Great Western Painting

Arc Flash Protection/PPE

In our field of work, arc flash is probably the most serious of the safety concerns that we have. Arc Flash is a constant risk and you will have to take precautions at all times to prevent it from happening. Unfortunately, it happens often and it is very costly. Most importantly, it can be deadly.

Recently a field engineer at a different contractor experienced an arc flash when opening the panel door of a 1200 amp GE Spectra Series switchboard. The spring clip of the interlock had broken loose, falling into the energized A-phase line side fuse cap and shorting to ground. This event took less than a second to occur and was caused by a "hidden" hazard – it could've happened to anyone. Because the field engineer was well-trained, used safe work practices, and wore the appropriate PPE, he sustained no injuries. The attached pictures show the effects of the arc blast (note the FE's scorched glove).

An arc flash, essentially an electrical short circuit through air from phase to ground or phase to phase, occurs in an instant. In a worst case scenario, an arc flash can vaporize equipment causing an arc-plasma fire ball. Solid copper conductors can expand to 67,000 times their original volume and temperatures may exceed 35,000ºF.

Per NFPA 70E, a Flash Hazard Analysis shall be done before a person approaches any exposed electrical conductor or circuit part that has not been placed in an electrical safe work condition. This Arc Flash Hazard Analysis will be used to determine the level of Personal Protection Equipment PPE required and the Arc Flash Boundary in inches along with the incident energy found at each location.

Each piece of equipment operating at 50 volts or more **and not put into a deenergized state** must be evaluated for arc flash and shock protection. This evaluation will determine the actual boundaries (i.e. prohibited, limited, restricted, etc.) and will inform the employee of what PPE must be worn.

Once the evaluation is complete an Arc Flash Hazard warning label must be affixed to the equipment and readily accessible to employees who may work on the energized equipment.

Specific OSHA Requirements:

Note: Employers that operate or maintain electric power generation, transmission, or distribution lines or equipment must follow §1910.269. Employers with employees who perform construction work on electric power transmission or distribution lines or equipment must follow Subpart V. For clarification, "construction work" includes the erection of new electric

transmission and distribution lines and equipment, and the alteration, conversion, and improvement of existing transmission and distribution lines and equipment.

Information Transfer Between Host and Contractor

Note: Host Employer is an employer that operates, or that controls the operating procedures for, an electric power generation, transmission, or distribution installation on which a contract employer is performing work covered by the standards above. . For clarification, the host employer need not be the entity that hired the contract employer.

Note: Contract employer is an employer, other than a host employer, that performs work covered by the standard under contract.

Before work begins, the **host employer** must inform the contract employer of:

1. The following characteristics of the host employer's installation when they are related to the safety of the work to be performed – nominal voltages of lines and equipment, the maximum switching-transient voltages, the presence of hazardous induced voltages, the presence of protective grounds and equipment grounding conductors, and the locations of circuits and equipment, including electric supply and communication lines and fire-protective signaling circuits;
2. The following conditions when they are related to the safety of the work to be performed and known to the host employer – the condition of protective grounds and equipment grounding conductors, the condition of poles, and environmental conditions relating to safety;
3. Information about the design and operation of the host employer's installation that the contract employer needs to make the assessments required by the standard; and
4. Other information about the design or operation of the host employer's installation that is (1) known by the host employer, (2) requested by the contract employer, and (3) related to the protection of the contract employer's employees.

Before work begins, the **contract employer** must advise the host employer of any unique hazardous conditions posed by the contract employer's work. Also, the **contract employer** must advise the host employer of any unanticipated hazardous conditions found, while the contractor's employees are working, that the host employer did not mention; the contract employer must provide this information to the host employer **within 2 working** days after discovering the hazardous condition.

Arc-Flash Protection Requirements:

We will:

1. Assess the workplace to identify employees exposed to hazards from flames or from electric arcs;
2. Make reasonable estimates of the incident heat energy of any electric-arc hazard to which an employee would be exposed;
3. Ensure that employees exposed to hazards from flames or electric arcs do not wear clothing that could melt onto their skin or that could ignite and continue to burn when exposed to flames or the estimated heat energy;
4. Ensure that the outer layer of clothing worn by an employee is flame resistant under certain conditions; and
5. With certain exceptions, ensure that employees exposed to hazards from electric arcs wear protective clothing and other protective equipment with an arc rating greater than or equal to the estimated heat energy.

We must assess the workplace for arc-flash hazards by the effective date of the final rule. In addition, we must ensure that employees do not wear clothing that could melt onto their skin or that could ignite and continue to burn by the effective date of the final rule. By **January 1, 2015**, we must make reasonable estimates of incident energy. Finally, we must provide protective clothing and other protective equipment meeting the arc-flash protection requirements of the final rule by **April 1, 2015**.

As an employer, we must, and of course will, pay for the flame-resistant and arc-rated clothing and other arc-flash protective equipment required by the standard.

Appendix E to Subpart V of Part 1926 - Protection From Flames and Electric Arcs provides assessment guidelines for assessing the workplace for flame and electric-arc hazards.

The following tables will assist in performing the required assessments.

TABLE 1- EXAMPLE ASSESSMENTS FOR VARIOUS TASKS
TABLE 2- METHODS OF CALCULATING INCIDENT HEAT ENERGY FROM AN ELECTRIC ARC
TABLE 3- SELECTING A REASONABLE INCIDENT-ENERGY CALCULATION METHOD
TABLE 4- SELECTING A REASONABLE DISTANCE FROM THE EMPLOYEE TO THE ELECTRIC ARC
TABLE 5- SELECTING A REASONABLE ARC GAP
TABLE 6- INCIDENT HEAT ENERGY FOR VARIOUS FAULT CURRENTS, CLEARING TIMES, AND VOLTAGES OF 4.0 TO 46.0 KV: RUBBER INSULATING GLOVE EXPOSURES INVOLVING PHASE-TO-GROUND ARCS IN OPEN AIR ONLY
TABLE 7- INCIDENT HEAT ENERGY FOR VARIOUS FAULT CURRENTS, CLEARING TIMES, AND VOLTAGES: LIVE-LINE TOOL EXPOSURES INVOLVING PHASE-TO-GROUND ARCS IN OPEN AIR ONLY