

## Application for LEED Innovation & Design Points

### **Liquid-Filled Transformer Technology Outdoors Mineral Oil vs. Less Flammable Natural Esters**

**Fire Safety:**

Envirotemp® FR3™ natural ester fluid has the highest firepoint of any transformer fluid currently available. This fluid has a higher firepoint than R-Temp Fluid (594°C) which has a 30-year, 100,000 unit installation record of no reported pool fires.

Envirotemp FR3 natural ester fluid is an FM Approved Less Flammable fluid. Per the table below, when placed in a FM Approved Transformer, these transformers can be placed within 3 feet of any building in any quantity. In contrast, any mineral oil filled transformers with <500gallons must be at least 5 feet from a two hour fire resistant building; and may need to be 100 feet from a combustible building.

*Table 2a. Separation Distance Between Outdoor Liquid Insulated Transformers and Buildings*

Liquid	FM Approved Transformer or Equivalent	Liquid Volume, gal (m³)	Horizontal Distance <sup>(1)</sup>			Vertical Distance ft (m)
			Two Hour Fire Resistant Construction, ft (m)	Non-Combustible Construction, ft (m)	Combustible Construction, ft (m)	
Less Flammable (FM Approved Fluid)	YES	N/A	3 (0.9)			5 (1.5)
	No	≤10,000 (38)	5 (1.5)		25 (7.6)	25 (7.6)
		>10,000 (38)	15 (4.6)		50 (15.2)	50 (15.2)
Mineral Oil or (unapproved fluid)	N/A	<500 (1.9)	5 (1.5)	15 (4.6)	25 (7.6)	25 (7.6)
		500-5,000(1.9-19)	15 (4.6)	25 (7.6)	50 (15.2)	50 (15.2)
		>5,000 (19)	25 (7.6)	50 (15.2)	100 (30.5)	100 (30.5)

Reproduction of Separation Distance Table 2a from FM Loss Prevention Data Sheet [1].

Transformers which are closer to the loads they serve result in lower transmission losses for the system and therefore lower energy consumption.

**Containment:**

FM Global requires containment for any mineral oil transformer containing more than 500 gallons. In contrast, any transformer with Envirotemp FR3, which is a FM Approved less flammable fluid certified as biodegradable by the EPA first requires containment at 2640 gallons [1].

Transformers which do not require containment reflect a safer technology also do not require containment pumps or sensors.

**Summary:**

Envirotemp® FR3(tm) natural-ester fluid-filled transformers are being used for this project instead of other (more common) mineral-oil filled transformers. This technology selection results in less energy consumption. Natural-ester fluid-filled transformers contribute to affordable, sustainable engineering/building practices.

[1] FM Global Property Loss Prevention Data Sheets - 5-4 - Transformers - Page 16