

## Primary injection testing requirements (NEC 230.95)

Section 230.95 in the National Electrical Code (NEC) addresses systems that are required to have Ground Fault Protection of Equipment (GFPE). Although the requirement for GFPE protection for service disconnects, feeders, and branch circuits over 1000 amps, and over 150 volts to ground, has been in the NEC for many code cycles, changes were made in the 2017 NEC regarding the performance testing. In previous editions of the NEC, the performance test was to be done according to the manufacturer's instructions provided with the equipment, and in some cases, the test could be achieved by a simple "push to test." In the 2017 NEC, in section 230.95(C), "primary injection testing" was mandated and a copy of the test is required to be provided to the electrical inspector.

The objective of the test is to identify how the system operates under various levels of current load. A large current (between 100A and 20,000A depending on system specifications and test requirements) is injected directly on the primary side of the electrical system, such as a circuit breaker. By injecting the current into the system, the test will determine if the breaker will trip or fail by measuring how much current the overcurrent device can handle over a determined amount of time.

Primary injection testing, as opposed to the secondary injection test, is the only way to prove correct installation and operation of the whole protection chain, as the test involves the entire circuit: current transformer primary and secondary windings, relays, trip and alarm circuits, circuit breakers, and all wiring. Primary injection testing is performed during the commissioning and maintenance process, or after any modification, as a functional test of the entire system.

The "primary injection test" documentation shall include:

1. Project name:
2. Project address:
3. Equipment/breaker manufacturer's name:
4. Testing agency:
5. Date the test was completed:
6. Signature of the qualified person who performed the primary injection test.