



**EXHIBIT 240.2** Overcurrent protection schemes without system coordination and with system coordination.

operation prevents power loss to unaffected loads. Coordinated short-circuit protection automatically opens the circuit by localizing and de-energizing the faulted portion of the circuit, but an overload condition is not required to result in automatic opening of a protective device. Instead, an alarm can be used to warn of the overload condition, and remedial action can be taken.

In some circumstances, an orderly shutdown of a system or process is more critical to personnel and equipment safety than is the automatic operation of the OCPD in response to an overload. Examples of overcurrent protection with and without coordinated protection are illustrated in Exhibit 240.2.

#### See also

**620.62, 645.27, 695.3(C)(3), 700.32, 701.32, and 708.54** for selective coordination requirements for specific systems or equipment

**240.13 Ground-Fault Protection of Equipment.** Ground-fault protection of equipment shall be provided in accordance with 230.95 for solidly grounded wye electrical systems of more than 150 volts to ground but not exceeding 1000 volts phase-to-phase for each individual device used as a building or structure main disconnecting means rated 1000 amperes or more.

This section shall not apply to the disconnecting means for the following:

- (1) Continuous industrial processes where a nonorderly shutdown will introduce additional or increased hazards
- (2) Installations where ground-fault protection is provided by other requirements for services or feeders
- (3) Fire pumps

Section 240.13 extends the requirement of 230.95 to building disconnects, regardless of whether they are classified as service

disconnects, building disconnects for feeders, or even branch circuits.

Where ground-fault protection for equipment is installed at the service equipment, and feeders or branch circuits are installed from that service to supply other buildings or structures, the disconnecting means at any subsequent building is not required to be provided with ground-fault protection if the service device provides the required protection. Installations performed prior to the 2008 edition of the *NEC*® permitted “re-grounding” of the grounded conductor at the separate building if an equipment grounding conductor was not included with the supply circuit. Where re-grounding of the neutral occurs downstream from the service, the re-grounding could nullify the ground-fault protection (or result in unwanted operation of the protection) because the neutral current has parallel paths on which to return to the source. Feeders or branch circuits supplying other buildings or structures might have to be isolated to allow for proper operation of the service ground-fault protection, and separate ground-fault protection installed at the building disconnecting means is then necessary to meet the requirements of 240.13.

#### See also

**210.13, 215.10, and Article 225, Part II**, for the requirements for building disconnects not on the utility service

### 240.15 Ungrounded Conductors.

**(A) Overcurrent Device Required.** A fuse or an overcurrent trip unit of a circuit breaker shall be connected in series with each ungrounded conductor. A combination of a current transformer and overcurrent relay shall be considered equivalent to an overcurrent trip unit.

Informational Note: See Parts III, IV, V, and XI of Article 430 for motor circuits.

**(B) Circuit Breaker as Overcurrent Device.** Circuit breakers shall open all ungrounded conductors of the circuit both manually and automatically unless otherwise permitted in 240.15(B)(1), (B)(2), (B)(3), and (B)(4).

**(1) Multiwire Branch Circuits.** Individual single-pole circuit breakers, with identified handle ties, shall be permitted as the protection for each ungrounded conductor of multiwire branch circuits that serve only single-phase line-to-neutral loads.

**(2) Grounded Single-Phase Alternating-Current Circuits.** In grounded systems, individual single-pole circuit breakers rated 120/240 volts ac, with identified handle ties, shall be permitted as the protection for each ungrounded conductor for line-to-line connected loads for single-phase circuits.

**(3) 3-Phase and 2-Phase Systems.** For line-to-line loads in 4-wire, 3-phase systems or 5-wire, 2-phase systems, individual single-pole circuit breakers rated 120/240 volts ac with identified handle ties shall be permitted as the protection for each ungrounded conductor, if the systems have a grounded neutral point and the voltage to ground does not exceed 120 volts.