

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
WASHINGTON, DC 20314-1000

ER 385-1-100

CESO-E

Regulation
No. 385-1-100

30 September 2014

Safety and Occupational Health
ARC FLASH HAZARD PROGRAM

1. Purpose. This memorandum provides information on and prescribes steps to implement the new Engineering Regulation 385-1-100, *Arc Flash Hazard Program*, dated 15 April 2014 and Engineering Pamphlet 385-1-100, *Implementation of Arc Flash Hazard Program*, dated 30 September 2014. These are both new documents although they have been in draft format for 5 years. This has been a very difficult program to develop for USACE and the PDT members encompassing Safety and Health professionals, craft personnel, management and electrical engineers did an outstanding and comprehensive job of writing these documents. The ER and EP were developed to establish consistent policy for the safe and reliable control of Arc Flash Hazards at USACE-operated facilities/plant.
2. Applicability. This ER applies to all HQUSACE staff elements.
3. Distribution Statement. Approved for public release; distribution is unlimited.
4. References.
 - a. 29 Code of Federal Regulation (CFR) 1910.132, General Requirements;
 - b. 29 Code of Federal Regulation (CFR) 1910.269 (I) (6), Electric Power Generation, Transmission, and Distribution;
 - c. 29 Code of Federal Regulation (CFR) 1910.335, Safeguards for Personnel Protection;
 - d. National Fire Protection Association (NFPA) 70E, *Standard for Electrical Safety in the Workplace*;
 - e. IEEE Std. 1584A, *Guide for Performing Arc Flash Calculations*;
 - f. Engineering Manual (EM) 385-1-1, U.S. Army Corps of Engineers, *Safety and Health Requirements Manual*;

g. Engineering Pamphlet (EP) 385-1-100, U.S. Army Corps of Engineers, *Implementation of Arc Flash Hazard Program*;

h. American Society for Testing and Materials (ASTM) F 1506-02a, *Standard Performance Specification for Flame Resistant Textile Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards*.

5. Availability. This ER is accessed from the official HQUSACE Publications web page at www.usace.army.mil. Select "Library" and then select "Publications".

6. Policy.

a. All USACE-operated facilities/plant are expected to demonstrate the consistent application of these documents. In addition, mandated regionally-developed supplements that represent locally consistent policies are required to be in place, as well as a facility-specific program for all USACE-operated facilities. The local Safety and Occupational Health office (SOHO) should be integrated into this process and be included on the team that will develop the regional and local supplements, which are required to be sent to the local SOHO for concurrence once developed.

b. All USACE-operated facilities/plant are expected to immediately begin the process of complying with this regulation.

(1) Transition Period. A transition period of no more than two (2) years from the effective date of this regulation may be necessary for *some* compliance actions if precluded by budgetary constraints and is considered acceptable before full compliance is achieved. The transition period is not intended as an interval of inactivity, however it is recognized that budgetary cycles, planning, procurements, fabrication of equipment and other issues could take time.

(2) Implementation Plan. An implementation plan shall be developed by each USACE Command (district, laboratory, center, etc.) within six (6) months of the effective date of this regulation. The plan is intended to cover all facilities/plant within the Command. The plan shall be provided to the local SOHO for review and acceptance. It shall include, but not be limited to, the following:

(a) AFH District Policy/Program (without specific PPE requirements for employee positions/roles, quantities per employee, etc.)

(b) AFH Facility Program (without specific PPE requirements for employee positions roles, quantities per employee, etc.)

- (c) AFH Analysis Schedule
- (d) AFH Mitigation Schedule
- (e) AFH Labeling Schedule
- (f) AFH Training Schedule (Awareness, Qualified, Unqualified)

Upon completion of the above identified steps in the implementation process, the implementing District/Center will be aware of the amount of AFHs (from the AFH Analyses), mitigation required (from AFH mitigation schedule) and will be trained (from the AFH training schedule) on the AFH Program (which details when AF PPE is required). Following AF training, management and bargaining units will have the knowledge to discuss, bargain, and craft a "PPE Implementation Policy" which will dictate a standard for AF PPE, boundary, and tool procurement.

