

Common Myths and Misunderstandings about Arc-Flash Hazard Assessments

Misconceptions about Arc-Flash Hazard Assessments (Arc Flash Studies) are quite common and can decrease the effectiveness of Assessments and actually lead to more electrical hazards. Many of these misconceptions are due to a lack of thorough understanding of the laws, regulations, and standards that apply to Arc-Flash Hazard Assessments.

OSHA (Occupational Safety and Health Administration) and other State OSHA organizations may rely on multiple consensus standards in regards to their regulations, which may vary from state to state. Furthermore, different methods are used to calculate and quantify Arc-Flash hazards. It is of utmost importance that when deciding to do an Arc-Flash assessment, the services provided by a service company and the necessary actions needed to be OSHA compliant are fully understood. This paper is intended to debunk the various misconceptions about Arc-Flash Hazard Assessments and clarify what OSHA and NFPA actually require.

OSHA and NFPA 70E require a complete electrical hazard assessment, which includes a Shock and Arc-Flash Hazard Assessment. The degree to which a worker may be exposed to potential Shock and Arc-Flash Hazards and the type of Personal Protective Equipment (PPE) that is required to protect workers from the heat, light, and blast associated with an Arc-Flash accident are all determined by an Arc-Flash Hazard Assessment.

Myth One: OSHA does not enforce NFPA 70E for Arc-Flash and electrical safety compliance.

OSHA 1910 Subpart "S" (1910.301 to 1910.399) specifies Electrical Safety-related work practices. The latest edition of NFPA 70E is also being used as a guideline for enforcing OSHA electrical safety rules. The 1970 Occupational Safety and Health Act stipulate that employers must provide their employees with a working environment free of any recognized hazards that could potentially result in death or serious injury.

The NFPA developed NFPA 70E, Standard for Electrical Safety in the Workplace, in an effort to help employers meet OSHA regulations. NFPA 70E is used by OSHA compliance officers to evaluate Arc-Flash Hazards and minimize or prevent Arc-Flash accidents. OSHA 1910.132(d) and OSHA 1910.335(a)(1)(i) require employers to assess their working environment and identify electrical or

any other hazards that are present, inform employees of the presence of any such hazards, provide employees with PPE, and train employees on the proper use of protective equipment.

OSHA 1910 Subpart "S" also mandates that employers must establish an electrical safety program which covers safe electrical design, safe electrical maintenance requirements, and safe work procedures for special electrical equipment. According to OSHA 1910.332, employers must train and qualify their employees in safe work practices and standard operating procedures to reduce the hazards and increase worker safety. However, OSHA regulations are written in general terms, rather than specific details as to how regulations may be met.

Furthermore, OSHA has stated that employers must provide workers with appropriate PPE as per the OSHA 29 1910.132 (h)(1) PPE payment requirement. PPE used to comply with this part, shall be provided by the employer at no cost to employees. Paragraph (h) became effective February 13, 2008, and employers must implement the PPE payment requirements no later than May 15, 2008

How to implement an electrical safety program, how to establish safety related work practices, how to establish methods and use mathematical formulas to evaluate electrical shock and Arc-Flash Hazards, and how to select and use electrical shock and Arc-Flash PPE are all addressed in NFPA 70E. The necessary types of safety training and how workers can become qualified are also specified in NFPA 70E. OSHA recognizes NPA 70E as a national standard and it must be followed in order to be OSHA compliant.

Myth Two: Per IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations, assessing equipment under 240 volts from a transformer rated less than 125 kVA is unnecessary.

OSHA regulations and NFPA 70E standards mandate that all equipment operating at 50 volts and higher must be assessed for electrical shock and potential Arc-Flash hazards. The Institute of Electrical and Electronic Engineers (IEEE) has published IEEE 1584, which provides a process of calculating the amount of potential Arc-Flash incident energy at various working distances from exposed live conductors. IEEE 1584 helps to establish the Hazard Risk Category and PPE requirements of NFPA 70E. In NFPA 70E Annex D, the IEEE 1584 calculation methods are referenced.

IEEE 1584 states, "Equipment below 240 V need not be considered unless it involves at least one 125 kVA or larger low-impedance transformer in its immediate power supply." This refers to the potential for incident energy exposure under these circumstances as observed during testing.

The current version of IEEE 1584 essentially makes the calculation of incident energy on equipment under 240V fed from a transformer less than 125 kVA

unnecessary, because the previous testing found that the available fault current is not at a level sufficient to maintain an Arc-Flash and discharge large amounts of energy. However, recent testing performed by the IEEE-NFPA Collaboration Group has found that this 125 kVA level is too high. They found that it is possible to maintain an arc flash event for some transformers rated as low as 75 kVA. The guide is in the process of being revised and the new version published by 2017.

Employers are still responsible for the assessment of all equipment operating at 50 volts and higher in the facility for other possible electrical dangers, such as shock and overload conditions which may lead to fires, electrocutions, and/or other hazards.

