \text{ A}$$

Further Demand Factor

[see 220.61(B)]

200 A at 100%	200.0 A
299 A - 200 A = 99 A at 70%	69 A
Net Calculated Load (neutral)	269 A

Example D6 Maximum Demand for Range Loads

Table 220.55, Column C, applies to ranges not over 12 kW. The application of Note 1 to ranges over 12 kW (and not over 27 kW) and Note 2 to ranges over 8¾ kW (and not over 27 kW) is illustrated in the following two examples.

A. Ranges All the Same Rating(see Table 220.55, Note 1)

Assume 24 ranges, each rated 16 kW.

From Table 220.55, Column C, the maximum demand for 24 ranges of 12-kW rating is 39 kW. 16 kW exceeds 12 kW by 4.

$$5\% \times 4 = 20\% \text{ (5\% increase for each kW in excess of 12)}$$

$$39 \text{ kW} \times 20\% = 7.8 \text{ kW increase}$$

$$39 + 7.8 = 46.8 \text{ kW (value to be used in selection of feeders)}$$

B. Ranges of Unequal Rating(see Table 220.55, Note 2)

Assume 5 ranges, each rated 11 kW; 2 ranges, each rated 12 kW; 20 ranges, each rated 13.5 kW; 3 ranges, each rated 18 kW.

5 ranges	× 12 kW =	60 kW (use 12 kW for range rated less than 12)
2 ranges	× 12 kW =	24 kW
20 ranges	× 13.5 kW =	270 kW
3 ranges	× 18 kW =	54 kW
30 ranges, Total kW =		408 kW

$$408 \div 30 \text{ ranges} = 13.6 \text{ kW (average to be used for calculation)}$$

From Table 220.55, Column C, the demand for 30 ranges of 12-kW rating is 15 kW + 30 (1 kW × 30 ranges) = 45 kW. 13.6 kW exceeds 12 kW by 1.6 kW (use 2 kW).

$$5\% \times 2 = 10\% \text{ (5\% increase for each kW in excess of 12 kW)}$$

$$45 \text{ kW} \times 10\% = 4.5 \text{ kW increase}$$

$$45 \text{ kW} + 4.5 \text{ kW} = 49.5 \text{ kW (value to be used in selection of feeders)}$$

Example D7 Sizing of Service Conductors for Dwelling(s)

Service conductors and feeders for certain dwellings are permitted to be sized in accordance with 310.12.

With No Required Adjustment or Correction Factors. If a 175-ampere service rating is selected, a service conductor is then sized as follows:

$$175 \text{ amperes} \times 0.83 = 145.25 \text{ amperes per 310.12.}$$

If no other adjustments or corrections are required for the installation, then, in accordance with Table 310.16, a 1/0 AWG Cu or a 3/0 AWG Al meets this rating at 75°C (167°F).

With Required Temperature Correction Factor.

If a 175-ampere service rating is selected, a service conductor is then

$$175 \text{ amperes} \times 0.83 = 145.25 \text{ amperes per 310.12.}$$

If the conductors are installed in an ambient temperature of 38°C (100°F), the conductor ampacity must be multiplied by the appropriate correction factor in Table 310.15(B)(1). In this case, we will use an XHHW-2 conductor, so we use a correction factor of 0.91 to find the minimum conductor ampacity and size:

$$145.25/0.91 = 159.6 \text{ amperes}$$

In accordance with Table 310.16, a 2/0 AWG Cu or a 4/0 AWG Al would be required.

If no temperature correction or ampacity adjustment factors are required, the following table includes conductor sizes calculated using the requirements in 310.12. This table is based on 75°C terminations and without any adjustment or correction factors.

<u>Service or Feeder Rating (Amperes)</u>	<u>Conductor (AWG or kcmil)</u>	
	<u>Copper</u>	<u>Aluminum or Copper-Clad Aluminum</u>
100	4	2
110	3	1
125	2	1/0
150	1	2/0
175	1/0	3/0
200	2/0	4/0
225	3/0	250
250	4/0	300
300	250	350
350	350	500
400	400	600

Example D8 Motor Circuit Conductors, Overload Protection, and Short-Circuit and Ground-Fault Protection

(see 240.6, 430.6, 430.22, 430.23, 430.24, 430.32, 430.52, and 430.62, Table 430.52, and Table 430.250)

Determine the minimum required conductor ampacity, the motor overload protection, the branch-circuit short-circuit and ground-fault protection, and the feeder protection, for three induction-type motors on a 480-V, 3-phase feeder, as follows:

(a) One 25-hp, 460-V, 3-phase, squirrel-cage motor, nameplate full-load current 32 A, Design B, Service Factor 1.15

(b) Two 30-hp, 460-V, 3-phase, wound-rotor motors, nameplate primary full-load current 38 A, nameplate secondary full-load current 65 A, 40°C rise

Conductor Ampacity

The full-load current value used to determine the minimum required conductor ampacity is obtained from Table 430.250 [see 430.6(A)] for the squirrel-cage motor and the primary of the wound-rotor motors. To obtain the minimum required conductor ampacity, the full-load current is multiplied by 1.25 [see 430.22 and 430.23(A)].

