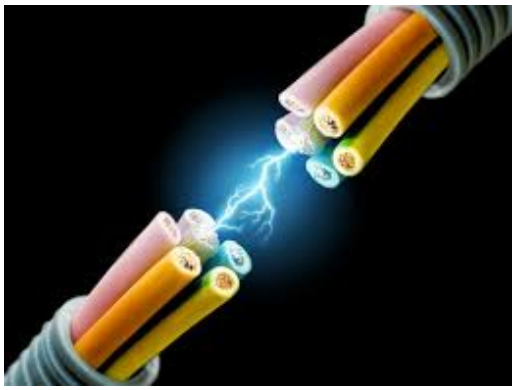
Electrical Equipment Protection



Substations have various structural, mechanical and electrical assets including transformers, switchgear, cable ducts, circuit breakers, Supervisory Control and Data Acquisition (SCADA) equipment, equipment housing, electrical conduits, storm drainage and security systems. Assets associated with substations are vulnerable to flooding, storm surge and other water related flooding events. Some level of electrical equipment protection may be in place at existing facilities; this measure should be evaluated for applicability for each substation. This measure covers increased electrical equipment protection including equipment housing, conduit penetration relocation, and waterproofing and corrosion retrofits.

Relation to Adaptation and Resiliency

Helps achieve protection of electrical components of critical systems in the event of floods or natural disasters.

Benefits

- Enhances employee safety during operations and maintenance activities.
- Extends asset useful life.
- Enables systems assets to operate during a flood or storm event.
- Mitigates corrosion to electrical systems.

Limiting Factors (Constraints)

Increased maintenance and inspections may be required to guarantee the correct protection of the equipment. Before carrying out any measure, perform a cost benefit analysis and implement the appropriate measures for each location or equipment required to be protected. Where electrical equipment cannot be protected, an alternative option is to stockpile necessary electrical equipment so it can be easily and quickly swapped out in case of failure.

Design & Preliminary Costs

When talking about design requirements, it is essential to have a hydrological study of the installation site to have the necessary water flow information to apply the corresponding measure. Transformer waterproof housing must allow minimum air flow required to maintain OEM recommended operating temperatures.

If the space necessary for the generation of a containment barrier or an additional physical measure is not available, consider the use of waterproof or submersible equipment, along with other flood protection measures, to ensure continued operations of electrical equipment in flood event. It should be clarified that this measure must consider the cut-off times of services and provisional facilities to guarantee the operation during the adaptation.

Waterproof or submersible equipment will be much more expensive than the cost of ordinary installation equipment, but costs will vary depending upon equipment used.

Permits & Approvals

Depending on the location where the measure is required to be implemented, the NFPA 70e safety standards for electrical installations must be met, along with the requirements and standards of MDOT. If moving equipment that produces electricity, complete MDE Form 1.21 Energy Facility Permitting Information: Certificate of Public Convenience and Necessity.

Implementation

The implementation of this measure does not extend construction duration. Depending on the location or conditions of the site, consideration should be given to installing submersible or waterproof equipment.

Maintenance Requirements

Periodically inspect electrical systems for impermeability of the installation and the corrosion, sealants and water intrusion, based upon OEM recommendations and any other relevant standards.

Useful Life

Variable depending upon the actions taken. Useful life is dependent upon OEM recommendations.

References/Specifications

- IEEE Std C57.12
- NFPA 70
- NFPA 70e