

SUBSURFACE VERSUS PAD-MOUNTED EQUIPMENT

The history of subsurface equipment at San Diego Gas & Electric Company (SDG&E) goes back to its use by the Southern California Edison Company (SCE). SDG&E followed SCE's lead in implementing this equipment in some communities near the SDG&E and SCE service boundaries. After a short time it was determined that this was not the best way to construct a distribution circuit. For over 30 years, SDG&E has not used subsurface equipment in new construction. The few remaining installations are still maintained and regularly reviewed and converted to pad-mounted surface equipment on a case-by-case basis. Subsurface installations are no longer approved for new construction at SDG&E for several reasons:

Safety

Operating and maintaining underground distribution equipment in confined spaces poses a significant safety hazard to personnel. Most types of distribution equipment use oil as an insulating medium, and this equipment can fail during normal operation and maintenance. This type of failure in confined spaces can result in injury or death.

Operability

Because of the nature of subsurface equipment, vaults and substructures, specific safety rules exist to protect personnel. Because of these rules, subsurface equipment is rarely serviced energized. Pad-mounted or pole-mounted equipment has to be operated first to de-energize the subsurface equipment before servicing or operating any subsurface gear. As a result, planned outages are increased both in size and duration, which adversely affects SDG&E performance based rates to the detriment of ratepayers.

Availability

The number of subsurface equipment manufacturers has steadily declined since the inception of this technology. Utilities that once used this equipment in new construction have now begun to move to the pad-mounted standard used by the majority of the electrical industry. Today, only one of the top three transformer manufacturers offers standard submersible equipment.

Reliability

Subsurface equipment is highly susceptible to adverse operating conditions. Oil filled equipment needs to have airflow to remove generated heat. Because this equipment is in a confined space, operating temperatures can be multiplied many times. The effects of contaminants and pollutants are increased due to the concentration of these materials in confined spaces. Drainage water collects these compounds and deposits them within the vault spaces. Over time, a rich collection of these contaminants attacks the equipment and increases operational hazards.

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Subsurface versus Pad-Mounted Equipment –continued

Environment

Submersible Single-Phase in Vault



Hazardous materials collect in subsurface confined spaces and pose an environmental hazard. Like pad-mounted equipment, if there is an oil spill the entire area of contamination needs to be secured and removed by Hazmat Crews. In a confined space or vault, the oil may seep into the ground underneath the vault, and the entire structure will need to be unearthed and the contamination contained and remediated. There is also an environmental impact with the breeding of mosquitoes in subsurface transformer installations. For example, in Orange County neighborhood irrigation and watering systems were filling many of our vaults with water. This water, heated by the subsurface equipment, creates a breeding ground for mosquito larvae. City exterminators were called to investigate and address the problem. The chemicals they used increased the caustic environment, further accelerating degradation of the subsurface equipment.

Expense

The expense of constructing and operating subsurface equipment is 3-4 times greater than pad-mounted equipment, which in turn is more expensive than pole-mounted equipment. Because of the rural electrification act, underground systems have long since been accepted and preferred over the cost effective alternative of overhead distribution. Pad-mounted equipment has become the national preferred method of construction based on years of work and research in the power utility industry. While it was once thought that subsurface equipment would be the next phase in this beautification process, the toll on safety, functionality, and the environment is such an expense that SDG&E and the majority of domestic utilities are not willing to add the cost impacts to their rate base.

Pad-Mounted Single-Phase Transformer



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