

See also

408.4 and its commentary for additional requirements and information on circuit directories for switchboards and panelboards

(B) Engineered Series Combination Systems. Equipment enclosures for circuit breakers or fuses applied in compliance with series combination ratings selected under engineering supervision in accordance with 240.86(A) shall be legibly marked in the field as directed by the engineer to indicate the equipment has been applied with a series combination rating. The marking shall meet the requirements in 110.21(B) and shall be readily visible and state the following:

CAUTION — ENGINEERED SERIES
COMBINATION SYSTEM RATED _____
AMPERES. IDENTIFIED REPLACEMENT
COMPONENTS REQUIRED.

The warnings on replacement components are important to follow in order to maintain the level of protection provided by the design. Likewise, when components are replaced, new or updated warning labels with information based on the new component may be necessary.

(C) Tested Series Combination Systems. Equipment enclosures for circuit breakers or fuses applied in compliance with the series combination ratings marked on the equipment by the manufacturer in accordance with 240.86(B) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating. The marking shall meet the requirements in 110.21(B) and shall be readily visible and state the following:

CAUTION — SERIES COMBINATION
SYSTEM RATED ____ AMPERES. IDENTIFIED
REPLACEMENT COMPONENTS REQUIRED.

Informational Note: See IEEE 3004.5-2014 *Recommended Practice for the Application of Low-Voltage Circuit Breakers in Industrial and Commercial Power Systems*, for further information on series tested systems.

110.23 Current Transformers. Unused current transformers associated with potentially energized circuits shall be short-circuited.

110.24 Available Fault Current.

- Δ **(A) Field Marking.** Service equipment at other than dwelling units shall be legibly marked in the field with the available fault current. The field marking(s) shall include the date the fault-current calculation was performed and be of sufficient durability to withstand the environment involved. The calculation shall be documented and made available to those authorized to design, install, inspect, maintain, or operate the system.

Informational Note No. 1: See NFPA 70E-2021, *Standard for Electrical Safety in the Workplace*, for assistance in determining

the severity of potential exposure, planning safe work practices, and selecting personal protective equipment. The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current and interrupting ratings of equipment.

Informational Note No. 2: Values of available fault current for use in determining appropriate minimum short-circuit current and interrupting ratings of service equipment are available from electric utilities in published or other forms.

(B) Modifications. When modifications to the electrical installation occur that affect the available fault current at the service, the available fault current shall be verified or recalculated as necessary to ensure the service equipment ratings are sufficient for the available fault current at the line terminals of the equipment. The required field marking(s) in 110.24(A) shall be adjusted to reflect the new level of available fault current.

Exception: The field marking requirements in 110.24(A) and 110.24(B) shall not be required in industrial installations where conditions of maintenance and supervision ensure that only qualified persons service the equipment.

To be used safely, equipment must have an interrupting rating or short-circuit current rating equal to or greater than the available fault current. Any equipment operating with ratings less than the available fault current is potentially unsafe.

Existing electrical distribution systems often experience change over the life of the system. As the system ages, the supply network to which it is connected is affected by growth and is forced to increase capacity or increase efficiency by reducing transformer impedance. In some cases, alternative energy systems are added to existing installations. Such changes to the electrical distribution system can result in an increase of the available fault current. That increase in available fault current can exceed the ratings of the originally installed equipment, violating 110.10 and 110.11 and creating an unsafe condition. This section requires an initial marking of maximum available fault current as well as the requirement to update the information when the system is modified.

The available fault current must be known to complete an arc-flash risk assessment per Section 130.5 of NFPA 70E, *Standard for Electrical Safety in the Workplace*. This assessment is used to determine the arc-flash protection boundary and required PPE in accordance with NFPA 70E, Sections 130.5(E) and 130.5(F). The equipment must then be marked with the incident energy or required level of PPE per 130.5(H). According to NFPA 70E, Article 130, an arc-flash risk assessment is required to be conducted any time work is performed where electrical conductors or circuit parts operate at 50 volts and greater and are not placed in an electrically safe work condition. Additionally, per NFPA 70E 130.5(H) the assessment must be reviewed periodically — at least every 5 years — to account for changes in the electrical distribution system that could affect the original arc-flash assessment.

110.25 Lockable Disconnecting Means. If a disconnecting means is required to be lockable open elsewhere in this Code, it shall be capable of being locked in the open position. The