

Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the disconnect switch or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in *NFPA 70E-2021, Standard for Electrical Safety in the Workplace*.

Informational Note No. 3: IEEE 1584-2018, *IEEE Guide for Performing Arc Flash Hazard Calculations*, provides guidance in determining arcing current.

**(C) Performance Testing.** The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer's instructions.

A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.

## Part VII. Circuit Breakers

**240.80 Method of Operation.** Circuit breakers shall be trip free and capable of being closed and opened by manual operation. Their normal method of operation by other than manual means, such as electrical or pneumatic, shall be permitted if means for manual operation are also provided.

**240.81 Indicating.** Circuit breakers shall clearly indicate whether they are in the open "off" or closed "on" position.

Where circuit breaker handles are operated vertically rather than rotationally or horizontally, the "up" position of the handle shall be the "on" position.

If the panelboard enclosure is mounted in a horizontal position, compliance with this requirement that the up position of the handle is on or closed and the down position of the handle is off or open limits the number of pole spaces available in a panelboard. This results in some of the circuit breakers having their "on" and "off" operation upside down.

Opening or turning off a circuit breaker or switch is one of the steps necessary to achieve an electrically safe work condition for servicing or maintenance. *NFPA 70E®*, *Standard for Electrical Safety in the Workplace®*, Article 120 contains seven additional steps that must be followed before electrical conductors or circuit parts are considered to be in an electrically safe work condition.

**240.82 Nontamperable.** A circuit breaker shall be of such design that any alteration of its trip point (calibration) or the time required for its operation requires dismantling of the device or breaking of a seal for other than intended adjustments.

### 240.83 Marking.

**(A) Durable and Visible.** Circuit breakers shall be marked with their ampere rating in a manner that will be durable and visible after installation. Such marking shall be permitted to be made visible by removal of a trim or cover.

**(B) Location.** Circuit breakers rated at 100 amperes or less and 1000 volts or less shall have the ampere rating molded, stamped, etched, or similarly marked into their handles or escutcheon areas.

**(C) Interrupting Rating.** Every circuit breaker having an interrupting rating other than 5000 amperes shall have its interrupting rating shown on the circuit breaker. The interrupting rating shall not be required to be marked on circuit breakers used for supplementary protection.

**(D) Used as Switches.** Circuit breakers used as switches in 120-volt and 277-volt fluorescent lighting circuits shall be listed and shall be marked SWD or HID. Circuit breakers used as switches in high-intensity discharge lighting circuits shall be listed and shall be marked as HID.

Circuit breakers marked switch duty (SWD) have been subjected to additional endurance and temperature testing to assess their ability for use as the regular control device for fluorescent lighting circuits. Circuit breakers marked HID are also acceptable for use as the regular switching device to control high-intensity discharge (HID) lighting such as mercury vapor, high-pressure or low-pressure sodium, or metal halide lighting. Circuit breakers marked HID can be used for switching both HID and fluorescent lighting loads; however, a circuit breaker marked SWD can be used only as a switching device for fluorescent lighting loads.

**(E) Voltage Marking.** Circuit breakers shall be marked with a voltage rating not less than the nominal system voltage that is indicative of their capability to interrupt fault currents between phases or phase to ground.

**240.85 Applications.** A circuit breaker with a straight voltage rating, such as 240V or 480V, shall be permitted to be applied in a circuit in which the nominal voltage between any two conductors does not exceed the circuit breaker's voltage rating. A two-pole circuit breaker shall not be used for protecting a 3-phase, corner-grounded delta circuit unless the circuit breaker is marked 1 $\phi$ -3 $\phi$  to indicate such suitability.

A circuit breaker with a slash rating, such as 120/240V or 480Y/277V, shall be permitted to be applied in a solidly grounded circuit where the nominal voltage of any conductor to ground does not exceed the lower of the two values of the circuit breaker's voltage rating and the nominal voltage between any two conductors does not exceed the higher value of the circuit breaker's voltage rating.

Informational Note: Proper application of molded case circuit breakers on 3-phase systems, other than solidly grounded wye, particularly on corner grounded delta systems, considers the circuit breakers' individual pole-interrupting capability.