EVALUATING THE IMPORTANCE OF A TRANSFORMER

INTRODUCTION

Typically, from the point of ac electric power generation to the site of industrial power use, a series of transformers convert voltages and currents up and down as needed for transmission, distribution and utilization. Each transformer links its supply, connected to the primary, to a load, connected to the secondary, and at the same time adjusts the output voltage to required values. Without these links, loads will not be powered. Thus, a transformer is of prime importance to the functioning of the facility, building or process that it serves.

The effects on business operations from the loss of a transformer can be negligible, catastrophic or something in between. The impact depends on various considerations including unit cost, the availability of replacement units, system flexibility and exposures.

Typically, only minimum levels of protection are required by codes, often for purposes of safety. Increased protection may be warranted on the more important units, those that have loss scenarios suggesting a major impact on business operations. Thus, evaluating the importance of a transformer is useful in determining protection needs.

The framework for evaluating the importance of electrical equipment is described in PRC.5.0.5. To expand on that information, considerations applying specifically to transformers are presented in this Property Risk Consulting Guideline.

POSITION

Expanding on the ranking system, a transformer should be considered **highly important** when any of the following criteria are met:

- A transformer failure can result in a fire that spreads to an important building, structure or nearby electrical equipment such as transformers, switchgear and distribution system equipment.
- A transformer failure can generate a corrosive atmosphere and seriously damage the surrounding occupancy.
- A transformer failure can cause significant environmental pollution. A PCB transformer is one example.
- The loss of transformed power (through the unit) will cause a major loss of production or output considering both direct and indirect (consequential) effects of the power outage.
- Auxiliary equipment expected to be involved in transformer-related electrical breakdown or ensuing fire cannot be replaced within 2 weeks.

- A transformer contains more than 500 gal (1895 L) of mineral oil.

DISCUSSION

NFPA 70 has been adopted by many jurisdictions. It prescribes the legal requirements within those communities. It may also be used as a guide where its use has not been mandated. It lists fundamental installation requirements for transformers and transformer vaults and, at the same time, permits installing alternate, including higher, levels of protection.

The primary NFPA reference for transformer maintenance is NFPA 70B. Other NFPA references that guide the installation, use, protection or maintenance of special purpose, distribution and power transformers include NFPA 11, 15, 20, 70E, 79, 86, 99, 780, 850 and 851. Additional information can be found in various Property Risk Consulting Guidelines, including PRC.5.2.2, PRC.5.3.3, PRC.5.4.5, PRC.5.4.5.1, PRC.5.9.1, PRC.5.9.2, PRC.5.9.3 and PRC.5.9.4.

The Institute of Electrical and Electronics Engineers (IEEE), the International Electrical Testing Association (NETA), and transformer and test instrument manufacturers also publish standards or guidelines for installations and maintenance.

On-site reviews analyzing the importance of the transformer are required to secure effective and comprehensive loss control and to minimize business interruption. While compliance with codes may provide a practical and reasonable level of protection, higher loss potentials demand better maintenance, instrumentation, controls and other loss prevention and protection strategies. Thus, it is reasonable for loss control measures to be increased as the importance of the transformer increases.

Evaluating the importance of a transformer requires analyzing its loss potential. That is, “What can happen to it?” and “What will happen if it fails?” The maximum reasonable loss potential should be explored. The transformer type, size, location, and protective equipment will influence the nature and severity of its loss. Only probing will uncover the true importance of the unit.