For the 25-hp motor,

$$32 \text{ A} \times 1.25 = 43 \text{ A}$$

For the 30-horsepower motors,

$$40 \text{ A} \times 1.25 = 50 \text{ A}$$

$$65 \text{ A} \times 1.25 = 81 \text{ A}$$

Motor Overload Protection

Where protected by a separate overload device, the motors are required to have overload protection rated or set to trip at not more than 125% of the nameplate full-load current [see 430.6(A) and 430.32(A)(1)].

For the 25-hp motor,

$$32 \text{ A} \times 1.25 = 40.0 \text{ A}$$

For the 30-hp motors,

$$38 \text{ A} \times 1.25 = 48 \text{ A}$$

Where the separate overload device is an overload relay (not a fuse or circuit breaker), and the overload device selected at 125% is not sufficient to start the motor or carry the load, the trip setting is permitted to be increased in accordance with 430.32(C).

Branch-Circuit Short-Circuit and Ground-Fault Protection

The selection of the rating of the protective device depends on the type of motor and the protective device selected, in accordance with 430.52 and Table 430.52. The following is for the 25-hp squirrel-cage motor:

(a) Nontime-Delay Fuse: The fuse rating is $300\% \times 34 \text{ A} = 102 \text{ A}$. The next larger standard fuse is 110 A [see 240.6 and 430.52(C)(1), Exception No. 1]. If the motor will not start with a 110-A nontime-delay fuse, the fuse rating is permitted to be increased to 125 A because this rating does not exceed 400% [see 430.52(C)(1), Exception No. 2(a)].

(b) Time-Delay Fuse: The fuse rating is $175\% \times 34 \text{ A} = 59.5 \text{ A}$. The next larger standard fuse is 60 A [see 240.6 and 430.52(C)(1), Exception No. 1]. If the motor will not start with a 60-A time-delay fuse, the fuse rating is permitted to be increased to 70 A because this rating does not exceed 225% [see 430.52(C)(1), Exception No. 2(b)].

The following is for the 30-hp wound-rotor motors:

(a) Nontime-Delay Fuse: The fuse rating is $150\% \times 40 \text{ A} = 60 \text{ A}$. If the motor will not start with a 60-A nontime-delay fuse, the fuse rating is permitted to be increased to 150 A because this rating does not exceed 400% [see 430.52(C)(1), Exception No. 2(a)].

(b) Time-Delay Fuse: The fuse rating is $150\% \times 40 \text{ A} = 60 \text{ A}$. If the motor will not start with a 60-A time-delay fuse, the fuse rating is permitted to be increased to 90 A because this rating does not exceed 225% [see 430.52(C)(1), Exception No. 2(b)].

(c) Inverse Time Circuit Breaker: The breaker rating is $150\% \times 40 \text{ A} = 60 \text{ A}$. If the motor will not start with a 60-A breaker, the breaker rating is permitted to be increased to 150 A because this rating does not exceed 400% [see 430.52(C)(1), Exception No. 2(c) for motor full-load currents of 100 A or less].

Feeder Short-Circuit and Ground-Fault Protection

(a) Example using nontime-delay fuse. The rating of the feeder protective device is based on the sum of the largest branch-circuit protective device for the specific type of device protecting the feeder. In the previous step above, the calculation for the 25 hp squirrel-cage motor results in the largest branch-circuit protective device: $300\% \times 34 \text{ A} = 102 \text{ A}$ (therefore the next largest standard size, 110 A, would be used) plus the sum of the full-load currents of the other motors, or $110 \text{ A} + 40 \text{ A} + 40 \text{ A} = 190 \text{ A}$. The nearest standard fuse that does not exceed this value is 175 A [see 240.6, Table 430.52, and 430.62(A)].

