

**PUBLIC WORKS
AND
UTILITIES**

WATER AND WASTEWATER SYSTEMS

**ARC FLASH SAFETY
POLICY**

001

MARCH 26, 2008

CITY - COUNTY PERSONNEL
2008 MAY 1 PM 3 04

Purpose

The purpose of this policy is to help prevent accidental injury caused by an arc flash event and to promote safe facility practices among employees. Information relied upon in this policy are the generally accepted standards listed in the OSHA 29 Code of Federal Regulations (CFR) Part 1910, Subpart S, National Fire Prevention Association 70E – 2004, Standard for Electrical Safety Requirements, IEEE Standard 1584-2002, Guide for Performing Arc Flash Hazard Calculations.

Objectives

The objectives of this policy are to establish a written program outlining minimum guidelines for the use of arc flash protection. This written program will address the following elements.

- I. What is an Arc Flash?
- II. Can equipment be de-energized before work is conducted?
- III. Preparing for work in an arc flash zone.
- IV. Determining Personal Protective Equipment Risk Category.
- V. Fire Resistant Clothing Issuance.
- VI. Non-Compliance of Arc Flash Policy.

Responsibilities

1. Department Heads Have the Responsibility to:

Implement this arc flash policy by:

- A. Directing supervisors and employees to endorse and comply with this policy.
- B. Ensuring that protective clothing is worn, in compliance with this policy.
- C. Enforcing compliance with this policy.
- D. Implement hazard warning labeling in compliance with this policy.

2. Supervisors Have the Responsibility to:

- A. Identify and train employees in the proper use of this policy.
- B. Ensure that all outside contractors comply with this safety policy.
- C. Require and enforce compliance with this policy.
- D. Ensure that hazard warning labels have been installed in compliance with this policy.
- E. Ensure that lockout/tag out procedures are followed in conjunction with this policy.

3. Employees Have the Responsibility to:

- A. Understand their assigned tasks relating to potential arc flash hazards.
- B. Know the consequences of non compliance.
- C. Comply with the directives of this policy.
- D. Understand the hazard warning labels associated with arc flash hazards.

I. What is an Arc Flash?

Arc flash is a short circuit through the air. In an arc flash incident, an enormous amount of concentrated radiant energy explodes outward from the electrical equipment creating, pressure waves that can damage a person's hearing, a high-intensity flash that can damage their eyesight, and a superheated ball of gas that can severely burn a worker's body and melt metal.

II. Can equipment be de-energized before trouble shooting?

The best way to prevent an arc flash incident from occurring is to de-energize equipment before beginning work. When ever possible, equipment shall be de-energized before beginning work. Verification of voltage must be made to ensure the equipment is truly de-energized before it is worked on. Refer to the City of Lincoln Lockout Tag-out policy.

III. Preparing for work in an arc flash zone.

Arc Flash zones will be labeled with a standard arc flash zone hazard sign.

The arc flash protection boundary is an imaginary sphere that surrounds the potential arc point within which a person could receive a second degree burn if an electrical arc flash were to occur, based upon the available energy. For purposes of City policy, the minimum arc flash protection boundary, where required, shall be at a minimum, 4 feet. Arc flash PPE shall be worn while in the arc flash zone.

For systems that are 600 volts or less, the flash protection boundary shall be 4.0 ft. based on the product of clearing times of 6 cycles (0.1 second) and the available bolted fault current of 50 kA or any combination not exceeding 300 kA cycles (5000 ampere seconds). For clearing times and bolted fault currents other than 300 kA cycles, or under engineering supervision, the flash protection boundary shall alternatively be permitted to be calculated in accordance with the following general formula:

$$\text{Or} \quad \begin{aligned} D_c &= [2.65 \times MVA_{bf} \times t]^{1/2} \\ D_c &= [53 \times MVA \times t]^{1/2} \end{aligned}$$

Where:

- D_c = distance in feet from an arc source for a second-degree burn.
- MVA_{bf} = bolted fault capacity available at point involved (in mega volt-amps)
- MVA = capacity rating of transformer (mega volt-amps). For transformers with MVA

ratings below 0.75 MVA, multiply the transformer MVA rating by 1.25
 t = time of arc exposure (in seconds)

At voltage levels above 600 volts, the flash protection boundary is the distance at which the incident at which the incident energy equals 5 J/cm²(1.2 cal/cm²). For situations where fault-clearing time is 0.1 second (or faster), the flash protection boundary is the distance at which the incident energy level equals 6.24 J/cm²(1.5 cal/cm²).

