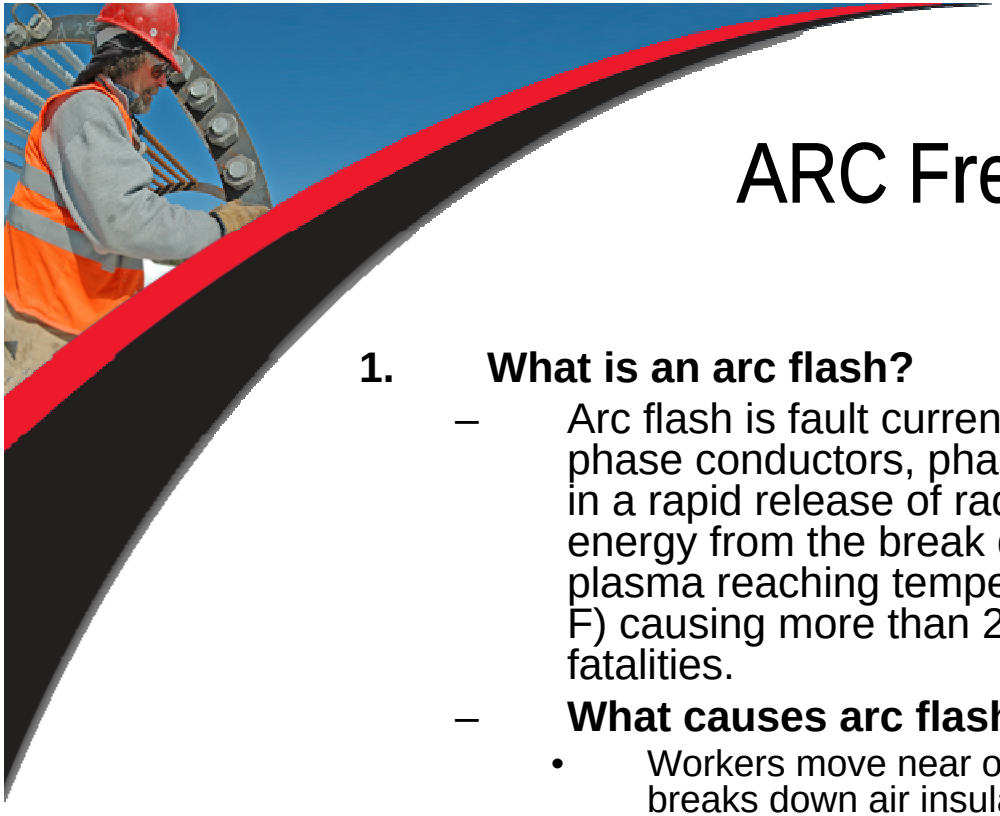

# ARC Frequently Asked Questions

**1. What is an arc flash?**

- Arc flash is fault current flowing through air between energized phase conductors, phase conductors to neutral or ground. It results in a rapid release of radiant (90%) and convection (10%) heat energy from the break down of air insulation into a highly conductive plasma reaching temperatures 4 times hotter than the sun (35,000 º F) causing more than 2000 burn injuries per year, and some fatalities.
- **What causes arc flash?**
  - Workers move near or contact energized conductors causing a spark that breaks down air insulation between conductors, and failure of equipment may create a spark that causes an arc flash between energized conductors.
- **How is arc flash heat energy measured?**
  - Arc flash heat energy is measured in Joules/cm2 ($J/cm^2$) or Calories/$cm^2$ ($Cal/cm^2$).
- **What is a Calorie?**
  - A calorie is the energy required to raise one gram of water one degree Celsius at one atmosphere. The onset of second-degree burns may occur from 1.2 calories/$cm^2$. One calorie/cm2 can be equal to holding your finger over the tip of a flame of a cigarette lighter for one second.