(g) AFH PPE, Boundary, and Tool Procurement Schedule (negotiate and create Arc Flash Hazard PPE Implementing Letter)

(h) AFH Program Implementation and Review (Schedule)

(i) Applicable budgetary issues.

c. Web-based Training. Webinars will be scheduled on the ER 385-1-100 and EP 385-1-100. The webinars will be presented regionally so that a geographically-related audience can attend, however, they will be open to everyone. They will all be scheduled and held within the first 3 months after the effective date of these regulations. The webinars will explain briefly the arc flash program, the requirements, the intent, and provide a review of both documents for clarification and understanding.

d. Requests for variances to the transition period must be accompanied by a compliance plan, will only be considered in rare circumstances and will be subject to approval by the local SOHO, (MSC SOHO if applicable) and CESO.

FOR THE COMMANDER:



WILLIAM H. GRAHAM
COL, EN
Chief of Staff

CESO

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Safety
ARC FLASH HAZARD PROGRAM

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CHAPTER 1

General

1-1. Purpose. The purpose of this regulation is to establish consistent policy for the safe and reliable control of arc flash hazards (AFHs) at US Army Corps of Engineers (USACE) operated facilities.

a. Implementation shall begin immediately with full implementation as soon as is practical, but no longer than two years from the date of this regulation only for items that require budget adjustments to accomplish.

b. An implementation plan shall be developed by each USACE Command within six months of the effective date of this regulation detailing a proposed plan for implementation and shall include schedule, milestones, procedures, etc. This plan shall be provided to the local SOHO for review and acceptance. See Appendix A for the definition of an Arc Flash Hazard (AFH).

1-2. Applicability. This regulation applies to all USACE operated facilities where the potential for AFH exists. This includes, but is not limited to, recreational facilities, hydropower facilities, spillways, navigation facilities, flood control (flood damage reduction) facilities, floating plant, fish facilities, pumping stations, irrigation and domestic water facilities, maintenance shops, offices, laboratories, remote communications sites, and transportable or mobile equipment.

1-3. Distribution Statement. Approved for public release, distribution is unlimited.

1-4. References.

- a. 29 Code of Federal Regulation (CFR) 1910.132, General Requirements;
- b. 29 Code of Federal Regulation (CFR) 1910.335, Safeguards for Personnel Protection;
- c. 29 Code of Federal Regulation (CFR) 1910.269 (1) (6), Electric Power Generation, Transmission, and Distribution;
- d. National Fire Protection Association (NFPA) 70E, *Standard for Electrical Safety in the Workplace*;
- e. IEEE Std. 1584A, *Guide for Performing Arc Flash Calculations*;
- f. Engineering Manual (EM) 385-1-1, U.S. Army Corps of Engineers, *Safety and Health Requirements Manual*;
- g. Engineering Pamphlet (EP) 385-1-100, U.S. Army Corps of Engineers, *Implementation of Arc Flash Hazard Program*;

h. American Society for Testing and Materials (ASTM) F 1506-02a, *Standard Performance Specification for Flame Resistant Textile Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards*.

1-5. Policy. It is the policy of the USACE to:

a. Protect all persons that are directly involved with, or affected by, the operation, installation, servicing and/or maintenance of electrical machines and equipment;

b. Require a current, written Activity Hazard Analysis (AHA) for the work to be performed. The AHA shall identify, analyze and provide controls for potential hazardous energy sources and be completed prior to conducting work. The AHA shall be completed by the personnel performing the work and is considered a living document. It should reflect current conditions and personnel and shall be updated as necessary to reflect this. It shall also address potential emergency situations;

c. Develop and implement a comprehensive Arc Flash Hazard (AFH) Program at USACE operated facilities;

d. Train employees and assure they understand the purpose and application of AFH program and procedures and are knowledgeable of local requirements;

e. Perform periodic inspections to assure continued program compliance;

f. Ensure hazard mitigation techniques are considered when equipment is modified, rehabilitated or replaced;

g. Inform employees of their rights and responsibilities with regard to reporting unsafe conditions and/or procedures;

1-6. Suggested Improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms).