(b) Example using inverse time circuit breaker. The largest branch-circuit protective device for the specific type of device protecting the feeder. The calculation for the 25-hp squirrel-cage motor results in the largest branch-circuit protective device, $250\% \times 34 \text{ A} = 85$. The next larger standard size is 90 A, plus the sum of the full-load currents of the other motors, or $90 \text{ A} + 40 \text{ A} + 40 \text{ A} = 170 \text{ A}$. The nearest standard inverse time circuit breaker that does not exceed this value is 150 A [see 240.6, Table 430.52, and 430.62(A)].

Example D9 Feeder Ampacity Determination for Generator Field Control

[see 215.2, 430.24, 430.24 Exception No. 1, 620.13, 620.14, 620.61, and Table 430.22(E) and 620.14]

Determine the conductor ampacity for a 460-V 3-phase, 60-Hz ac feeder supplying a group of six elevators. The 460-V ac drive motor nameplate rating of the largest MG set for one elevator is 40 hp and 52 A, and the remaining elevators each have a 30-hp, 40-A, ac drive motor rating for their MG sets. In addition to a motor controller, each elevator has a separate motion/operation controller rated 10 A continuous to operate microprocessors, relays, power supplies, and the elevator car door operator. The MG sets are rated continuous.

Conductor Ampacity

Conductor ampacity is determined as follows:

(a) In accordance with 620.13(D) and 620.61(B)(1), use Table 430.22(E), for intermittent duty (elevators). For intermittent duty using a continuous rated motor, the percentage of nameplate current rating to be used is 140%.

(b) For the 30-hp ac drive motor,

$$140\% \times 40 \text{ A} = 56 \text{ A}$$

(c) For the 40-hp ac drive motor,

$$140\% \times 52 \text{ A} = 73 \text{ A(I)}$$

(d) The total conductor ampacity is the sum of all the motor currents:

$$(1 \text{ motor} \times 73 \text{ A}) + (5 \text{ motors} \times 56 \text{ A}) = 353 \text{ A}$$

(e) In accordance with 620.14 and Table 620.14, the conductor (feeder) ampacity would be permitted to be reduced by the use of a demand factor. Constant loads are not included (see 620.14, *Informational Note*). For six elevators, the demand factor is 0.79. The feeder diverse ampacity is, therefore, $0.79 \times 353 \text{ A} = 279 \text{ A}$.

(f) In accordance with 430.24 and 215.3, the controller continuous current is $125\% \times 10 \text{ A} = 13 \text{ A}$

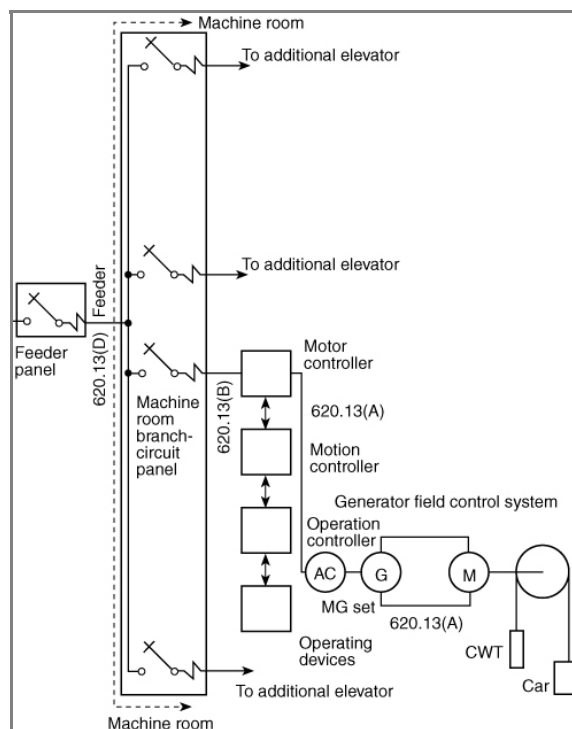
(g) The total feeder ampacity is the sum of the diverse current and all the controller continuous current.

$$I_{\text{total}} = 279 \text{ A} + (6 \text{ elevators} \times 12.5 \text{ A}) = 354 \text{ A}$$

(h) This ampacity would be permitted to be used to select the wire size.

See Figure D9.

Figure D9 Generator Field Control.



Example D10 Feeder Ampacity Determination for Adjustable Speed Drive Control [see 215.2, 430.24, 620.13, 620.14, 620.61, and Table 430.22(E)]

Determine the conductor ampacity for a 460-V, 3-phase, 60-Hz ac feeder supplying a group of six identical elevators. The system is adjustable-speed SCR dc drive. The power transformers are external to the drive (motor controller) cabinet. Each elevator has a separate motion/operation controller connected to the load side of the main line disconnect switch rated 10 A continuous to operate microprocessors, relays, power supplies, and the elevator car door operator. Each transformer is rated 95 kVA with an efficiency of 90%.

