

EXHIBIT 450.7 A zigzag autotransformer used to establish a neutral connection for a 480Y/277-volt, 3-phase ungrounded system to supply single-phase line-to-neutral loads.

autotransformer becomes disconnected. Consequently, simultaneous interruption of the power supply to all the line-to-neutral loads is necessary whenever the grounding autotransformer is switched off.

CT-1 is connected to an overload relay responsive to excess neutral current being supplied. See 450.5(A)(2). CT-2 and CT-3 are connected to differential-type fault-current sensing relays responsive to an unbalance of neutral current among the three phases of the grounding autotransformer (indicating an internal fault). All three relays are to be arranged to trip the circuit breaker located upstream of both the autotransformer and the line-to-neutral connected loads.

(B) Ground Reference for Fault Protection Devices. A grounding autotransformer used to make available a specified magnitude of ground-fault current for operation of a ground-responsive protective device on a 3-phase, 3-wire ungrounded system shall conform to 450.5(B)(1) and (B)(2).

(1) Rating. The autotransformer shall have a continuous neutral-current rating not less than the specified ground-fault current.

(2) Overcurrent Protection. Overcurrent protection shall comply with 450.5(B)(2)(a) and (B)(2)(b).

(a) *Operation and Interrupting Rating.* An overcurrent protective device having an interrupting rating in compliance with 110.9 and that will open simultaneously all ungrounded conductors when it operates shall be applied in the grounding autotransformer branch circuit.

(b) *Ampere Rating.* The overcurrent protection shall be rated or set at a current not exceeding 125 percent of the

autotransformer continuous per-phase current rating or 42 percent of the continuous-current rating of any series-connected devices in the autotransformer neutral connection. Delayed tripping for temporary overcurrents to permit the proper operation of ground-responsive tripping devices on the main system shall be permitted but shall not exceed values that would be more than the short-time current rating of the grounding autotransformer or any series connected devices in the neutral connection thereto.

Exception: For high-impedance grounded systems covered in 250.36, where the maximum ground-fault current is designed to be not more than 10 amperes, and where the grounding autotransformer and the grounding impedance are rated for continuous duty, an overcurrent device rated not more than 20 amperes that will simultaneously open all ungrounded conductors shall be permitted to be installed on the line side of the grounding autotransformer.

In high-impedance grounded systems, the currents are low enough that finding overcurrent devices rated at 125 percent of a typical 5-ampere system is not practical.

Exhibit 450.8 illustrates the proper method of protecting a grounding autotransformer where it is used as a ground reference for fault protective devices. The overcurrent protective device is to have a rating (or setting) not in excess of 125 percent of the rated phase current of the autotransformer (42 percent of the neutral current rating) and not more than 42 percent of the continuous current rating of the neutral grounding resistor or other current-carrying device in the neutral connection, as specified in 450.5(B)(2).

(C) Ground Reference for Damping Transitory Overvoltages.

A grounding autotransformer used to limit transitory overvoltages shall be of suitable rating and connected in accordance with 450.5(A)(1).

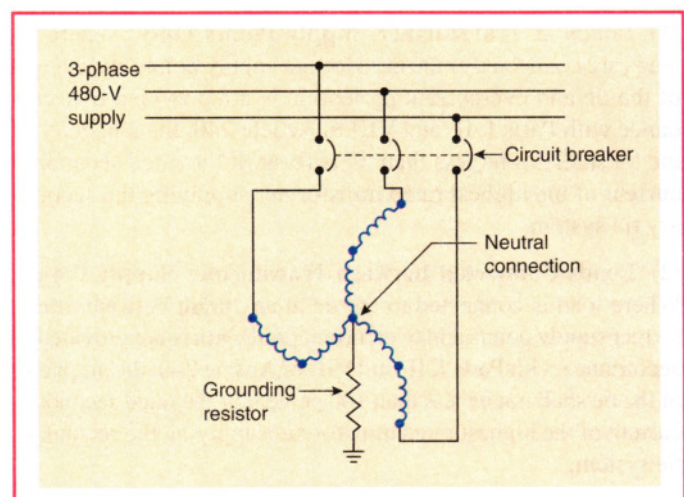


EXHIBIT 450.8 A zigzag autotransformer used to establish a reference ground-fault current for fault protective device operation or for damping transitory overvoltage surges.