(C) Over 35,000 Volts. Dry-type transformers rated over 35,000 volts shall be installed in a vault complying with Part III of this article.

Dry-type transformers depend on the surrounding air for adequate ventilation and must comply with 450.9. Where rated 112½ kilovolt-amperes or less, dry-type transformers are not required to be installed in a fire-resistant transformer room. For that reason, dry-type transformers or gas-filled or less-flammable liquid-insulated transformers, with a primary voltage of not more than 35,000 volts, are commonly used indoors.

See also

450.23 and its commentary for more information on less-flammable liquid-insulated transformers

Exhibit 450.12 shows a typical dry-type power transformer rated at 1000 kilovolt-amperes, 13,800 volts to 480 volts, 3-phase, 60 hertz. This transformer has a high-voltage flange and a low-voltage flange for connection to switchgear and a high-voltage, 2-position (double-throw), 3-pole-load air-break switch that may be attached to the case and arranged as a selector switch for connection of the transformer primary to either of two feeder sources.

Dry-type transformers rated 112½ kilovolt-amperes or less require 12 inches of separation from combustible material or separation by fire-resistant barriers. Transformers rated less than 1000 volts and completely enclosed, except for ventilating openings, are exempt from this requirement unless the manufacturer's installation instructions specify clearance distances. Transformers rated over 112½ kilovolt-amperes must be located in fire-resistant transformer rooms or vaults unless the transformers have Class 155 or higher insulation ratings.

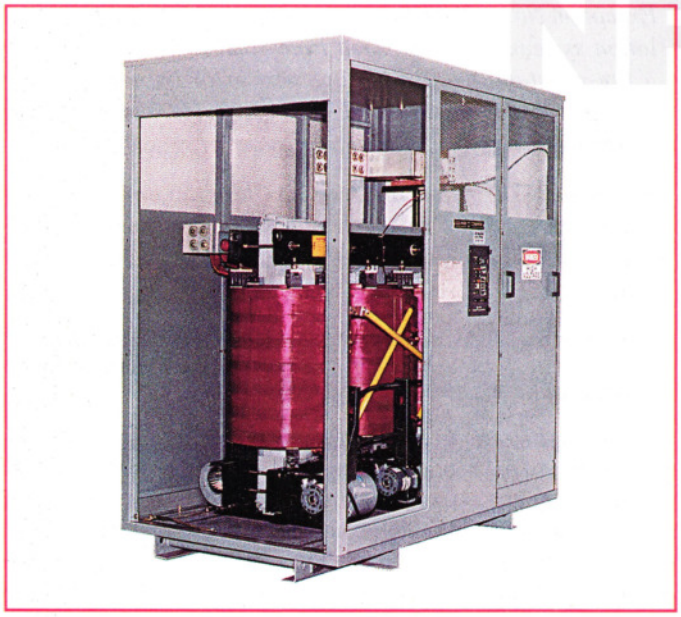

EXHIBIT 450.12 A dry-type transformer with a core and coil design rated at 1000 kilovolt-amperes, 13,800 volts to 480 volts, 3-phase, 60 hertz. Note cooling fans beneath each winding. *(Courtesy of Schneider Electric)*

450.22 Dry-Type Transformers Installed Outdoors. Dry-type transformers installed outdoors shall have a weatherproof enclosure.

Transformers exceeding 112½ kVA shall not be located within 300 mm (12 in.) of combustible materials of buildings unless the transformer has Class 155 insulation systems or higher and is completely enclosed except for ventilating openings.

450.23 Less-Flammable Liquid-Insulated Transformers. Transformers insulated with listed less-flammable liquids that have a fire point of not less than 300°C shall be permitted to be installed in accordance with 450.23(A) or 450.23(B).

(A) Indoor Installations. Indoor installations shall be permitted in accordance with one of the following:

(1) In Type I or Type II buildings, in areas where all of the following requirements are met:

a. The transformer is rated 35,000 volts or less.
b. No combustible materials are stored.
c. A liquid confinement area is provided.
d. The installation complies with all the restrictions provided for in the listing of the liquid.

Informational Note: Such restrictions can include, but are not limited to, maximum pressure of the tank, use of a pressure relief valve, appropriate fuse types, and proper sizing of overcurrent protection.

(2) If an automatic fire extinguishing system and a liquid confinement area is present, provided the transformer is rated 35,000 volts or less

(3) If the installation complies with 450.26

Δ **(B) Outdoor Installations.** Less-flammable liquid-filled transformers shall be permitted to be installed outdoors, attached to, adjacent to, or on the roof of buildings, if installed in accordance with either of the following:

(1) For Type I and Type II buildings, the installation shall comply with all the restrictions provided for in the listing of the liquid.

Informational Note No. 1: See NFPA 220-2021, *Standard on Types of Building Construction*, for definitions of Type I and Type II building construction.

Informational Note No. 2: Such restrictions can include, but are not limited to, maximum pressure of the tank, use of a pressure relief valve, appropriate fuse types, and proper sizing of overcurrent protection.

(2) In accordance with 450.27.

Informational Note No. 3: See 450.27 for examples of additional safeguards that can be required for installations adjacent to combustible material, fire escapes, or door and window openings.