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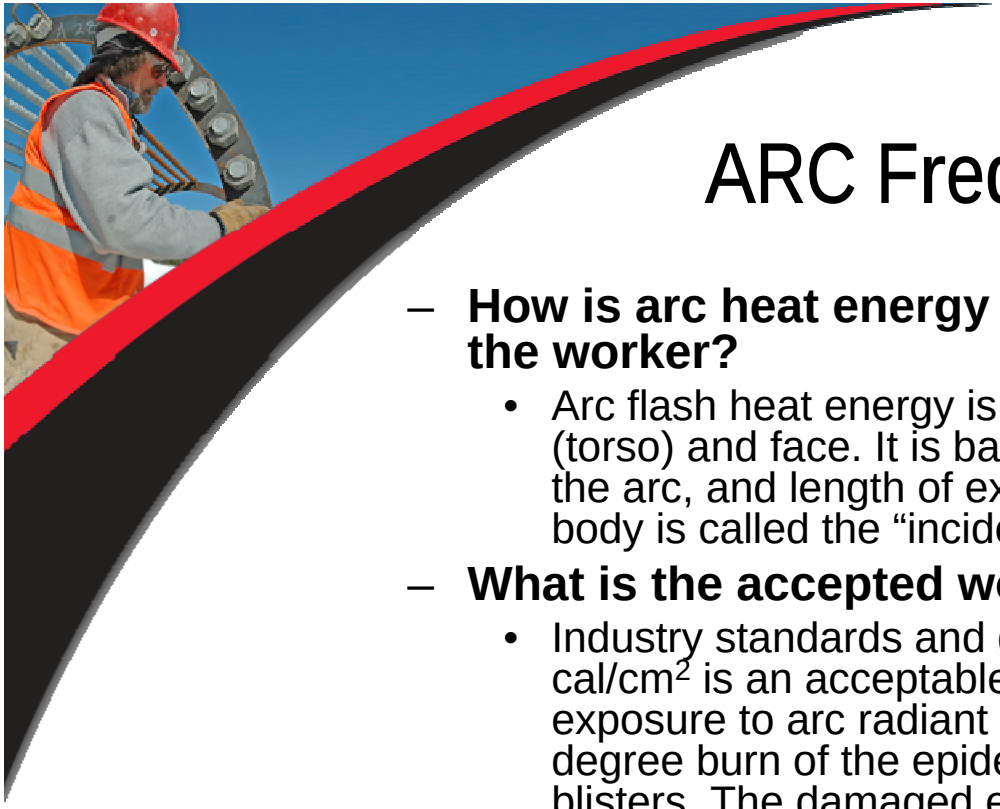
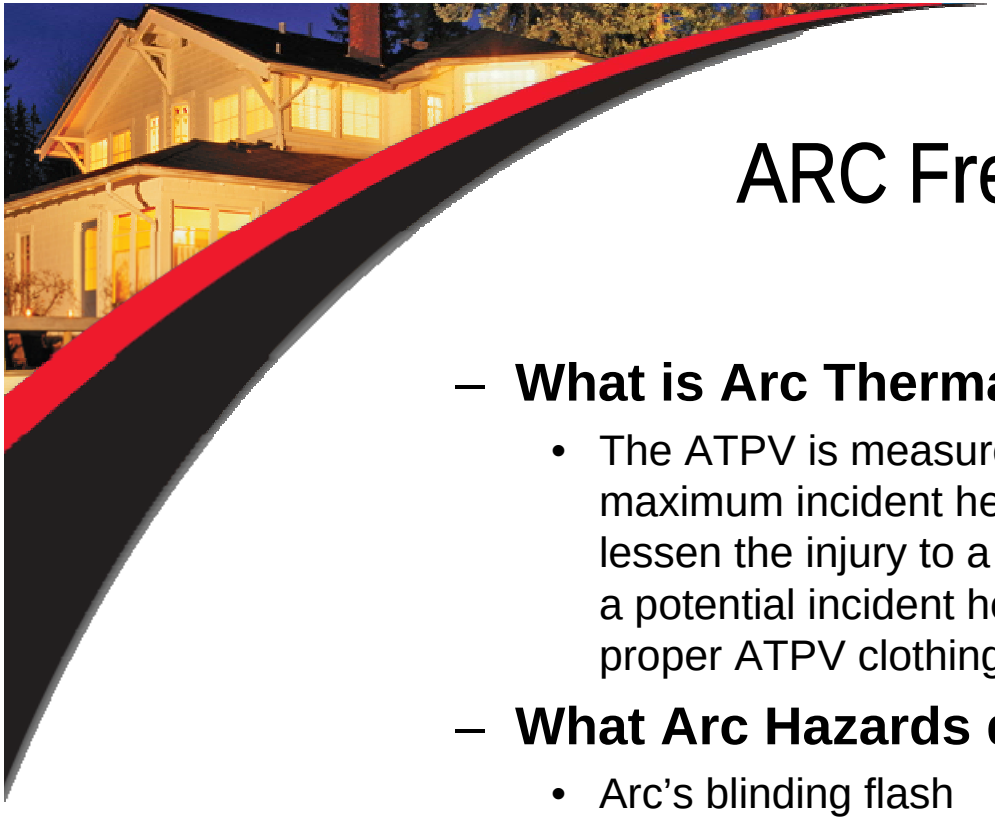