OSHA 1910.303(g)(2), OSHA 1910.333, and NFPA 70E Articles 110.8(B), specify that all equipment operating at 50 volts or higher must be assessed for the possibility of electrical shock (establishing protection boundaries and PPE) and potential Arc-Flash hazards (Arc Rated Clothing Categories, incident energy levels, flash protection boundaries and PPE). Supplementing these requirements, Article 110.16 of the National Electrical Code (NEC) mandates that all equipment that may be worked on while energized be identified and marked with the proper Arc-Flash warning label.

Myth Three: When equipment is determined to be less than 1.2 Cal/cm², it is assumed that all other equipment, fed downstream, will 1.2 Cal/cm² or less.

According to NFPA 70E and OSHA, employers must continue to assess any equipment operating at 50 volts or above for shock and Arc-Flash Hazards. Some companies simply assume that downstream equipment supplied from low energy sources must also be low and consequently stop assessments of any of the equipment or panels. Although the probability that this is correct is high, it is not always the case.

Shock hazards, incident energy, and Arc Rated Clothing Categories can increase the further into your electrical distribution system and the farther away you are from the power source. The severity of a potential Arc-Flash depends on the available fault current where the Arc-Flash occurs and the opening time of the upstream overcurrent protective devices.

The maximum available fault current decreases the farther away you are from the power source, due to impedance from cables or bus ducts, etc. The lower the fault current, the longer the fuse or circuit breaker will take to open. Sometimes, the opening time of the upstream fuse or circuit breaker can double or even triple because of a lower fault current. Due to this, panels and equipment downstream of the protection device can have much higher energy levels. Incident energy levels often increase if long cable runs, transformers or other overcurrent protective devices are downstream from low energy equipment.

One should never assume energy levels or Arc Flash PPE categories. The possible incident energy at all equipment must always be confirmed, even if they are supplied from panels assessed at 1.2 Cal/cm².

The available fault currents and opening times of overcurrent protective devices can be affected by other factors such as large motor loads, alternate power sources during emergency service, or auxiliary generators as well. When performing an Arc-Flash Hazard Assessment, it is necessary to consider all possible power sources and available fault currents from the power utility, on-site power generators, or UPS systems. Before establishing Arc Rated Clothing Categories and selecting PPE, both IEEE 1584 and NFPA 70E methods should be used to calculate worst case incident energy scenarios.

Myth Four: Beyond the Motor Control Center, it is no longer necessary to check equipment for Arc-Flash Hazards.

Just because the Motor Control Center (MCC) is the final access point of power for motor loads, it doesn't mean that there is no need to assess any other loads which are fed from the MCC. This misconception has the potential to cause a very serious and dangerous situation.

For example, quite often a MCC will feed a 277/480 volt power panel or a 480/120-240 volt transformer that feeds an additional panel. Every panel, switchboard, or industrial control panel that is fed from a Motor Control Center must be assessed for Arc-Flash and shock hazards in order to be in accordance with OSHA and NFPA regulations. This is critical because, if a fault were to occur, the motor loads at the MCC can contribute to the available fault current. Both OSHA 1910.303(g)(2) and NFPA 70E Article 110.8(B) require an *electrical* shock hazard evaluation for all energized parts operating at 50 volts and higher in addition to potential Arc-Flash hazards.

In order to effectively warn workers of potential Arc-Flash and electrical shock hazards, NEC Article 110.16 and NFPA 70E 130.5.D mandate that all industrial control panels, motor control centers, switchboards, panel boards, meter socket enclosures and disconnect switches or circuit breakers that may be inspected, modified, serviced or otherwise maintained while energized, must be identified and prominently marked.

Myth Four: We do not need to worry about NFPA 70E and Arc Flash Labels. We do not have electricians on staff and we subcontract all of our work out to electrical contractors.

NFPA 70E has two very important sections that details the owners requirements for labels and required meetings. NFPA 70E 130.5(D) states that the owner is responsible for documentation, and installation, and maintenance of the Arc Flash Labels and their equipment.

110.3 Host and Contract Employers' Responsibilities.

(A) Host Employer Responsibilities.

- (1) The host employer shall inform contract employers of the following:
 - (1) Known hazards that are covered by this standard, that are related to the contract employer's work, and that might not be recognized by the contract employer or its employees
 - (2) Information about the employer's installation that the contract employer needs to make the assessments required by Chapter 1
- (2) The host employer shall report observed contract employer-related violations of this standard to the contract employer.