CHAPTER 2

Arc Flash Hazard Program (AFH Program)

2-1. Regional Arc Flash Hazard (AFH) Program. All USACE operated facilities meeting the requirements in ER 385-1-100, shall be covered by an AFH Program. The AFH Program may be developed or supplemented at the facility level, depending on if the MSC and/or District have developed an all-encompassing AFH Program. The intent is to establish and maintain the greatest practical level of consistency within areas of control.

2-2. Contents. As a minimum, the AFH Program shall:

- a. Be supplemental to this Engineering Regulation;
- b. Identify an AFH Coordinator for each facility;
- c. Identify AFH Qualified Personnel;
- d. Identify personnel roles and responsibilities;
- e. Provide details on and contain AFH analyses;
- f. Procedures to address DC, single-phase and high voltage;
- g. Define appropriate hazard mitigation;
- h. Provide for integration of controls into work activities;
- i. Provide PPE policies and procedures;
- j. Describe labeling procedures;
- k. Provide training procedures and methods;
- l. Describe inspections and program review procedures;
- m. Detail mishap reporting procedures;
- n. Describe documentation and recordkeeping procedures;
- o. Provide procedures for outside contractors (Service Personnel);
- p. Be made available to all personnel with potential exposure to AFHs;

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q. Include provisions:

(i) that violators of the policy shall be subject to appropriate administrative disciplinary action; and

(ii) that procedures for reporting violations of AFH Program and/or procedures;

r. Include facility-specific information.

CHAPTER 3

Responsibilities

3-1. Local Commander/Director (USACE). The Local Commander or Director shall ensure compliance with this regulation, and shall provide adequate resources to do so.

3-2. Site Manager. The Site Manager at each project or facility has overall responsibility for their Project's AFH Program and shall:

- a. Appoint an AFH Coordinator for the facility;
- b. Ensure the requirements of this regulation are properly applied and adhered to;
- c. Ensure the AFH Program is updated when a major modification or renovation takes place and that it is reviewed annually, as a minimum;
- d. Ensure all AFH Qualified personnel are identified in writing;
- e. Ensure all AF-related mishaps (near-misses, incidents and accidents) are immediately reported through the proper chain of command to the local Command's Safety and Health Office (and upward to CESO) and ensure proper investigation takes place;
- f. Ensure that applicable Activity and Position Hazard Analyses address AFHs;
- g. Make provisions for initial and refresher training.

3-3. AFH Coordinator. The AFH Coordinator (who may be the Site Manager) shall:

- a. Act as the facility's point of contact for AFH Program elements;
- b. Work in coordination with the Site Manager to insure a successful AFH Program is in place and is implemented.

3-4. Qualified Persons. Qualified Persons shall:

- a. Be trained in and have demonstrated skills and knowledge in the construction and operation of electrical equipment and installations and the hazards involved;
- b. Be able to distinguish exposed live parts from other parts of electric equipment, to determine the nominal voltage of exposed live parts, the clearance distances and corresponding voltages to which the qualified person will be exposed;
- c. Advise any accompanying qualified person of the possible hazards and continuously escort the unqualified person while inside the limited approach boundary.

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3-5. Unqualified Persons. Unqualified Persons shall:

a. Be trained in and familiar with AFHs; Level of training provided shall be determined by the degree of AFHs to which personnel are exposed;

b. Not enter the limited approach boundary of energized conductors and circuit parts unless advised of the possible hazards and continuously escorted by the qualified person while inside the limited approach boundary;

c. Be familiar and comply with, the facility's AFH program.

3-6. All Employees. All employees shall comply with the facility's AFH Program and report procedural errors, violations and arc flash-related mishaps to their supervisor or appropriate official.

CHAPTER 4

Training

4-1. General. AFH training shall be provided for all Qualified and Unqualified personnel. Level of training provided shall be determined by the degree of AFHs to which personnel are exposed.