# ARC Frequently Asked Questions

- **How is arc heat energy or "incident energy" measured on the worker?**
  - Arc flash heat energy is calculated at the worker's upper body (torso) and face. It is based on arc energy, the workers distance to the arc, and length of exposure. The arc energy at the worker's body is called the "incident energy" measured in cal/cm$^2$ or J/cm$^2$.
- **What is the accepted worker incident energy level?**
  - Industry standards and government agencies agree that 1.2 to 2.0 cal/cm$^2$ is an acceptable worker incident energy level. This exposure to arc radiant heat energy may cause a curable 2nd degree burn of the epidermis indicated by painful red skin and blisters. The damaged epidermis will regenerate without scare tissue.
- **Why is control of worker's incident energy important?**
  - Controlling worker's incident energy reduces the severity of burn injuries and saves lives. Methods we use to reduce worker incident energy levels are reduce arc flash current and clearing time, move worker farther from potential arc, wear proper Arc Thermal Performance Value (ATPV), Flame Resistant (FR), clothing system, and change work method to lower arc incident energy.



# ARC Frequently Asked Questions

- **What is Arc Thermal Performance Value (ATPV)?**
  - The ATPV is measured in cal/cm$^2$, and it's defined as the maximum incident heat energy that a fabric can absorb and lessen the injury to a 2nd degree burn. If the worker is exposed to a potential incident heat energy level of less than 4.0 cal/cm$^2$, the proper ATPV clothing system is 4 cal/cm$^2$.
- **What Arc Hazards does ATPV clothing not protect?**
  - Arc's blinding flash
  - Sound levels that rupture the ear drums
  - Molten metal burns
  - Flying parts
  - Blast pressure wave that causes worker injuries .

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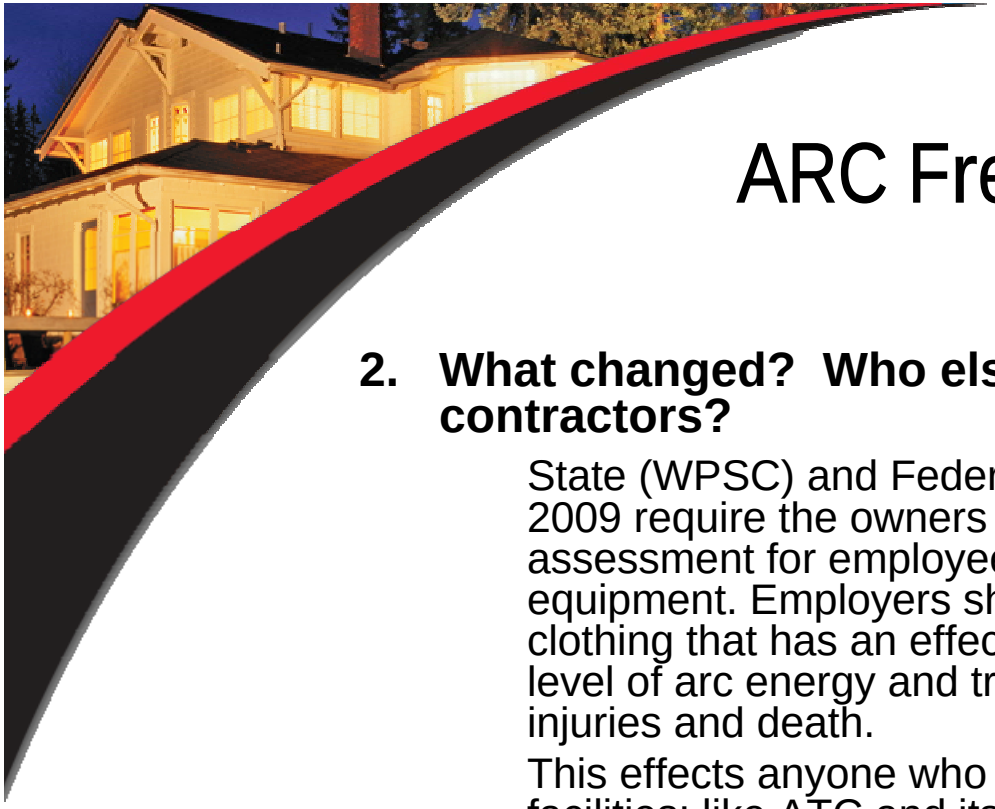

