

required to be installed in vaults because askarel is considered a noncombustible fluid.

**450.26 Oil-Insulated Transformers Installed Indoors.** Oil-insulated transformers installed indoors shall be installed in a vault constructed as specified in Part III of this article.

*Exception No. 1: Where the total capacity does not exceed 112½ kVA, the vault specified in Part III of this article shall be permitted to be constructed of reinforced concrete that is not less than 100 mm (4 in.) thick.*

*Exception No. 2: Where the nominal voltage does not exceed 1000, a vault shall not be required if suitable arrangements are made to prevent a transformer oil fire from igniting other materials and the total capacity in one location does not exceed 10 kVA in a section of the building classified as combustible or 75 kVA where the surrounding structure is classified as fire-resistant construction.*

*Exception No. 3: Electric furnace transformers that have a total rating not exceeding 75 kVA shall be permitted to be installed without a vault in a building or room of fire-resistant construction, provided suitable arrangements are made to prevent a transformer oil fire from spreading to other combustible material.*

*Exception No. 4: A transformer that has a total rating not exceeding 75 kVA and a supply voltage of 1000 volts or less that is an integral part of charged-particle-accelerating equipment shall be permitted to be installed without a vault in a building or room of noncombustible or fire-resistant construction, provided suitable arrangements are made to prevent a transformer oil fire from spreading to other combustible material.*

*Exception No. 5: Transformers shall be permitted to be installed in a detached building that does not comply with Part III of this article if neither the building nor its contents present a fire hazard to any other building or property, and if the building is used only in supplying electric service and the interior is accessible only to qualified persons.*

*Exception No. 6: Oil-insulated transformers shall be permitted to be used without a vault in portable and mobile surface mining equipment (such as electric excavators) if each of the following conditions is met:*

- (1) Provision is made for draining leaking fluid to the ground.
- (2) Safe egress is provided for personnel.
- (3) A minimum 6-mm (1/4-in.) steel barrier is provided for personnel protection.

**450.27 Oil-Insulated Transformers Installed Outdoors.** Combustible material, combustible buildings, and parts of buildings, fire escapes, and door and window openings shall be safeguarded from fires originating in oil-insulated transformers

installed on roofs, attached to or adjacent to a building or combustible material.

In cases where the transformer installation presents a fire hazard, one or more of the following safeguards shall be applied according to the degree of hazard involved:

- (1) Space separations
- (2) Fire-resistant barriers
- (3) Automatic fire suppression systems
- (4) Enclosures that confine the oil of a ruptured transformer tank

Oil enclosures shall be permitted to consist of fire-resistant dikes, curbed areas or basins, or trenches filled with coarse, crushed stone. Oil enclosures shall be provided with trapped drains where the exposure and the quantity of oil involved are such that removal of oil is important.

*Informational Note: See ANSI/IEEE C2-2017, National Electrical Safety Code, for additional information on transformers installed on poles or structures or underground.*

**450.28 Modification of Transformers.** When modifications are made to a transformer in an existing installation that change the type of the transformer with respect to Part II of this article, such transformer shall be marked to show the type of insulating liquid installed, and the modified transformer installation shall comply with the applicable requirements for that type of transformer.

An existing askarel-insulated transformer may have the askarel replaced with either oil or a less-flammable liquid. Where such a modification takes place, the completed installation must have the same degree of safety as a new installation. For example, replacement of askarel with oil in an indoor installation without a vault may not be acceptable (see 450.26 and its exceptions). The same is true if the replacement liquid is a less-flammable liquid (see 450.23). Additional safety precautions may be necessary to compensate for the different fire characteristics of the new dielectric fluid.

### Part III. Transformer Vaults

**450.41 Location.** Vaults shall be located where they can be ventilated to the outside air without using flues or ducts wherever such an arrangement is practicable.

**450.42 Walls, Roofs, and Floors.** The walls and roofs of vaults shall be constructed of materials that have approved structural strength for the conditions with a minimum fire resistance of 3 hours. The floors of vaults in contact with the earth shall be of concrete that is not less than 100 mm (4 in.) thick, but, where the vault is constructed with a vacant space or other stories below it, the floor shall have approved structural strength for the load imposed thereon and a minimum fire resistance of 3 hours. For the purposes of this section, studs and wallboard construction shall not be permitted.