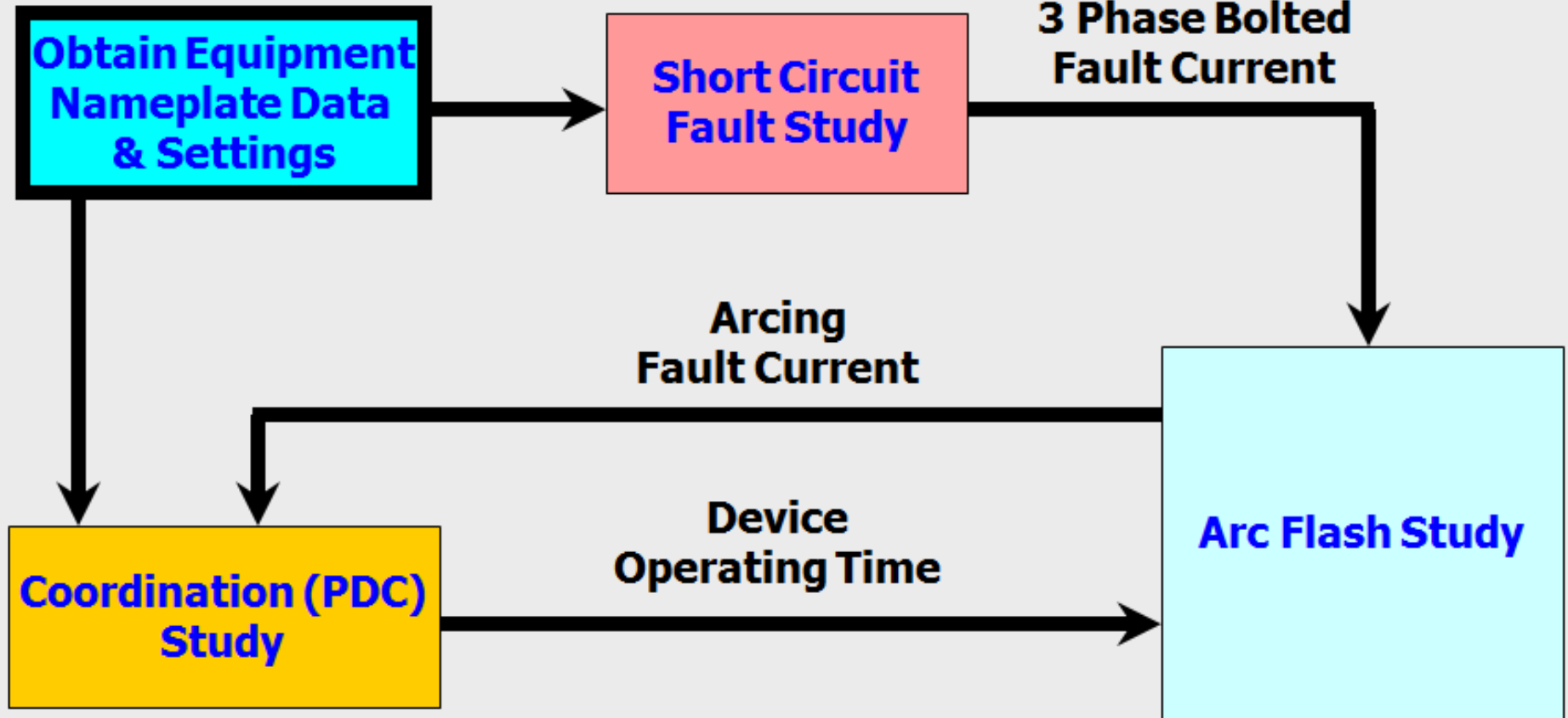
In Conclusion:

One must remember that Arc-Flash Hazard Assessments are absolutely necessary. OSHA and NFPA 70E require Arc-Flash Hazard Assessments as a part of an Electrical Hazard Assessment. In order to have a fully comprehensive electrical safety plan, Arc-Flash Hazard Assessments must be made. Employers are required by OSHA and NFPA to identify any and all possible workplace electrical hazards, reduce or eliminate these hazards, train and qualify their employees, and provide them with PPE of sufficient quality to protect them from all hazards. OSHA and NFPA 70E can help employers meet the safety requirements for their workers and make their facility more productive.

For more information about Arc Flash Hazard Assessments, please see our website at <http://www.powerstudies.com/articles>

If you need a quotation for a power system study, Arc Flash Hazard Assessment, or electrical safety training, please see our website at <http://www.powerstudies.com/quote>

or send your request to Quotes@powerstudies.com



WARNING

Arc Flash and Shock Hazard

3 Ft 8 In	Flash Hazard Boundary
5.1	cal/cm ² Flash Hazard at 1 Ft 6 In
	Arc Rated Clothing Required (See NFPA 70E H.3(b) for additional PPE)
480 VAC	Shock Hazard when cover is removed
00	Glove Class
10 Ft 0 In	Limited Approach (Fixed Circuit)
12 In	Restricted Approach

09/30/2014 IEEE 1584-2002/2004a/2011b & NFPA 70E-2015
 Equipment ID (Name): MCC-STASRV1 (MCC STR SRV1)
 Protective Device: 51 STA