Rail Transit Systems and Arc Flash

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Electric light rail and subway systems are a significant part of the U.S. transportation system. As population centers grow and expand into the suburbs these systems are similarly experiencing pressures to expand. System operators have long been keenly aware of the need to keep the trains moving and the role reliable electricity plays in that mission. Trains that fail, in-transit, present significant safety and rider convenience issues, as well as expensive recovery efforts. This critical emphasis provides incentive for management to perform electrical procedures and repairs without taking down the power (de-energizing).

Whenever workers are required to work on energized parts, care must be taken to ensure the safety of the workers and to prevent accidents that could destroy the electrical equipment, which would seriously delay restoration of service and be very costly.

Whether this energized work is performed on overhead catenary systems, power rectifier stations or other places, there is danger to the qualified worker, unqualified workers and observers. Procedures must be followed to protect anyone who may be near the work from shock and flash hazards. There is danger from making contact with energized parts which is called a shock hazard and is generally understood. Perhaps less understood, is the danger from an arc flash which causes severe burns and blast pressures without making contact. So, how does one go about protecting workers and others from such hazards? The same rules and procedures that govern other electrical installations apply to electric rail systems.

The workers must receive proper training and be provided with proper personal protective equipment (PPE). In addition to their own safety they must know how and where to set boundaries to keep unqualified persons out of the danger area. In order to know the type of PPE required and where to set the flash boundary an arc flash hazard analysis must be completed as required in NFPA 70E-2009®, "Standard for Electrical Safety in the Workplace®." IEEE 1519 -2002 also contains information and calculation procedures for conducting an arc flash hazard analysis. There are federal regulations that must be followed as well. If there is an accident fines and penalties could be imposed by OSHA. OSHA 29 CFR 1910 subpart R and subpart S specify regulations for electrical work that will apply. In addition to existing standards for safe work practices The Institute of Electrical and Electronic Engineers (IEEE) committees are presently working on new standards specific to Overhead Contact Systems (OCS).

Once an analysis has been completed the employer will be able to determine the specific types of PPE required. NFPA 70E-2009® does have tables that can be used in the interim, but an analysis is required to comply and to determine PPE for specific locations. Also, upon completion of the analysis, equipment can be labeled, as required by the National Electric Code® (NEC®) and NFPA 70E-2009®. The labeling requirements cannot be met without calculating the arc flash incident energy. PPE can be chosen and employees can receive training specific to their hazard exposures.

An analysis can provide other benefits as well:

- It will provide an equipment evaluation that will tell you if you have existing equipment that is electrically undersized and dangerous.
- The engineering firm can identify settings to protective devices that would greatly reduce the flash hazard level.
- It will tell you if you have locations where employees cannot be protected by PPE.
- It will provide you with an updated equipment list and protective device settings.
- It will provide you with data to update your electrical diagrams.
- If you choose, you may also have the engineering firm run a load flow study as part of the analysis to identify overloaded cables and equipment.

- If you choose, you may also have the engineering firm perform a coordination study to see if your protective devices are coordinated with each other and recommend changes to coordinate them. When devices are properly coordinated only the device nearest to the electrical problem will operate and allow the power to keep flowing to the rest of the system.

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APTA Advertisement References and Context:

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