Conductor Ampacity

Conductor ampacity is determined as follows:

(a) Calculate the nameplate rating of the transformer:

$$I = \frac{95 \text{ kVA} \times 1000}{\sqrt{3} \times 460 \text{ V} \times 0.90_{\text{eff}}} = 133 \text{ A} \quad \text{[D10]}$$

(b) In accordance with 620.13(D), for six elevators, the total conductor ampacity is the sum of all the currents.

$$6 \text{ elevators} \times 133 \text{ A} = 798 \text{ A}$$

(c) In accordance with 620.14 and Table 620.14, the conductor (feeder) ampacity would be permitted to be reduced by the use of a demand factor. Constant loads are not included (see 620.13, *Informational Note No. 2*). For six elevators, the demand factor is 0.79. The feeder diverse ampacity is, therefore, $0.79 \times 798 \text{ A} = 630 \text{ A}$.

(d) In accordance with 430.24 and 215.3, the controller continuous current is $125\% \times 10 \text{ A} = 13 \text{ A}$.

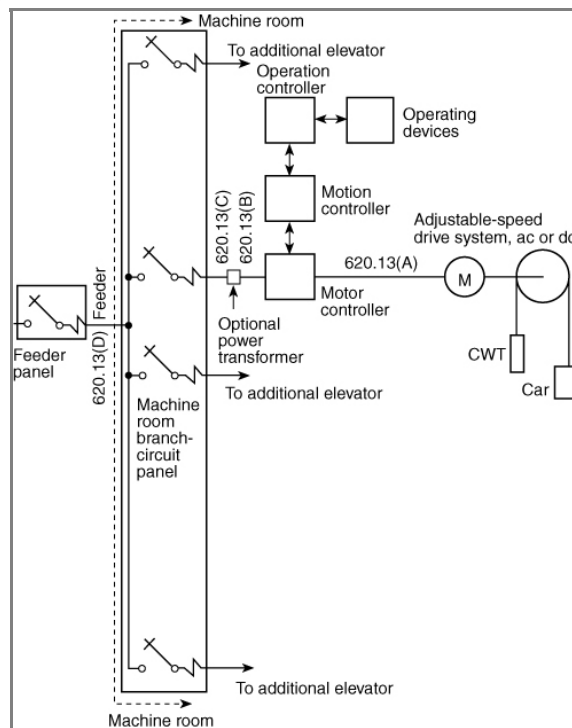
(e) The total feeder ampacity is the sum of the diverse current and all the controller constant current.

$$I_{\text{total}} = 630 \text{ A} + (6 \text{ elevators} \times 12.5 \text{ A}) = 705 \text{ A}$$

(f) This ampacity would be permitted to be used to select the wire size.

See Figure D10.

Figure D10 Adjustable Speed Drive Control.

**Example D11 Mobile Home**

(see 550.18) A mobile home floor is 70 ft by 10 ft and has two small appliance circuits; a 1000-VA, 240-V heater; a 200-VA, 120-V exhaust fan; a 400-VA, 120-V dishwasher; and a 7000-VA electric range.

Lighting and Small-Appliance Load

Lighting (70 ft × 10 ft × 3 VA per ft ²)	2,100 VA
Small-appliance (1500 VA × 2 circuits)	3,000 VA
Laundry (1500 VA × 1 circuit)	1,500 VA
Subtotal	6,600 VA
First 3000 VA at 100%	3,000 VA
Remainder (6600 VA – 3000 VA = 3600 VA) × 35%	1,260 VA
Total	4,260 VA

$$4260 \text{ VA} \div 240 \text{ V} = 17.75 \text{ A per leg}$$

<u>Amperes per Leg</u>	<u>Leg A</u>	<u>Leg B</u>
Lighting and appliances	18	18
Heater (1000 VA ÷ 240 V)	4	4
Fan (200 VA × 125% ÷ 120 V)	2	—
Dishwasher (400 VA ÷ 120 V)	—	3
Range (7000 VA × 0.8 ÷ 240 V)	23	23
Total amperes per leg	47	48

Based on the higher current calculated for either leg, a minimum 50-A supply cord would be required.

For SI units, $0.093 \text{ m}^2 = 1 \text{ ft}^2$ and $0.3048 \text{ m} = 1 \text{ ft}$.

Example D12 Park Trailer

(see 552.47)

A park trailer floor is 40 ft by 10 ft and has two small appliance circuits, a 1000-VA, 240-V heater, a 200-VA, 120-V exhaust fan, a 400-VA, 120-V dishwasher, and a 7000-VA electric range.