4-2. Documentation. All training documentation shall be maintained at the project for at least two years. Documentation is required for both initial training and retraining and shall contain, as a minimum: employees' names, dates of training, instructor's name and outline of training content.

4-3. Training Frequency. Training shall be required at the following intervals:

- a. Upon implementation of the AFH Program;
- b. Upon employment at the facility;
- c. If a supervisor or an inspection indicates that an employee is not complying with the AFH Program or AFH safety-related work practices;
- d. Upon new technology, new types of equipment, or changes in procedures which have been implemented at the facility;
- e. When new safety-related work practices are required or AFH Program is updated, and;
- f. At least annually for Qualified Persons;
- g. At least every 3 years for Unqualified Persons.

4-4. Training Content. Training content shall be as described in EP 385-1-100.

4-5. Instructors. Instructors, whether government or contractor, shall possess an in-depth understanding of electrical system design, technical knowledge, skills and abilities in the subject of arc flash hazards.

4-6. Type of Training. The training required by this section shall be classroom or on-the-job type, or a combination of the two. The degree of training provided shall be determined by the risk to the employee.

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CHAPTER 5

Arc Flash Hazard Analyses (AFH Analyses)

5-1. General. An AFH analysis is required if there is a possibility that employees may be exposed to energized electrical equipment with AC or DC voltages of 50 volts to ground or more. An AFH analysis shall be performed by a Qualified Engineer. There are two forms of AFH analysis: Task Based Assessment and a Detailed Incident Energy (IE) Analysis.

5-2. Task-Based Assessment.

a. The Task-Based Assessment, per NFPA 70E, may be used at the following facilities, if determined appropriate by a Qualified Engineer: recreational areas, offices, remote communications sites, or similar type facilities.

b. The Task-Based Assessment may be used as an interim step at all facilities, regardless of type, to protect employees until the Detailed IE Analysis is completed (if required).

5-3. Detailed IE Analysis.

a. The Detailed IE Analysis, based on IEEE 1584, shall be completed at the following facilities: powerhouses, spillways, navigation facilities (locks and dams), flood control (flood damage reduction) facilities, floating plant and vessels, fish facilities, pumping stations, irrigation and domestic water facilities, maintenance shops, laboratories, mobile equipment, or similar type facilities.

b. Results of the Detailed IE Analysis determine the IE exposure of the worker, the arc flash boundary (AFB), hazard/risk category and required PPE.

c. Recommendations shall be included in the Detailed IE Analysis to reduce the hazard/risk Category to Level 2, where feasible.

d. The Detailed IE Analysis consists of 3 studies: a fault study, a protective relay coordination study and the AF analysis. See EP 385-1-100, paragraph 6.b.

5-4. AFH Analysis Revision/Update. The AFH analysis must be updated when a major modification or renovation takes place. It shall be reviewed periodically, not to exceed five years, to account for changes in the electrical distribution system that could affect the results of the AFH analysis.

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CHAPTER 6

Arc Flash Hazard Mitigation

6-1. Hazard Mitigation. Hazard mitigation shall be completed by applying the Hierarchy of Controls to remove, reduce, or achieve an acceptable level of risk. The Hierarchy of Controls is presented below and shall be applied in the following order:

- a. Elimination (design out);
- b. Substitution (replace, protective device changes);
- c. Engineering Controls (barriers, covers, enclosures, insulated tools);
- d. Administrative Controls (training, job briefings, hazard analyses, labeling);
- e. PPE (arc-rated clothing & suits, gloves, earplugs, etc).

6-2. Integration of Controls into Work Practices.

a. Existing work practices at each facility shall be reviewed and altered as necessary to ensure employees are protected from AFHs. These work practices may include, but are not limited to:

- (1) Position Hazard Analyses (PHAs);
- (2) Facility standard operating procedures (SOPs);
- (3) Preventive maintenance and work order job tasks;
- (4) Switching orders (including AF reduction maintenance switches); and
- (5) Safe Clearances.

b. An AHA shall be developed for each activity when there is a potential for AFHs and must include the AFHs involved and applicable control measures (to include specific PPE needed for each task, AFB, etc) that are needed to reduce the AFHs to an acceptable level.

