

NFPA 70®-2020 Edition

National Electrical Code®

TIA Log No.: 1564

Reference: 210.8(F)

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www.nfpa.org/70

1. Revise Section 210.8(F) to read as follows:

210.8 Ground-Fault Circuit-Interrupter Protection for Personnel. ...

(F) Outdoor Outlets. All outdoor outlets for dwellings, other than those covered in 210.8(A)(3), Exception to (3), that are supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall have ground-fault circuit-interrupter protection for personnel. This requirement shall become effective January 1, 2023, for ducted or ductless mini-split and multi-split-type heating/ventilating/air-conditioning (HVAC) equipment, including variable refrigerant flow (VFR), variable air volume (VAV), and other HVAC, or water heating units employing power conversion equipment as a means to control compressor speed.

Informational Note: Power conversion equipment is the term used to describe HVAC equipment components that are commonly referred to as the variable speed drive. The use of power conversion equipment to control compressor speed differs from multi-stage compressor speed control.

Exception: Ground-fault circuit-interrupter protection shall not be required on lighting outlets other than those covered in 210.8(C).

Substantiation: While this expanded GFCI protection in the 2020 NEC presents a clear enhancement to safety, HVAC component and equipment safety standards are not harmonized with GFCI amperage limits. Until both equipment and component standards are updated, designers, installers, AHJs, and consumers are forced to choose between an NEC 2020 compliant installation or an operational installation. In jurisdictions that have adopted 2020 NEC with 210.8(F) intact, there have been numerous instances of field tripping of the GFCI breaker on ductless mini splits and units containing power conversion equipment. In these cases, the only solution was for the AHJ to approve a temporary allowance to install a non-GFCI breaker. Known instances of attempt to use GFCI breaker on products with inverter driven compressors, with only resolution to provide heating/cooling to residence by using non-GFCI breaker:

1. Columbiana, AL
 - a. 1-1/2-ton mini-split HP
 - b. GFCI circuit breaker – Brand “A”
2. Helena, AL
 - a. 1-ton mini-split HP
 - b. GFCI circuit breaker – Brand “B”
3. Helena, AL
 - a. 1-ton mini-split HP

- b. GFCI circuit breaker – Brand “B”
- 4. Middleburg Heights, OH
 - a. 3-ton mini-split HP
 - b. GFCI circuit breaker – Brand “A”
- 5. Middleburg Heights, OH – Three separate instances, two different HP manufacturers, and three different GFCI circuit breaker brands, all resolved by replacing with non-GFCI breakers. Ohio has not adopted 2020 NEC yet, so this was a compliant solution.
 - a. 3-ton mini-split HP
 - b. GFCI circuit breaker – Brand unknown

These concerns are emergency in nature as this issue impacts consumers who would be relying on this equipment for their only or primary source of heating or cooling. Tripping of the GFCI breakers could result in dangerous conditions for people in cold or hot weather. In CDC’s June 19, 2020 Morbidity and Mortality Weekly Report, an article was published analyzing Heat-Related Deaths in the United States, 2004-2018

(<https://www.cdc.gov/mmwr/volumes/69/wr/pdfs/mm6924a1-H.pdf>). A key finding of the article is that, “Observed differences in heat-related mortality across racial/ethnic groups can also be associated with social vulnerability, which often tracks with factors leading to heat exposure (e.g., less green space and more heat-absorbing surfaces), health disparities *manifested by lower income, and absence of structural adaptations such as air conditioning.*” [Emphasis added.] AHRI notes, there has not yet been a full peak cooling season while NEC 2020 requirements are in place and our expectation is that installations compliant with 210.8(F) will cause widespread non-operational applications of cooling in peak cooling season. In June 2020, the Guardian published an article (<https://www.theguardian.com/us-news/2020/jun/16/climate-deaths-heat-cdc>) noting that, “in the last six decades, the number of annual heatwaves in 50 US cities has, on average, tripled.” Heat and cold related deaths, a known hazard, may be exacerbated by the lack of a temporary suspension of 210.8(F) for inverter-driven equipment.

The purpose of this proposed TIA is not to eliminate the GFCI protection, but simply to provide time for the NEC, Product Standards (both UL 943 and UL 60335-2-40), and product certification to be harmonized. While some products covered by this new requirement may work, there is no assurance without appropriate revisions to leakage current limitations and associated text in the product and component standards, that all listed (certified) products will operate. While adoption of the 2020 NEC and use of 210.8 (F) is currently limited (as of 1/1/2021 only nine states have adopted the 2020 NEC (along with some other local jurisdictions), however, 13 more states are currently in the process of adopting the 2020 NEC and the number of affected installations will rise significantly), interoperability of listed equipment has already been identified. These issues are noted from multiple manufacturers and multiple jurisdictions. In addition, inverter-driven HVAC equipment currently represent a small portion of the industry installations – although this product segment is quickly increasing due to the increased demand for higher efficient HVAC equipment. It is significant to note that Massachusetts and Utah, in the adoption of NEC 2020, declined to adopt the provision of 210.8(F), recorded for MA, here: <https://www.mass.gov/doc/state-electrical-code-massachusetts-amendments-2020/download>.

Emergency Nature: The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation. The

proposed TIA intends to correct a circumstance in which the revised NFPA Standard has resulted in an adverse impact on a product or method that was inadvertently overlooked in the total revision process or was without adequate technical (safety) justification for the action.

Without this TIA, designers, installers, AHJs, and consumers are forced to choose between an NEC compliant installation or an operational installation. While lack of harmonization may not impact every installation, current product and component standards do not address leakage current at other than 60Hz for all utilization equipment from exceeding the Class A GFCI trip levels. GFCI component standards and product safety standards need time to update certification testing requirements and OEMs need time to redesign to these yet undefined certification requirements. With the small number of states/jurisdictions that have adopted the 2020 NEC along with there has not yet been a full peak cooling season while NEC 2020 requirements are in place and our expectation is it is expected that installations compliant with 210.8(F) will cause widespread non-operational applications of cooling outages in high peak cooling season. Tripping of the GFCI breakers could result in dangerous conditions for consumers in cold or hot weather.