Lighting and Small-Appliance Load

Lighting ($40 \text{ ft} \times 10 \text{ ft} \times 3 \text{ VA per ft}^2$)	1,200 VA
Small-appliance ($1500 \text{ VA} \times 2 \text{ circuits}$)	3,000 VA
Laundry ($1500 \text{ VA} \times 1 \text{ circuit}$)	1,500 VA
Subtotal	5,700 VA
First 3000 VA at 100%	3,000 VA
Remainder ($5700 \text{ VA} - 3000 \text{ VA} = 2700 \text{ VA}$) × 35%	945 VA
Total	3,945 VA

$3945 \text{ VA} \div 240 \text{ V} = 16.44 \text{ A per leg}$

<u>Amperes per Leg</u>	<u>Leg A</u>	<u>Leg B</u>
Lighting and appliances	16	16
Heater (1000 VA ÷ 240 V)	4	4
Fan (200 VA × 125% ÷ 120 V)	2	—
Dishwasher (400 VA ÷ 120 V)	—	3
Range (7000 VA × 0.8 ÷ 240 V)	23	23
Totals	45	46

Based on the higher current calculated for either leg, a minimum 50-A supply cord would be required.

For SI units, $0.093 \text{ m}^2 = 1 \text{ ft}^2$ and $0.3048 \text{ m} = 1 \text{ ft}$.

Example D13 Cable Tray Calculations

(See Article 392)

(a) Multiconductor Cables 4/0 AWG and Larger

Use: NEC 392.22(A)(1)(a)

Cable tray must have an inside width equal to or greater than the sum of the diameters (Sd) of the cables, which must be installed in a single layer.

Example: Cable tray width is obtained as follows:

<u>Cable Size Being Used</u>	<u>(OD) Cable Outside Diameters (in.)</u>	<u>(N) Number of Cables</u>	<u>SD = (OD) × (N) (Sum of the Cable Diameters) (in.)</u>
3-conductor Type MC cable — 4/0 AWG	1.57	12	18.84

The sum of the diameters (Sd) of all cables = 18.84 in., therefore a cable tray with an inside width of at least 18.84 in. is required.

Note: Cable outside diameter is a nominal diameter from catalog data.

(b) Multiconductor Cables Smaller Than 4/0 AWG**Use:** NEC 392.22(A)(1)(b)

The sum of the cross-sectional areas of all the cables to be installed in the cable tray must be equal to or less than the allowable cable area for the tray width, as indicated in Table 392.22(A), Column 1.

Table D13(b) from Table 392.22(A), Column 1

<u>Inside Width of Cable Tray (in.)</u>	<u>Allowable Cable Area (in.²)</u>
6	7.0
9	10.5
12	14.0
18	21.0
24	28.0
30	35.0
36	42.0

Example: Cable tray width is obtained as follows:

<u>Cable Size Being Used</u>	<u>(A) Cable Cross-Sectional Area (in.²)</u>	<u>(N) Number of Cables</u>	<u>Multiply (A) × (N) (Which Is a Total Cable Cross-Sectional Area in in.²)</u>
4-conductor Type MC cable — 1 AWG	1.1350	9	12.15

The total cable cross-sectional area is 12.15 in.². Using Table D13(b) above, the next higher allowable cable area must be used, which is 14.0 in.². The table specifies that the cable tray inside width for an allowable cable area of 14.0 in.² is 12 in.

Note: Cable cross-sectional area is a nominal area from catalog data.

(c) Single Conductor Cables 1/0 AWG through 4/0 AWG**Use:** NEC 392.22(B)(1)(d)

Cable tray must have an inside width equal to or greater than the sum of the diameters (Sd) of the cables. The cables must be evenly distributed across the cable tray.

Example: Cable tray width is obtained as follows:

<u>Single Conductor Cable Size Being Used</u>	<u>(OD) Cable Outside Diameters (in.)</u>	<u>(N) Number of Cables</u>	<u>Sd = (OD) × (N) (Sum of the Cable Diameters) (in.)</u>
THHN — 4/0 AWG	0.642	18	11.556

The sum of the diameters (Sd) of all cables = 11.56 in., therefore, a cable tray with an inside width of at least 11.56 in. is required.

Note: Cable outside diameter from Chapter 9, Table 5.

(d) Single Conductor Cables 250 kcmil through 900 kcmil**Use:** NEC 392.22(B)(1)(b)

The sum of the cross-sectional areas of all the cables to be installed in the cable tray must be equal to or less than the allowable cable area for the tray width, as indicated in Table 392.22(B)(1), Column 1.

