

density is high and service reliability is important. This type of distribution system introduces a variety of problems not encountered in the more common radial-type distribution system and must be designed by experienced electrical engineers. Exhibit 450.9 illustrates a typical 3-phase network system for an industrial plant fed by two primary feeders, preferably from separate substations, energized at any standard voltage up to 34,500 volts. Each of the transformers is supplied by the two primary feeders via a double-throw switch at the transformer so that the transformer can be supplied by either feeder.

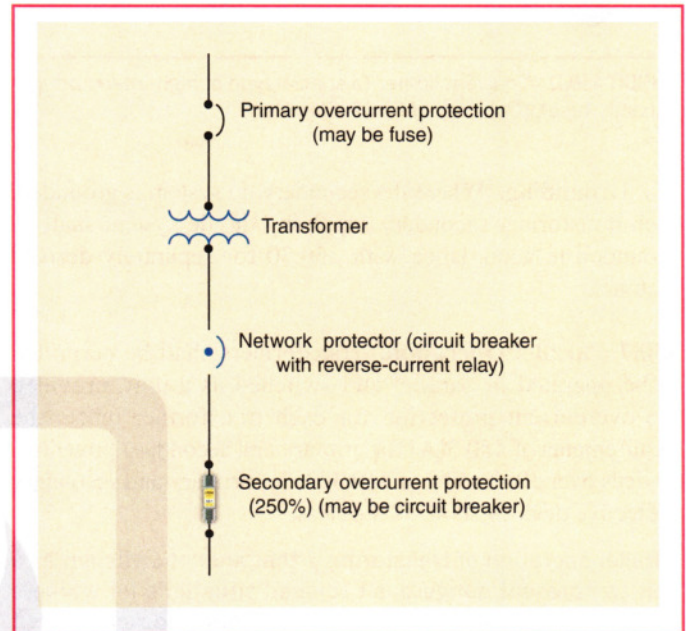
Each of the network transformers is rated in the range of 300 to 1000 kilovolt-amperes and is required to be protected as illustrated in Exhibit 450.10. The primary and secondary protection is in accordance with 450.3, but an additional protective device must be provided on the secondary side. This protective device, known as a network protector, consists of a circuit breaker and a reverse-current relay. The network protector operates on reverse current to prevent power from being fed back into the transformer through the secondary ties if a fault were to occur in the transformer or a primary feeder. The reverse-current relay is set to trip the circuit breaker at a current value not more than the rated secondary current of the transformer. The relay is not designed to trip the circuit breaker in the event of an overload on the secondary of the transformer.

The secondary ties shown in Exhibit 450.9 must be protected at each end with an overcurrent device, in accordance with 450.6(A)(3). The overcurrent device most commonly provided is a special type of fuse known as a current limiter, shown in Exhibit 450.11. This high-interrupting-capacity device provides short-circuit protection for only the secondary ties by opening safely before temperatures damaging to the cable insulation are reached. The secondary ties form a closed loop equipped with

switching devices so that any part of the loop may be isolated when repairs are needed or a current limiter must be replaced.

#### See also

**Article 100** for the definition of *overcurrent protective device*, *current-limiting (current-limiting overcurrent protective device)* and its commentary



**EXHIBIT 450.10** Primary and secondary overcurrent protection for a transformer in a network system, showing a network protector (an automatic circuit breaker actuated by a reverse-current relay).

**EXHIBIT 450.9** A typical 3-phase network system for an industrial plant fed by two primary feeders.

