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Your Workplace Safety Partner

## ARC FLASH AND SHOCK HAZARD ANALYSIS

**Sotaris' team of engineers and safety professionals stand ready to assist you with all aspects of your electrical safety program including the performance of a Shock and Arc Flash Hazard Analysis. Below we have defined some of the important elements.**

### Short Circuit Study

The short-circuit study calculates the short-circuit capacity at designated locations within the power delivery infrastructure. This data is utilized to perform the calculations necessary to complete the Arc Flash Hazard Analysis.

### Single Line Diagrams

Accurate up-to-date single line diagrams of your electrical system are a crucial aspect to a successful Arc Flash Hazard Analysis Project. Some of the information that is included on these diagrams includes; disconnect and breaker types, transformer sizes and ratings, cable length distances, and cable types, to name a few. If single-lines are not available we can develop from scratch. If you are unsure of the status of your single-lines we can update and review as part of this project.

### Hazard/Risk Categories

The major Hazard/Risk Categories (HRC) listed within NFPA 70E 2009 edition range from 0-4 (low to high hazard). There are some other levels that need to be taken into account as well; such as HRC 2\* and HRC EXTREME DANGER. Each HRC level represents specific incident energy range and required Personal Protective Equipment.

For example HRC 3 would relate to incident energy that ranges from 8 to 25 cal/cm<sup>2</sup> and would comprise the following PPE: Arc-rated long sleeve shirt, Arc-rated long pants, Arc-rated flash suit, Arc-rated hood, Hard hat, Hearing protection, Arc-rated gloves, and Leather work shoes.

### Arc Flash Hazard Analysis

The result of this analysis is to determine the Arc Flash Protection Boundary as well as the Personal Protective Equipment that needs to be worn (and/or used) when performing work within the Arc Flash Boundary. This analysis takes into account the protective devices, opening times, condition of equipment and other parameters.

This analysis needs to be reviewed and updated when a major modification or renovation to the electrical system components takes place. It also needs to be reviewed periodically with no more than five years elapsing between reviews.

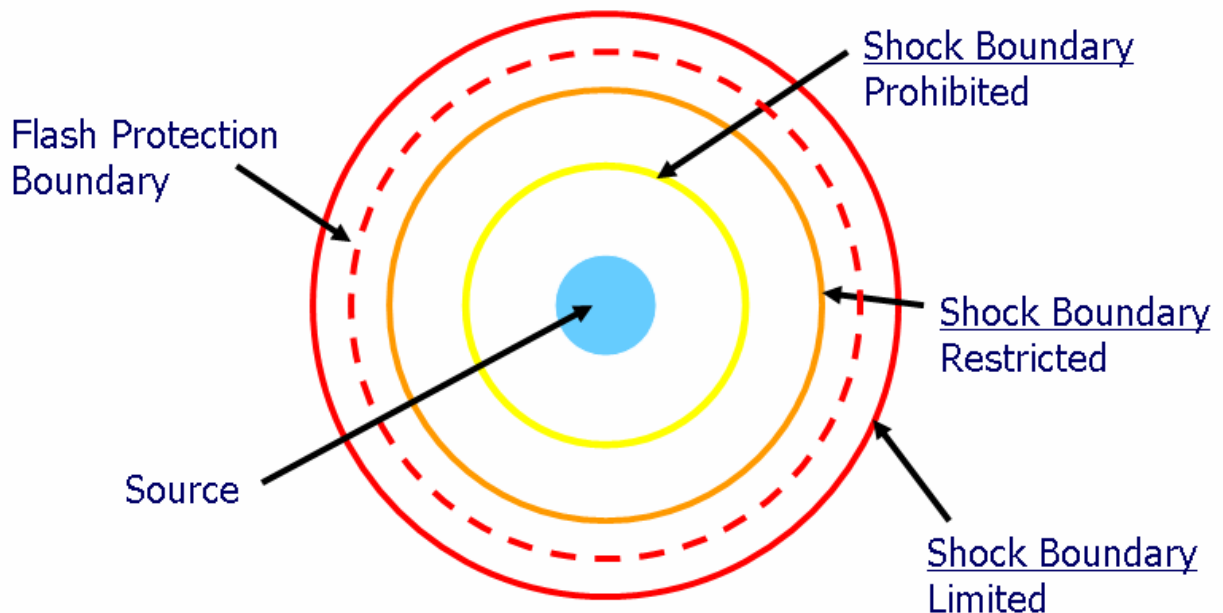
### Arc Flash Protection Boundary

The radiant energy released by an electric arc is capable of maiming or killing a human being at distances upwards of twenty feet. In addition to radiant heat, the molten material and objects ejected by the electrical blast can also be lethal to workers.

The Arc Flash Protection Boundary (AFPB) is a boundary line from the electrical system. If a person were standing at this distance during an arc event they would receive a just curable second degree burn. Another way to refer to this, is the distance from the arc source where the incident energy equals  $1.2 \text{ cal/cm}^2$ .

There are two ways for determining the types of Personal Protective Equipment required when working inside the Arc Flash Protection Boundary

- **Incident Energy Analysis** This is the process of performing detailed calculations to determine the actual amount of incident energy in  $\text{cal/cm}^2$  that could be released from a point in the electrical system during an Arc event. *Remember it only takes  $1.2 \text{ cal/cm}^2$  to produce a just curable 2<sup>nd</sup> degree burn on exposed skin.* From this information the proper Personal Protective Equipment can be selected.
- **Hazard/Risk Category Tables** Within NFPA 70E, various tables have been established based on panel types, voltage levels, and work tasks. You locate the information that matches your system and work task and select the Hazard Risk Category listed. This method can be used instead of performing the Incident Energy Analysis. HOWEVER, these tables are based on very specific parameters and therefore there are voltage levels, short circuit capacities, clearing times, panel types and other requirements that you must meet before you can utilize these tables.



### **Shock Hazard Analysis**

This analysis is to determine the proper work distances and PPE needed when working near exposed energized parts. The distances are set based on the available voltage levels of the system. There are three boundaries that are determined as a result of this analysis; Limited, Restricted and Prohibited. They are detailed below.

- **Limited Approach Boundary** The limited boundary is for unqualified personnel. No unqualified person may approach any closer than the limited approach boundary identified.
- **Restricted Approach Boundary** Qualified persons are not typically permitted to approach exposed, energized conductors any closer than the restricted approach boundary unless they are wearing appropriate PPE and have a written

and approved plan for the work they are performing. These individuals must break the restricted boundary only to the extent that it is absolutely required to perform their work.

- **Prohibited Approach Boundary** When qualified personnel cross the prohibited approach boundary, it is considered to be the same as actually contacting the exposed part. In addition to the requirements set forth for the restricted boundary approach, personnel must perform a risk assessment prior to crossing the prohibited boundary. Crossing this boundary is considered the same as touching the exposed live part.

### **Energized Electrical Work Permits**

When working on electrical conductors or circuit parts you are required to have a written permit filled out. These permits are required anytime your work on systems operating at 50 volts or greater that are not in an electrically safe work condition prior to performing the work. There are specific requirements for these permits and they must assist the person filling them out in defining the hazards as well as determining if this work really needs to be done live.

Under certain conditions these work permits are not needed, such as trouble shooting and voltage testing. But be sure to always utilize these exceptions with extreme caution and prejudice.

### **Implementation and Training**

Getting all the above information is the first step, the next big is getting everyone onboard and aware of how to interact with this information, this is where the training comes in. Our team of professionals and effective training programs will insure that all of your employees know what's required and have the confidence and willingness to follow the procedures and protocols as required.