DEPARTMENT OF LABOR AND INDUSTRY

Coordination of overcurrent protective devices (OCPDs)

There continues to be much confusion in the electrical industry regarding "selective coordination" as compared to "coordination," and more importantly, what the National Electrical Code (NEC) requires or allows.

The purpose of selectively coordinating OCPDs is to localize an overcurrent condition and to restrict the outage to the specific equipment or circuit that is affected, so as not to compromise the entire electrical system, and to ensure continuity of operations, such as emergency egress lighting in a high-rise building. A fault condition on a branch circuit should open the branch circuit OCPD, not the feeder OCPD. Likewise, a fault condition on a feeder should open the feeder OCPD, not the service OCPD.

Coordination

In accordance with NEC Article 517 for Health Care Facilities, which is derived from NFPA 99 (Health Care Facilities Code), specifically 517.31(G) and 517.42(F) "coordination" is required for OCPDs serving the essential electrical system, and it must be coordinated for the period of time that a fault's duration extends beyond 0.1 seconds (6 cycles on a 60HZ system). Note that this level of coordination does not cover the **full range** of possible overcurrent conditions. It might seem counterintuitive that design criteria for a health care facility are less restrictive than other types of equipment or systems in the NEC, but NFPA 99 has direct responsibility for developing electrical requirements for all health care facilities, and NFPA 99 takes a comparatively limited approach to electrical system coordination.

Selective coordination

For **all other equipment or systems** in the NEC where "selective coordination" is required, the threshold is not 0.1 seconds, and it's not 0.01 seconds: selective coordination is defined, in part, in NEC Article 100 as "…the selection and installation of overcurrent protective devices and their ratings or settings for the **full range** of available overcurrents, from overload to the maximum available fault current, and for the **full range** of overcurrent protective device opening times associated with those overcurrents." There is no threshold of .01 seconds. The term "full range" is not synonymous with "0.01 seconds". Traditional time current curves only show times of 0.01 seconds and may not be able to determine overcurrent protective device operation for all levels of current. In order to consider **all currents and all times**, it may be necessary to consult circuit breaker and fuse manufacturer selective coordination tables in addition to time current curves.

Articles where selective coordination is required in the NEC:

- Article 620 – Multiple Elevators supplied from a single feeder
- Article 645 – Information Technology Equipment (Critical Operations Data Centers)
- Article 695 – Fire Pumps
- Article 700 – Emergency Systems

- Article 701 – Legally Required Standby Systems
- Article 708 – Critical Operation Power Systems

How does an electrical installer comply with these complex code requirements?

Selective coordination must be determined by a licensed professional engineer or other qualified and knowledgeable persons engaged primarily in the design, installation, or maintenance of electrical systems. OCPD manufacturers, equipment suppliers and other third-party consultants can provide valuable information and assistance when an electrical system study needs to be completed. The electrical system study and resulting OCPD selection must be documented and made available to those authorized to design, install, maintain and operate the system. Upon request it must also be made available to electrical inspectors.