

## **5PP - 250 Volt Two-Pole GFCI Fact Sheet**

New requirements for ground-fault circuit interrupter protection (GFCI) expand the protection across a range of uses and occupancies in the 2020 edition of the NEC. First introduced in the early 1970s, their continued expansion to cover areas in homes and workplaces where occupants are particularly susceptible to electric shock accidents can be directly attributed to reductions in electrocutions and electric shock accidents as published by the U.S. Consumer Product Safety Commission.

Unfortunately, many times tragedy strikes before we see improvements to the Code. Substantiation submitted for the 2020 NEC revision process included several incidents where fatalities occurred.

Access to the 2020 NEC archived revision information can be found by visiting [www.nfpa.org/70](http://www.nfpa.org/70), which includes the historical record of public inputs, public comments, draft language developed by the NEC Technical Committee and final version of code language. There were four fatalities submitted as substantiation to the Technical Committee that further highlighted the need to expand this safety technology for these types of appliances.

These changes, which were arrived at after significant substantiation and deliberation from numerous, diverse organizations and individuals, have a single-minded purpose of making electrical systems safe in places where we live, work and play.

### **GFCI Field Testing**

Listed below are the results of additional field tests that were conducted and identified as issues that under the right circumstances, could have resulted in additional fatalities.

Proper grounding and bonding as required by the NEC and manufacturer's instructions is one of the key safety components of the electrical system. The majority of issues identified in these field tests revealed improper bonding connections. GFCIs installed at these locations have functioned correctly and prevented further incidents:

### **Stoves/Ranges**

Two-pole GFCI circuit breakers were provided to existing homeowners for installation on these circuits. The trial covered several brands: KitchenAid, Frigidaire, GE, Whirlpool, Kenmore, and Maytag. The following issues were discovered in total on approximately 20% of devices.

1. Miswiring
  - a. The grounded (neutral) conductor to frame bonding jumper was not removed when the appliance was being supplied by a 4-wire cord set.
  - b. The grounded (neutral) conductor to frame bonding jumper was not installed when the appliance was being supplied by 3-wire cord set.
2. Potentially hazardous situation
  - a. One issue was found where the lower element was in the process of failing and was starting to leak current to the frame of the appliance.

## **Electric Clothes Dryers**

Two-pole GFCI circuit breakers were provided to existing homeowners for installation on these circuits. The trial covered several brands: Whirlpool, Amana, Maytag, LG, GE, and Kenmore. The following issue was discovered in total on approximately 15% of devices.

1. Miswiring
  - a. The grounded (neutral) conductor to frame bonding jumper was not removed when supplied by a 4-wire cord set.

## **AC Condenser /Heat pump**

Two-pole GFCI circuit breakers were provided to existing homeowners for installation on these circuits. The trial covered several brands: Rheem, Bryant, Carrier, American Standard, Trane, Comfortmaker, Lennox, IPC, Unitary Products, Heil, Ruud, and Amana. The following issues were discovered on a total of approximately 13% of devices.

1. Miswiring
  - a. The grounded (neutral) conductor was improperly bonded in the appliance disconnecting means and/or junction boxes.
  - b. No equipment grounding conductor was installed or provided to bond the frame of AC condenser.
2. Potentially hazardous situation
  - a. This was created when a breakdown occurred in the branch circuit supply conductor insulation, resulting in a ground fault from the ungrounded conductor to the AC condenser frame.

## **Conclusion from Findings**

The findings from installation of two-pole GFCI circuit breakers in existing homes found no interoperability issues but did identify a key installation issue where appliances were not properly installed on 4-wire systems per the manufacturer's instructions and the NEC. Additionally, the comments made in the marketplace about wiring issues that created the fatality leading to NFPA adoption of two-pole GFCI requirements on outdoor outlets were not common is incorrect. Where issues with GFCI's tripping were found, it was the grounding and wiring issues that caused them, not an issue between the outdoor AC unit and the GFCI.

GFCI protection is fully compatible with ranges, stoves, electrical clothes dryers, AC condensers, and heat pumps where installed in accordance with the manufacturer's installation instructions and the National Electrical Code. GFCI protection will properly function to de-energize the branch circuit when the appliance is improperly wired or when the appliance has a defective component.

GFCI devices have a nearly 50-year record of protection against shock and electrocution since first becoming a requirement for receptacle outlets near swimming pools in the 1971 National Electrical Code. Subsequent editions of the National Electrical Code have since

expanded GFCI protection to other areas and appliances of a dwelling where shock and electrocution hazards may exist.

The purpose of the National Electrical Code is the practice safeguarding of persons and property from hazards arising from the use of electricity. GFCI protection of the branch circuits and outlets as required in the 2020 National Electrical are essential to upholding this commitment to electrical safety.