6-3. Mitigation on Floating Plant.

a. AFH Mitigation on floating plant may become infeasible due to plant configuration and confined areas (e.g. switchboards on vessels are in the pilot house with the Captain/operator). These situations shall be identified.

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b. When mitigation methods cannot bring risk to an acceptable level, an SOP must be developed that details how the crew will deal with these situations. These situations should not pose an AFH during normal operating conditions but do during maintenance.

c. For AFHs on U.S. Coast Guard inspected USACE Floating Plant, hazard mitigation must not violate applicable USCG protective device coordination requirements, thereby maintaining the reliability of the vessel's electrical power and distribution systems.

CHAPTER 7

Labeling

7-1. General.

- a. Warning labels shall be affixed to equipment and clearly visible.
- b. Label style, colors, and word usage shall be as described in EP 385-1-100.

7-2. Task-Based Assessment Labels. For facilities where a Task-Based Assessment has been performed, the information required to meet the label requirements listed above is not available. Labels for these facilities are allowed to be generic in nature.

7-3. Detailed Incident Energy (IE) Analysis Labels. Labels shall contain the following minimum information as prescribed by the Detailed IE Analysis:

- a. AF Protection Boundary;
- b. Incident Energy;
- c. Hazard/Risk Category Level;
- d. Working Distance.

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CHAPTER 8

Protective Clothing and Personal Protective Equipment (PPE)

8-1. General. There are five Hazard/Risk Categories of PPE: Categories 0, 1, 2, 3, and 4. Each category identifies the level of PPE required to limit the thermal injury to the worker's face and chest to a second-degree (i.e., curable burn). Levels above Category 4 are determined as Category Dangerous. Refer to EP 385-1-100 for a list of Hazard/Risk Categories and associated PPE requirements.

8-2. Protective Clothing and Personal Protective Equipment (PPE), to include Arc-Rated (AR) Clothing. This clothing and equipment shall be used when working within the AF boundary. PPE shall be arc-rated (when necessary) and:

- a. Required for work on Hazard/Risk Category 0 and higher;
- b. Properly inspected, stored, cleaned and maintained.

8-3. Prohibited Clothing and Equipment. Prohibited clothing and equipment is not permitted to be worn within the AFB and consists of:

- a. Flammable, synthetic materials (i.e., acetate, acrylic, nylon, polyester, polyethylene, polypropylene and spandex, alone or in blends);
- b. Other non-arc-rated apparel such as hard hat liners, hair nets, ear warmers, head covers, etc. (made from flammable, synthetic materials).

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CHAPTER 9

Non-USACE Personnel

9-1. Personnel Protection. When non-USACE personnel are exposed to AFHs while performing work at USACE operated facilities, the personnel shall be protected against AFHs. Non-USACE personnel shall be required to secure and wear the appropriate level of PPE while working at the facility.

9-2. Submittals. The non-USACE entity will provide their AFH Program and procedures to the government designated authority (GDA) as a submittal, which must be accepted by the GDA prior to beginning work. The AFH Program must include, as a minimum, items identified in Chapter 2 of this regulation.

9-3. Coordination. When AFH procedures and precautions will be required to safely perform the work, the appropriate USACE individual will discuss the AFH requirements with the non-USACE representative to ensure they understand the hazards and procedures. USACE individual and the non-USACE representative shall agree upon the procedures to be used. There shall be a documented meeting between the host employer and the non-USACE employer that details this information.

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CHAPTER 10

Documentation and Recordkeeping

10-1. Record Retention. All AFH Programs, training records, inspections and program reviews, mishap information shall be kept on file for a minimum of two years.

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CHAPTER 11

Inspections and Program Review

11-1. Purpose. Periodic inspections and program reviews shall be designed and conducted to insure all requirements of the AFH Program are being followed, to identify and correct any weaknesses in the program or procedures, in employee training, or in enforcement of the requirements.