Table D13(d) from Table 392.22(B)(1), Column 1

<u>Inside Width of Cable Tray (in.)</u>	<u>Allowable Cable Area (in.²)</u>
6	6.5
9	9.5
12	13.0
18	19.5
24	26.0
30	32.5
36	39.0

Example: Cable tray width is obtained as follows:

<u>Cable Size Being Used</u>	<u>(A) Cable Cross-Sectional Area (in.²)</u>	<u>(N) Number of Cables</u>	<u>Multiply (A) × (N) (Which Is a Total Cable Cross-Sectional Area in in.²)</u>
THHN — 500 kcmil	0.707	9	6.36

The total cable cross-sectional area is 6.36 in.². Using Table D13(d), the next higher allowable cable area must be used, which is 6.5 in.². The table specifies that the cable tray inside width for an allowable cable area of 6.5 in.² is 6 in.

Note: Single-conductor cable cross-sectional area from Chapter 9, Table 5.

Statement of Problem and Substantiation for Public Comment

FR-8075: Updating Load Calculations to align with ASHRAE.

It is the opinion of the EEI-EL&P task group that the adoption of the ASHRAE 90.1 standard based on ASHRAE data be supported by the Code Making Panel.

Related Item

- FR-8075

Submitter Information Verification

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Submission Date: Tue Aug 21 13:43:27 EDT 2018

Committee: NEC-P02

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Public Comment No. 887-NFPA 70-2018 [Definition: Example D3(a) Industrial Feeders in a Common Raceway]

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 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 220.5(B)]}.

Noncontinuous Loads

Receptacle Load (see 220.44)

22 receptacles at 180 VA	3,960 VA

Welder Load [see 630.11(A), Table 630.11(A)]

Each welder: $480\text{V} \times 23\text{A} \times 0.78 = 8,610\text{ VA}$

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: $7.6\text{ A} \times 480\text{ V} \times \sqrt{3} =$	6,310 VA

Grinder: $3\text{ A} \times 480\text{ V} \times \sqrt{3} =$	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

(see 215.3) The overcurrent protective device must accommodate 125% 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] $[99,000 \text{ VA} \div (480\text{V} \times \sqrt{3}) = 119 \text{ A}]$	95,500 VA
(25% of 56,600 VA) (See 215.3)	14,200 VA
Total VA	109,700 VA

Conversion to amperes using three significant figures: $109,700 \text{ VA} / (480\text{V} \times \sqrt{3}) = 132 \text{ A}$

Minimum size overcurrent protective device: 132 A

Minimum standard size overcurrent protective device (see 240.6): 150 amperes

Where the overcurrent protective device and its assembly are listed for operation at 100 percent of its rating, a 125 ampere overcurrent protective device would be permitted. However, overcurrent protective device assemblies listed for 100 percent of their rating are typically not available at the 125-ampere rating. (See 215.3 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 overcurrent device termination [see 110.14(C) and 215.2(A)(1), 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, Ampacity, and 310.15(C)(a) and correction factors to Table 310.16]:

$$95,500 \text{ VA} / 0.7 / 0.96 = 142,000 \text{ VA}$$

$$[70\% = 310.15(C)(a)] \text{ \& } [0.96 = \text{Correction factors to Table 310.16}]$$

Conversion to amperes:

$$142,000 \text{ VA} / (480\text{V} \times \sqrt{3}) = 171 \text{ A}$$

Note that the neutral conductors are counted as current-carrying conductors [see 310.15(E)(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 $(95,500 \text{ VA} / 0.8 = 119,000 \text{ VA}; 119,000 \text{ VA} / (480\text{V} \times \sqrt{3}) = 143 \text{ A}$, 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 overcurrent protective device 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),

$$195 \text{ amperes} \times 0.96 \times 0.7 = 131 \text{ A}$$

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 overcurrent protective device. Note that the feeder layout precludes the application of 310.14(A)(2) Exception.

Feeder Neutral Conductor

(see 220.61)

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. $(11,600 \text{ VA} / 277\text{V} = 42 \text{ amperes})$. 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 overcurrent devices, the effects of continuous loading can be disregarded in evaluating its terminations [see 215.2(A)(1) Exception No. 2]. That calculation is $(11,600 \text{ VA} \div 277\text{V} = 42 \text{ amperes})$, 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 215.2(A)(1), second paragraph]. Therefore, because the minimum size equipment grounding conductor for a 150 ampere circuit, as covered in Table 250.122, is 6 AWG, that is the minimum neutral size required for this feeder.

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
CN_242.pdf	70_CN 242

Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 242 in the First Draft Report on First Revision No. 8114.