IV. Determining Personal Protective Equipment Hazard Risk Category.

PPE shall be worn when any work is conducted within the arc flash zone for specific equipment.

FR clothing shall be in compliance with the following NFPA 70E Table 3-3.9.3

Category	Cal/cm ²	Clothing
0	1.2	Untreated cotton
1	5	Flame retardant (FR) shirt and FR pants
2	8	Cotton underwear, FR shirt, and FR pants
3	25	Cotton underwear, FR shirt, and FR pants, and FR coverall
4	40	Cotton underwear, FR shirt, FR pants, and double-layer switching coat and pants

FR eye protection and FR hearing protection shall be worn as part of the PPE requirement for arc flash safety.

V. Fire Resistant Clothing Issuance.

Fire Resistant (FR) Personal Protective Equipment and FR daily wear clothing will be made available by the employee's respective division. Daily wear FR clothing will be *issued* to Qualified Persons and Occasional Users as designated by respective divisions.

Some employees with the following Job Class's may be required to work in arc flash zones.

<u>Departments</u>	<u>Job Description</u>	<u>Job Class</u>
Water & Wastewater	Telemetry Control Tech.	5304
	Control Instrumentation Tech.	5372
	Control Systems Support Spec.	5375
	Utility Plant Tech.	5301
	Utility Plant Mechanic I	5336
	Utility Control Instrumentation Tech.	5371

When the employee changes job title (and no longer qualifies for FR daily wear clothing) or is no longer employed by Public Works Water/Wastewater, the FR daily wear clothing shall be returned to their supervisor.

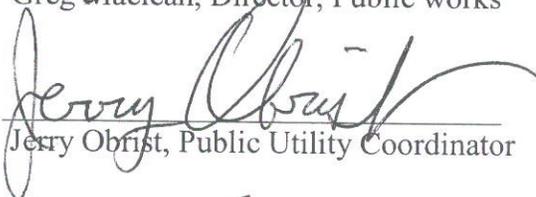
Upon issuance of replacement daily wear FR clothing, the replaced garments shall be turned into their supervisor.

VI. Non-Compliance of Arc Flash Safety Policy

The nature and level of the hazard reflect the compliance level. Safety is a condition of employment. Non-adherence to the Arc Flash Safety Policy may result in disciplinary action.



Greg Maclean, Director, Public works



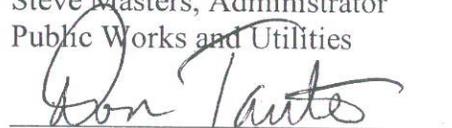
Jerry Obrist, Public Utility Coordinator



Gary Brandt, Utilities Coordinator Wastewater and Solid Waste



Steve Masters, Administrator
Public Works and Utilities



Don Taute, Director Personnel
Department

Appendix A - Definitions

Flash Hazard Analysis - A study investigating a worker's potential exposure to arc-flash energy, conducted for the purpose of injury prevention and determination of safe work practices and the appropriate levels of PPE.

Flash Protection 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.

Flame-Resistant (FR) - The property of a material whereby combustion is prevented, terminated, or inhibited following the application of a flaming or non-flaming source of ignition, with or without subsequent removal of the ignition source.

Flash Hazard - A dangerous condition associated with the release of energy caused by an electric arc.

Qualified Person - One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved.

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.

Arc Rating - The maximum incident energy resistance demonstrated by a material (or a layered system of materials) prior to breakopen or at the onset of a second-degree skin burn. Arc rating is normally expressed in cal/cm²

De Energized - Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth.

Energized - Electrically connected to or having a source of voltage.

Occasional Users - Qualified persons who work in a limited capacity in arc flash zones, not on a daily basis.

For any other definitions concerning this policy, refer to NFPA 70E : Standard for Electrical Safety in the Workplace