11-2. Responsibility. The AFH Program shall define the responsibilities for the inspections and program review.

11-3. Frequency. Periodic inspections and program reviews shall be performed at least annually by individual(s) knowledgeable in the AFH Program, to include an AFH Qualified Person. Personnel internal to the project/facility may conduct the inspection one year and personnel external to the project/facility shall conduct the inspection the next year (peer review).

11-4. Review of Program. Periodic inspections and program reviews shall cover all elements of the written AFH Program and assess its proper implementation in the facility, as well as employee understanding.

11-5. Documentation. Inspections and program reviews shall be documented (date, persons involved, results), including any identified deficiencies and any corrective actions taken. A copy of these reports shall be provided through the proper chain of command to the local Command's Safety and Health Office.

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CHAPTER 12

Mishap Reporting and Investigation

12-1. Policy. Any AF-related mishap (near-miss, incident and accident, regardless of severity), shall be immediately reported through proper chain of command to the USACE local Command's Safety Office, who will then provide immediate electronic notice of mishap to MSC and HQ Safety (within 24 hours).

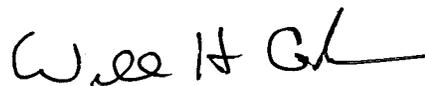
12-2. Near-Miss/Incident Reporting. An AF-related near-miss is ANY unplanned event that did not result in injury, illness, or damage – but had the potential to do so. An AF-related incident is ANY unplanned event that results in an injury or property damage that is less than the accident reporting thresholds found in ER 385-1-99. These near-misses and incidents are reported as lessons-learned in an effort to prevent a more serious mishap from occurring. AF-related near-misses and incidents shall be reported in ENGLINK.

12-3. Accident Reporting. All AF-related accidents shall be reported in accordance with ER 385-1-99. Lessons learned shall be provided to the local Command's Safety Office, the MSC Safety Office (if applicable) and HQ Safety who will insure appropriate distribution.

12-4. Investigation. An in-depth investigation and program review (See Chapter 11) shall be conducted by an AFH Qualified Person for all AF-related mishaps. Investigative report detailing results, findings, recommendations, programmatic changes, program and procedure violations, personnel qualifications and other applicable information shall be forwarded through chain of command to MSC and HQ Safety within 10 days.

FOR THE COMMANDER:

Appendix A
Definitions



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Chief of Staff

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APPENDIX A

Definitions

Accident, recordable - One of 3 types of mishaps meeting the definition of an Army accident that involves a Government employee, Contractor, or member of the public that rises to the severity level that they are used to calculate accident experience modification rates; an unplanned event related to an activity that results in a recordable property damage (over \$5,000), employee injury or illness, or fatality. > *See also "Mishap"*.

Arc Flash (AF) – A concentrated release of electric energy caused by an arcing fault.

Arc Flash Boundary (AFB) – When an arc flash hazard exists, the AFB is an identified approach limit at a distance from a prospective arc source within which a person could receive a second-degree burn if an electrical arc flash were to occur.

Arc Flash Hazard (AFH) – A dangerous condition associated with the possible release of energy caused by an electric arc. An arc flash hazard may exist when energized electrical conductors or circuit parts are exposed or when they are within equipment in a guarded or enclosed condition, provided a person is interacting with the equipment in such a manner that could cause an electric arc. Under normal operating conditions, enclosed energized equipment that has been properly installed and maintained is not likely to pose an arc flash hazard. See NFPA 70E, Article 100.

Arc Flash Hazard (AFH) Analysis – A study investigating a worker's potential exposure to AF energy, conducted for the purpose of injury prevention, the determination of safe working practices, and the appropriate level of Personal Protective Equipment (PPE).

Arc-Rated - Refers to clothing or equipment and indicates that it has been tested for exposure to an electric arc. Flame-Resistant (FR) clothing without an arc rating has not been tested for exposure to an electric arc.