The Correlating Committee directs Code-Making Panel 5 to correlate FR 8114 with 250.102(D), 250.104(B), and 250.190(C)(3).

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 2 for correlation with Annex D Example D3(a).

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 4 for correlation with 690.45.

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 10 for correlation with 215.2(A)(2)(b)(2) and 215.2(B).

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 15 for correlation with 525.11.

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 18 for correlation with 600.7(A)(2).

These actions will be considered as public comments.

The Correlating Committee directs that FR 8114 be sent to all panels for information.

Related Item

- FR 8114

Submitter Information Verification

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Committee: NEC-P02

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Correlating Committee Note No. 242-NFPA 70-2018 [Section No. 250.122]

Submitter Information Verification

Submitter Full Name: Sarah Caldwell

Committee:

Submittal Date: Fri May 11 16:23:39 EDT 2018

Committee Statement and Meeting Notes

Committee Statement: The Correlating Committee directs Code-Making Panel 5 to correlate FR 8114 with 250.102(D), 250.104(B), and 250.190(C)(3).

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 2 for correlation with Annex D Example D3(a).

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 4 for correlation with 690.45.

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 10 for correlation with 215.2(A)(2)(b)(2) and 215.2(B).

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 15 for correlation with 525.11.

The Correlating Committee directs that FR 8114 be referred to Code-Making Panel 18 for correlation with 600.7(A)(2).

These actions will be considered as public comments.

The Correlating Committee directs that FR 8114 be sent to all panels for information.

First Revision No. 8114-NFPA 70-2018 [Section No. 250.122]

Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters
0 Not Returned
12 Affirmative All
0 Affirmative with Comments
0 Negative with Comments
0 Abstention

Affirmative All

Brunssen, James E.
Dressman, Kevin L.
Hickman, Palmer L.
Hittinger, David L.

Holub, Richard A.
Johnston, Michael J.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Pierce, James F.
Saporita, Vincent J.
Williams, David A.



Public Comment No. 415-NFPA 70-2018 [Definition: Example D5(b) Optional Calculation for Multifam...]

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 220.55, Column B): $8000 \text{ VA at } 80\% \div 208 \text{ V} = 31 \text{ A}$ or a circuit of two 8 AWG conductors and one 10 AWG conductor in accordance with 210.19(A)(3)

Space Heating: $6000 \text{ VA} \div 208 \text{ V} = 29 \text{ A}$

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 $18,782 \text{ VA} \div 208 \text{ V} = 90 \text{ A}$

Net calculated load (lighting line to neutral):

$3882 \text{ VA} \div 2 \text{ legs} \div 120 \text{ V per leg} = 16 \text{ amperes}$

Line to line = $14,900 \text{ VA} \div 208 \text{ V} = 72 \text{ A}$

Total load = $16.2 \text{ A} + 71.6 \text{ A} = 88 \text{ A}$

Minimum Size Feeder Required for Service Equipment to Meter Bank (For 20 Dwelling Units)

Net Calculated Load

$167,352 \text{ VA} \div (208 \text{ V})(1.732) = 465 \text{ A}$

Feeder Neutral Load

$$65,080 \text{ VA} \div (208 \text{ V})$$

Load for Feeder from Service Equipment to Meter Bank (For 20 Dwelling Units)

Lighting and Small-Appliance Load

$$20 \text{ units} \times 5,520 \text{ VA} = 110,400 \text{ VA}$$

$$\text{First } 3,000 \text{ VA at } 100\% = 3,000 \text{ VA}$$

$$110,400 \text{ VA} - 3,000 \text{ VA} = 107,400 \text{ VA} \text{ at } 35\% = 37,590 \text{ VA}$$

$$\text{Net Calculated Load } 40,590 \text{ VA}$$

Minimum Size Main Feeder (Less House Load) (For 40 Dwelling Units — 20 with Ranges)

For 208Y/120-V, 3-phase, 4-wire system,

Ranges:

$$\text{Maximum number between any two phase legs} = 7$$

$$2 \times 7 = 14$$

$$\text{Table 220.55 demand} = 29,000 \text{ VA}$$

$$\text{Per phase demand} = 29,000 \text{ VA} \div 2 = 14,500 \text{ VA}$$

$$\text{Equivalent 3-phase load} = 43,500 \text{ VA}$$

Net Calculated Neutral Load (total):

$$40,590 \text{ VA} + 43,500 \text{ VA} = 84,090 \text{ VA}$$

$$84,090 \text{ VA} \div (208 \text{ V})(1.732) =$$

$$234 \text{ A}$$

$$234 \text{ A}$$

Minimum Size Main Feeder Required (Less House Load) (For 40 Dwelling Units)