# ARC Frequently Asked Questions

2. **What changed? Who else does this impact? LDC's? Non-LDC contractors?**

   State (WPSC) and Federal (NESC) regulations effective January 1, 2009 require the owners of electrical facilities to perform an arc flash assessment for employees who do work on or near energized parts or equipment. Employers shall require employees to wear proper FR clothing that has an effective arc rating not less than the anticipated level of arc energy and train employees to reduce the risk of arc flash injuries and death.

   This effects anyone who owns, operates or works on electrical facilities; like ATC and its employees, the LDCs and their employees and contractors.

3. If there is no live electrical work taking place in the substation, do I need different FR clothing?

   No, ATC's current requirement to wear Category 1, (4 cal/cm$^2$) protection is sufficient. See ATC safety procedure "Personal Protective Equipment". The procedure also discusses FR clothing free zones.

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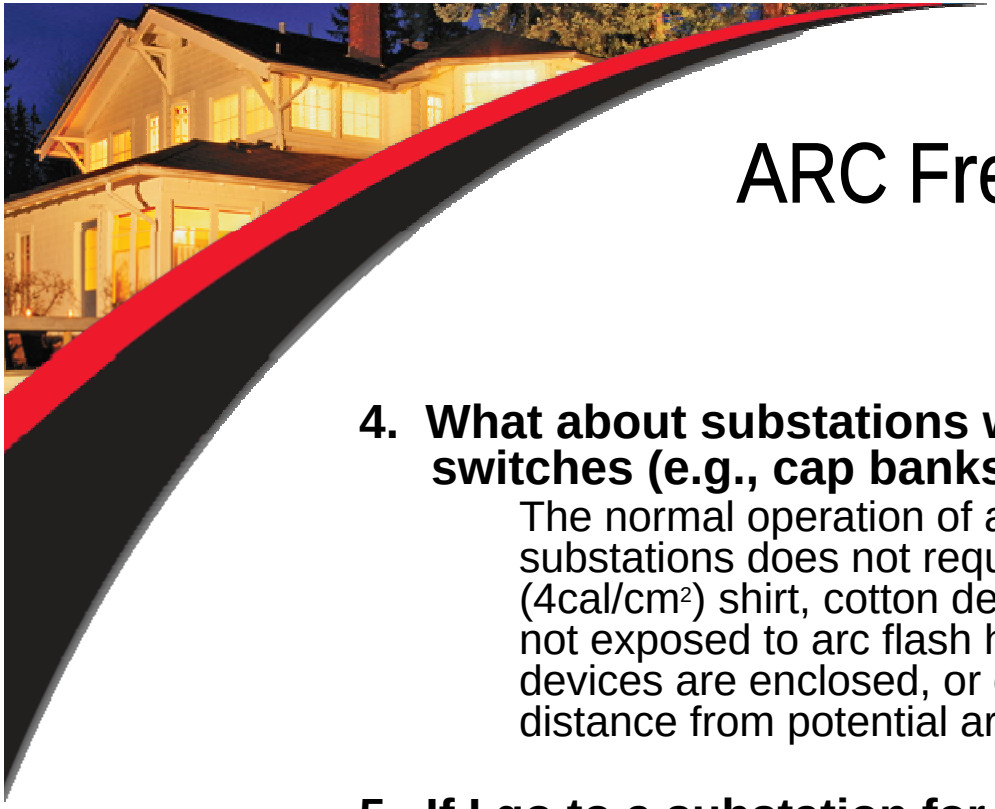

# ARC Frequently Asked Questions

**4. What about substations with automatic or remotely operated switches (e.g., cap banks, MOD's)?**

The normal operation of automatic and remotely operated devices in substations does not require workers wear more than their Category 1 (4cal/cm$^2$) shirt, cotton denim pants, and PPE equipment. Workers are not exposed to arc flash hazards because electric devices, automatic devices are enclosed, or elevated from ground to provide a safe distance from potential arc flash hazards.

