



Nuisance Tripping of Ground Fault Circuit Interrupters (GFCIs) for Electric Household Cooking Ranges

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ABOUT THE ASSOCIATION OF HOME APPLIANCE MANUFACTURERS

AHAM represents manufacturers of major, portable and floor care home appliances, and suppliers to the industry. AHAM's membership includes over 150 companies throughout the world. AHAM members employ tens of thousands of people and produce more than 95% of the household appliances that are shipped for sale within the United States. The factory shipment value of these products is more than \$50 billion annually. The home appliance industry, through its products and innovation, is essential to consumer lifestyle, health, safety and convenience. Through its technology, employees and productivity, the industry contributes significantly to the US job market and the nation's economic security. Home appliances also are a success story in terms of energy efficiency and environmental protection. The purchase of new appliances often represents the most effective choice a consumer can make to reduce home energy use and costs.

AHAM is also a standards development organization, accredited by the American National Standards Institute (ANSI). The Association authors numerous appliance performance testing standards used by manufacturers, consumer organizations and governmental bodies to rate and compare appliances. AHAM's consumer safety education program has educated millions of consumers on ways to safely use appliances such as portable heaters, clothes dryers, and cooking products. The Association's Verifide[®] program provides independent testing by verifying the volume, energy, and in some cases, performance of common household appliances to ensure they will perform according to manufacturers' stated claims.

Introduction

The 2020 edition of NFPA 70®, National Electric Code® (NEC®) includes new language requiring Ground-Fault Current Interrupters (GFCIs) for household branch circuits in new constructions and significant remodels. Section 210.8(A) affects household electric cooking ranges:

210.8(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A) (11) ... shall have ground-fault circuit-interrupter protection for personnel.

...

(7)

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

In new homes, many electrical outlets for household ranges are located near a kitchen sink and their outlets fall into item (7) above. These outlets now require connection to a Class A GFCI device. When this code proposal was submitted to the NEC, it was not submitted to the relevant product safety standards for household appliances that plug into such outlets. As a result, no evaluation was conducted to evaluate issues of compatibility between these household appliances and GFCI devices, some of which are overly sensitive as discussed below.

Nuisance Tripping of Household GFCIs in Kitchen Branch Circuits

In section 422.6 of the 2017 NEC, a clause was added requiring household appliances to be listed to the relevant product safety standard. For electric ranges, the industry standard is UL 858, which states that products must be installed in accordance with the National Electric Code. The latest edition of UL 858 is aligned with the 2017 NEC.

The 2020 NEC requires 240 volt GFCIs per section 210.8(A). This NEC update effectively creates a new appliance requirement that goes beyond the listing requirements in section 422.6 of the NEC. The current version of UL 858 does not require leakage current assessment for products above 125 volts and does not require GFCI compatibility. By the same token, the safety standard for heating elements, UL 1030, has an exception that states:

Exception: A heating element intended exclusively for use in a household electric range, oven, or surface assembly having exposed metal parts connected to the neutral terminal or lead at the factory, or provided with a four-conductor cord at the factory need not be tested for leakage current.

Many residential range constructions employ sheathed heating elements, which utilize ceramic insulator materials; these materials are susceptible to moisture accumulation. During manufacturing, storage, or shipping, moisture can collect within the sheathed heating elements if the appliance is in an unconditioned environment for an extended period of time. This moisture is evaporated when heating elements are energized, causing a spike in leakage current for roughly three to five minutes. Sometimes this condition, while safe, can cause

nuisance tripping of certain GFCI circuits, especially if multiple appliance elements are energized at one time. Leakage current is not a potential safety issue with household ranges because electric ranges are constructed with a reliable ground path as required by UL 858.

Updates to Product Safety Standards

Since range manufacturers have not been required to evaluate GFCI compatibility in the respective appliance standards, several electric ranges have limitations when powered by a GFCI protected circuit. Electric range manufacturers have been working on a technical update for UL 858 that will seek to address compatibility with GFCI devices. A revision proposal was submitted to UL's Collaborative Standards Development System (CSDS) on April 19, 2021. However, this UL 858 revision will take months for approval and will have an effectivity date set after the proposal is published. The revision will include leakage current requirements, which address some of the GFCI tripping issues.

However, the leakage current test may not be the best method for determining GFCI compliance and reducing nuisance tripping due to GFCIs. In fact, UL 101 and UL 943 Task Groups have been formed to study nuisance tripping of home appliances connected to GFCIs. These Task Groups are hoping to develop a test specifically for evaluating GFCI nuisance tripping, predicting whether or not the appliance will nuisance trip in the field. Work is ongoing with meetings occurring every few months; it will take time to define a repeatable and reproducible GFCI compatibility test.

Remedies

The NFPA Code Making Panel (CMP) has twice rejected a request to extend the NEC update's effectivity date to allow time for electric cooking products to improve compatibility with NEC 2020, and with GFCI breakers. For ranges which are currently nuisance tripping, the only remedies AHAM sees as acceptable are:

- Relocating the outlet greater than 6 feet from a kitchen sink;
- Asking the authorities having jurisdiction (AHJ) to invoke section 90.4 of the NEC, which allows the code to roll back to the 2017 edition, eliminating the need for a GFCI breaker:

90.4 Enforcement:

...This Code may require new products, constructions, or materials that may not yet be available at the time the Code is adopted. In such event, the authority having jurisdiction may permit the use of the products, constructions, or materials that comply with the most recent previous edition of this Code adopted by the jurisdiction.

Another possible method has been mentioned in some forums to reduce potential nuisance tripping: install the range using permanent wiring and not an attached power cord. However, this remedy for rewiring ranges from cord connection to hard wire, while providing relief for

the 2020 code, as hard wired installations do not require GFCI protection, is insufficient. Rewiring of cord sets to hard-wired installations is not feasible for appliances that can be consumer installed and that need to permit movement for cleaning under or behind the range. Freestanding ranges are cord connected out of consumer convenience and are commonly pulled out for cleaning. If a permanent connection is used to install the range, then an electrician would need to be called to move the freestanding range. This method is not recommended as it reduces the utility of the range and is likely to be misunderstood by future home owners. Furthermore, swapping a cord with a hard-wired connection in the field may invalidate the appliance's NRTL listing as per section 9 of the UL 858 standard.

Conclusion

Manufacturers are facing an urgent need to respond to increasing GFCI incompatibility complaints as more AHJs adopt the 2020 NEC. Until the UL product standard is harmonized with the NEC update, appliance designers, installers, AHJs, and consumers are forced to choose between a compliant and an operational installation, or must change the installation.

Additional GFCI requirements were added in the NEC for kitchen branch circuits which effectively created a new appliance requirement. A transition period was not provided, and electric cooking products are still being brought into compliance with the 2020 NEC. AHAM and home appliance manufacturers have submitted a proposal to change the UL 858 standard but it will take time to publish and then become effective. The proposed updates to the UL 858 standard will address incompatibility tripping robustness for future designs, but will do nothing to provide relief for current field incompatibility tripping complaints. In the meantime, nuisance tripping with GFCI breakers are expected to occur and, unfortunately, there are only few remedies to prevent this nuisance tripping.