Net Calculated Load

$$246,624 \text{ VA} \div (208 \text{ V})(1.732) = 685 \text{ A}$$

Main Feeder Neutral Load

$$107,650 \text{ VA} \div (208 \text{ V})($$

Feeder Neutral Load for Feeder from Service Equipment to Meter Bank (For 40 Dwelling Units)Lighting and Small-Appliance Load

$$40 \text{ units} \times 5520 \text{ VA} = 220,800 \text{ VA}$$

$$\text{First } 3000 \text{ VA at } 100\% = 3,000 \text{ VA}$$

$$\text{Next } 120,000 \text{ VA} - 3000 \text{ VA} = 117,000 \text{ VA at } 35\% = 40,950 \text{ VA}$$

$$\text{Remainder } 220,800 \text{ VA} - 120,000 \text{ VA} = 100,800 \text{ VA at}$$

$$25\%$$

$$25,200 \text{ VA}$$

$$\text{Net Calculated Load } 69,150 \text{ VA}$$

Minimum Size Main Feeder (Less House Load) (For 40 Dwelling Units — 40 with Ranges)

For 208Y/120-V, 3-phase, 4-wire system,

Ranges:

$$\text{Maximum number between any two phase legs} = 14$$

$$2 \times 14 = 28$$

$$\text{Table 220.55 demand} = 15,000 + (1,000 \times 28) = 43,000 \text{ VA}$$

$$\text{Per phase demand} = 43,000 \text{ VA} \div 2 = 21,500 \text{ VA}$$

$$\text{Equivalent 3-phase load} = 21,500 \text{ VA} \times 3 = 64,500 \text{ VA}$$

$$\text{Neutral Load} = 64,500 \text{ at } 70\% \text{ [See Table 220.55 and 220.61(B)]}$$

$$\text{Neutral Load} = 45,150$$

Net Calculated Neutral Load (total):

$$79,230 \text{ VA} + 45,150 \text{ VA} = 124,380 \text{ VA}$$

$$124,380 \text{ VA} \div (208 \text{ V})(1.732) =$$

$$299 \text{ A}$$

$$346 \text{ A}$$

Further Demand Factor

[see 220.61(B)]

$$200 \text{ A at } 100\%$$

$$200.0 \text{ A}$$

$$299 \text{ A} - 346 \text{ A} - 200 \text{ A} = 99 \text{ A} - 146 \text{ A at } 70\%$$

$$69 \text{ A} - 102.2 \text{ A}$$

Net Calculated Load (neutral)

$$269 \text{ A} - 302.2 \text{ A}$$

Statement of Problem and Substantiation for Public Comment

The neutral load used in Example D5(b) was extracted from example D4(a). The problem is that example D4(b) (extract) was single phase, and example D5(b) is a three-phase example. Clearly we can use a single phase method for ranges for a three-phase example. I know it's a lot of text but it is what it is.

Related Item

- PI-911

Submitter Information Verification

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Zip:**Submittal Date:** Sun Aug 05 16:45:02 EDT 2018**Committee:** NEC-P02**Copyright Assignment**

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**Public Comment No. 1908-NFPA 70-2018 [Definition: Feeder Neutral Conductor]****Feeder Neutral Conductor**

(see 220.61)

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 / 277V = 42 amperes.) 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 overcurrent devices, the effects of continuous loading can be disregarded in evaluating its terminations [see 215.2(A)(1) Exception No. 2]. That calculation is (11,600 VA ÷ 277V = 42 amperes), 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 215.2(A)(1), second paragraph]. Therefore, because the minimum size equipment grounding conductor for a 150-ampere circuit circuit wired with 2/0 AWG conductors, as covered in Table 250.122, is 6 AWG, that is the minimum neutral size required for this feeder.

Statement of Problem and Substantiation for Public Comment

This rewording, that fortunately does not change the conductor size, correlates with the revised approach being taken by CMP 5 in 250.122. If the new approach ultimately fails, then this comment becomes unnecessary.

Related Item

- FR 8069

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Public Comment No. 1378-NFPA 70-2018 [New Part after I.]

TITLE OF NEW CONTENT

Dormitory Unit (Dormitories). A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.

Statement of Problem and Substantiation for Public Comment

This term appears in multiple code articles and appears as both dormitory and dormitory units. Dormitory Unit appears in Article 210, Dormitories appears in Articles 210, 240, 406 and 550.

Related Item

- First Revision No. 7688-NFPA 70-2018

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