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THE NATIONAL ELECTRICAL CODE AND ARC FLASH

In recent years, the National Electrical Code (NEC) has added some requirements associated with Arc Flash. With regard to its application in industrial environments, a simplified summary of these requirements is given below with some application notes.

Notes on NEC Article 110.16 Arc-Flash Hazard Warning:

1. This article was added to the NEC in 2002 under *Article 110 – Requirements for Electrical Installations*. It underwent minor revisions every three years through 2014.
2. It is a general requirement that certain electrical equipment “be field marked or factory marked to warn qualified persons of potential electrical arc flash hazards”. It originally did not require any detailed information on the label. To meet this requirement, a general warning label was applied on new equipment when it was shipped from the factory.
3. In 2017, an additional requirement was included for equipment rated 1200 amps or more. The label is to include the nominal system voltage, the available fault current, the clearing time based on that fault current, and the date the label was applied. This labeling is not “required if an arc flash label is applied in accordance with acceptable industry practice”, such as defined in NFPA 70E.
4. If arc flash labels are applied on equipment per NFPA 70E, the requirements of article 110.16 should be met.

Notes on NEC Article 240.87 Arc Energy Reduction:

1. This article was added to the NEC in 2011 under *Article 240 – Overcurrent Protection, Part VII – Circuit Breakers*.
2. It underwent a fairly significant revision in 2014.
3. It was further revised in 2017.
4. As of 2017, circuit breakers rated 1200A or higher must have a fast means of clearing the arcing fault current when energized work is going to take place down-line of the circuit breaker. These methods could include zone-selective interlocking, differential relaying, maintenance switch, energy-reducing active arc flash mitigation system, instantaneous trip, instantaneous override, or an approved equivalent.

5. The key focus is that [the arcing current](#) must be cleared quickly. To understand the implications of this requirement, consider a 2500 kVA transformer feeding a 480V system:
 - a. The maximum short circuit current from the transformer at 480V would be approximately 50 kA.
 - b. The 100% arcing current would be approximately 26 kA. (This is per the equations in IEEE Standard 1584-2002.)
 - c. The 85% arcing current would be approximately 22 kA. (This is per the guidelines in IEEE Standard 1584-2002.)
 - d. Using the 22 kA value, the traditional instantaneous trip would typically not be used, as this would likely miscoordinate with down-line protective devices. One of the other methods would be preferred for maintaining overcurrent coordination on the system.

Notes on NEC Article 240.67 Arc Energy Reduction:

1. This article was added to the NEC in 2017 under *Article 240 – Overcurrent Protection, Part VI – Cartridge Fuses and Fuseholders*. It is to become effective January 1, 2020.
2. Fuses rated 1200A or higher must have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following shall be provided: differential relaying, energy-reducing maintenance switching, energy-reducing active arc flash mitigation system, or an approved equivalent.
3. To understand the implications of this requirement, consider a 2500 kVA transformer feeding a 480V system:
 - a. The maximum short circuit current from the transformer at 480V would be approximately 50 kA.
 - b. The 100% arcing current would be approximately 26 kA.
 - c. The 85% arcing current would be approximately 22 kA.
 - d. Using a typical Class L fuse, to have a clearing time of < 0.07 seconds at 22 kA, a fuse size of approximately 1800A would be the maximum that would meet the 0.07 second criteria.
 - e. In conclusion, fuses of 2000A or higher are unlikely to meet this criterion on 480V systems.

The specific NEC articles should be reviewed for more details when applying the summary information given in this document.