Arc Rating - A value attributed to materials that describes their performance to exposure to an electrical arc discharge. The arc rating is expressed in cal/cm² and is derived from the determined value of the arc thermal performance value (ATPV) or energy of breakopen threshold (EBT) (should a material system exhibit a breakopen response below the ATPV value). Arc rating is reported as either ATPV or EBT, whichever is the lower value.

Breakopen - A material response evidenced by the formation of one or more holes in the innermost layer of arc-rated material that would allow flame to pass through the material.

Exposed (as applied to energized electrical conductors or circuit parts) – Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to electrical conductors or circuit parts that are not suitably guarded, isolated, or insulated from accidental contact or arc.

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Flammable, Non-FR Materials - Cotton, silk, rayon and wool fabrics. Although permitted within an AFB, these fabrics could ignite and continue to burn on the body, resulting in serious burn injuries.

Flammable, synthetic materials – These materials melt as a result of AF exposure conditions, form intimate contact with the skin and aggravate the burn injury (i.e., acetate, acrylic, nylon, polyester, polyethylene, polypropylene and spandex, alone or in blends are prohibited).

Hazard/Risk Category Level – A number (level 0 through level 4) based on the energy released during an arcing fault. A higher number indicates a higher energy level. The PPE needed to protect a worker is determined by the hazard/risk category level.

Incident - a mishap that adversely affects a mission and results in property damage and personal injury below the recordable threshold of a recordable accident; > See also “Mishap”.

Incident Energy – The amount of energy impressed on a surface, a certain distance from the source, generated during and electrical arc event. One of the units used to measure incident energy is calories per centimeter squared (cal/cm^2).

Insulated tools or equipment – Tools or equipment designed to provide insulation from an energized part or conductor. It may have conductive parts and be coated or covered by a dielectric material, or be composed entirely of insulating materials. Insulated industrial hand tools are typically stamped on the handle with an emblem (a double triangle) and a voltage rating. Such tools must be ASTM certified.

Limited Approach Boundary – An approach limit at a distance from an exposed live part within which a shock hazard exists. This boundary is also referred to as the safe approach distance in National Fire Protection Association (NFPA) 70E, “Standard for Electrical Safety in the Workplace,” Annex C.

Mishap - an unplanned, undesired event that occurs during the course of work being performed. A mishap includes accidents, incidents and near-misses.

Near-Miss – a mishap resulting in no personal injury and zero property damage, but given a shift in time or position, damage or injury may have occurred. > See also “Mishap”.

PPE – see *Protective Clothing and Personal Protective Equipment*

Prohibited Approach Boundary – An approach limit at a distance from an exposed live part within which work is considered the same as making contact with the live part.

Protective Clothing and Personal Protective Equipment (PPE) – Items of clothing or equipment, that provide a barrier between an AF hazard and a worker. PPE consists of protective and arc-rated (AR) clothing. For the purposes of this document, the term PPE will encompass protective clothing, arc-rated clothing and personal protective equipment.

Qualified Engineer – An electrical engineer who has skills and knowledge related to the engineering and design of the electrical equipment and installations to include fault studies, coordination studies, arc flash studies.

Qualified Person (Electrical) – One who has received training in and has demonstrated skills and knowledge in the construction and operation of electrical equipment and installations and the hazards involved. This includes the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, to determine the nominal voltage of exposed live parts, the clearance distances and corresponding voltages to which the qualified person will be exposed.

- Whether an employee is considered to be a “qualified person” will depend upon various circumstances in the workplace, e.g., an individual may be considered “qualified” with regard to certain equipment in the workplace, but “unqualified” as to other equipment.

- An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

Unqualified Person – A person that is not a Qualified Person.

Working Distance – The dimension between the possible arc point and the head and body of the worker positioned in place to perform the assigned task.

Working On (energized electrical conductors or circuit parts) – Intentionally coming in contact with energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing. There are two categories of “working on”:

- *Diagnostic (testing)* is taking readings or measurements of electrical equipment with approved test equipment that does not require making any physical change to the equipment;

- *Repair* is any physical alteration of electrical equipment (such as making or tightening connections, removing or replacing components, etc.).

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30 Sep 14

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