**5. If I go to a substation for a walkdown, but I find a work crew there, can I enter the substation?**

Do you know the arc flash boundaries? If so, you can enter if you do not infringe upon the boundaries. If you are there to perform work it is required that you make contact w/ that crew to discuss what that crew is doing and understand their PJSB. If in doubt and they are working on equipment w/ an arc flash hazard make contact w/ them before entering. Note that any activity that could cause an arc flash should be considered live electrical work. This can include testing for energized circuit, installing grounds, switching or simply opening cabinets containing exposed live conductors. This pertains to transmission as well as distribution facilities.

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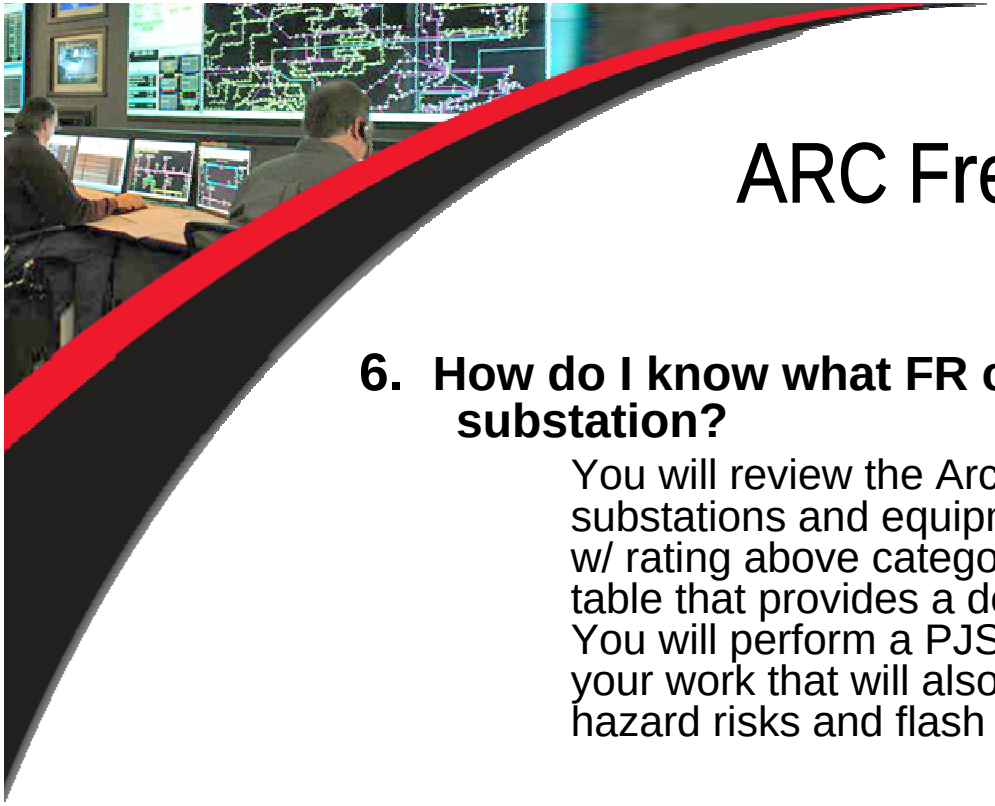

# ARC Frequently Asked Questions

**6. How do I know what FR clothing is appropriate for a particular substation?**

You will review the Arc Flash Hazard table that identifies substations and equipment w/in those subs that require FR clothing w/ rating above category/level 1. You will review the FR Clothing table that provides a description of FR clothing and its FR rating. You will perform a PJSB prior to entering the sub and performing your work that will also address FR clothing requirements, arc hazard risks and flash boundaries.

**7. Does this affect any work outside the substation fence?**

It does on pole switches and equipment/work that can cause arc flash hazard outside of a sub.

**8. If I need additional FR clothing, how do I get it?**

Employee supervisors order FR clothing per the ATC safety procedure “Personal Protective Equipment.”

# ARC Frequently Asked Questions

**9. Is there training for the new rules and is it required?**

Yes, ATC will provide an initial “train the trainer” training session that will cover arc flash information on:

The “hazard’ and “clothing” table

Work tasks associated w/ arc flash hazards

PPE & FR clothing

PJSB & JHA requirements

LDC information

The training is mandatory and will be rolled into the Substation Access training in the future.

**10. If I still have questions about arc flash boundaries or FR clothing, who can I talk to?**

Your supervisor

Substation Services

Safety

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Current as of 1.05.09