

ARC FLASH SUMMARY

What is Arc Flash?

An Arc Flash is a rapid, explosive discharge of electrical energy that usually results from a short circuit fault.

Annex K of NFPA 70E states:

- This burst of intense energy can cause temperatures to reach 35,000 degrees F within a millisecond.
- The Arc Flash then expands with very high speeds that can exceed 300 feet per second.
- There is an immediate burst of light and radiation in the range of 300 to 1500 nm.
- Copper expands by a factor of 67,000 times when it turns from a solid to a vapor.
- High pressures can exceed hundreds or even thousands of pounds per square foot.
- Sounds associated with these pressures can exceed 160 db.
- Molten metal and debris is expelled away from the arc flash at speeds that can exceed 700 miles per hour.
- Each year 2000 people are admitted to burn centers with severe Arc Flash burns.
- Arc Flashes can and do kill at distances of 10 feet.
- NFPA 70 E recommends the use of Personal Protective Equipment (PPE) when operating switchgear.
- Following **PACSafe** equipment can further mitigate or eliminate the effects of Arc Flash phenomena where PPE would not withstand the violent physical effects of an Arc Flash described above.

PACSafe

Illustration of Arc Resistant switchgear with Collector Plenum directing Arc Flash detritus away from operator.



PACS can mitigate or prevent damage and injuries as follows:

- Provide new Arc Resistant switchgear in accordance with IEEE C37.20.7.
- Prevent faults by continuously monitoring (7/52) insulation by Partial Discharge.
- Limit Arc Flash energy with Arc Mitigation controls.
- Provide closed door and electrical remote operation to rack breakers in and out.
- Retrofit existing switchgear with Partial Discharge and Arc Mitigation controls.
- Provide remote operating and mimic panels.

Regulatory agencies such as OSHA, NEC, and NFPA require that safe electrical operating areas be provided for personnel.

Definitions of Terms (from NFPA 70E)

Following defines the safe or unsafe operating boundaries in front of switchgear. This can be further confirmed by flash boundary calculations. PPE categories are based upon these boundaries.

Flash Boundary – An approach limit at a distance from exposed live parts within which a person could receive a second degree burn if an electrical arc flash were to occur.

Limited Approach Boundary – An approach limit at a distance from an exposed live part within which a shock hazard exists.

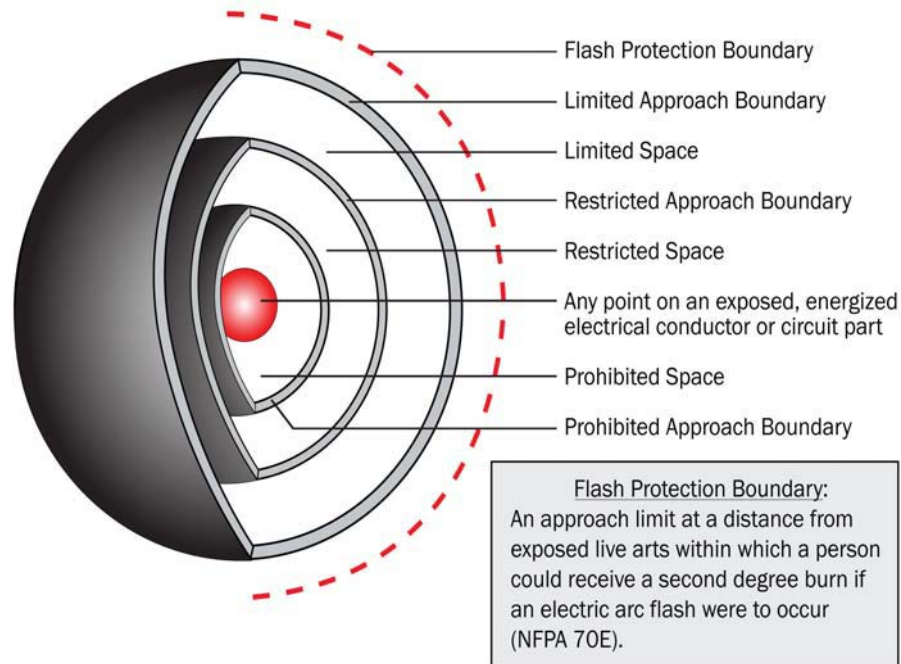
Prohibited Approach Boundary – An approach limit at a distance from an exposed live part within which work is considered the same as making contact with the live part.

Restricted Approach Boundary – An approach limit at a distance from an exposed live part within which there is an increased risk of shock, due to electrical arc over combined with inadvertent movement, for personnel working in close proximity to the live part.

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Incident Energy – *The amount of energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. One of the units used to measure incident energy is calories per centimeter squared (cal/cm²). shall be used by the employee based on the incident energy exposure associated with the specific task. Recognizing that incident energy increases as the distance from the arc flash decreases, additional PPE shall be used for any parts of the body that are closer than the distance at which the incident energy was determined*

Personal Protection Equipment (PPE) – *All parts of the body inside the flash protection boundary shall be protected. Arc-Rated FR clothing and other personal protective equipment (PPE) shall be used by the employee based on the incident energy exposure associated with the specific task. Recognizing that incident energy increases as the distance from the arc flash decreases, additional PPE shall be used for any parts of the body that are closer than the distance at which the incident energy was determined.*



IT IS THE RESPONSIBILITY OF THE EMPLOYER TO PROVIDE A SAFE ELECTRICAL WORKING ENVIRONMENT