

Arc Flash Program

Revised April 2024

Purpose

The Arc Flash Prevention Program is designed to provide specific direction throughout the District to ensure our employees are afforded a safe workplace free from recognized hazards. This program identifies employee responsibilities to reduce risk of exposure to arc flash that may result in severe injury and/or loss of life. In addition, the program covers training and requirements for specific types of equipment. It also recognizes that, if feasible, we must engineer out exposure to arc flash during all system design and protection upgrades.

Applicability

This program establishes work requirements, personal protection and safety procedures for all District employees, contractors, visitors, and vendors who while working within the arc flash boundary on exposed energized lines, parts, or equipment or while in the process of exposing or interacting with unguarded lines and energized electrical conductors or electrical equipment of 50 volts (AC and DC) or greater. This program exists to improve workplace safety and minimize the injuries sustained from the hazards associated with an electric arc flash and anyone entering the established arc flash boundary. This program and associated arc flash data may not cover every arc flash scenario an employee may encounter, **Stop Work Authority** must be considered if the arc flash data is unavailable. This program does not restrict the use of more protective safety measures.

Note: Work with exposure above 40cal/cm² or greater is prohibited.

Responsibility and Communication

Management Responsibilities

- Implement this program within their scope of responsibility.
- Conduct workplace safety assessments to identify and mitigate arc flash exposure -- with engineering the hazard out as a priority.
- Ensure employees are trained on arc flash hazards, mitigation, and PPE.
- Provide employees with AR rated PPE that exceeds the calculated incident energy for the work assigned.

Foreman / Lead Worker Responsibilities

- Communicate known arc flash hazards during tailboard discussions.
- Ensure employees working within the arc flash boundaries are wearing the appropriate PPE to mitigate injury from arc flash.
- Promptly report all arc flash incidents regardless of injury to Safety
- Report any program deficiencies or unidentified arc flash risks to management and engineering.

Affected Employee Responsibilities

- Inspect PPE prior to use. If it shows signs of wear or contamination remove it from service.

- If PPE / Clothing is damaged during the shift, ensure that work is not performed within the arc flash boundary.
- Look out for each other, if you observe a coworker exposed to a hazard, exercise **Stop Work Authority**.
- Promptly report all arc flash incidents regardless of the extent of injury to Safety

Safety Department Responsibilities

- Program administration to include audit, inspection, and program updates to ensure regulatory compliance.
- Maintain the documented Arc Flash Program, to include current engineering arc flash analysis.
- Participate on the Arc Flash Clothing Committee.

Engineering Responsibilities

- Perform arc flash hazard calculations and provide documented assessments for Line Operations, Substations, Meter, Water, and Generation.
- Incorporate engineering design and equipment to reduce exposure to arc flash.
- Perform an annual review of the existing arc flash assessments and provide updates, as necessary.

Procedures

- Whenever practical, energized electrical conductors or equipment must be de-energized to limit arc flash hazard exposure.
- **No energized work may be performed by District employees that exceeds the protective calorie limit of Arc Rated clothing and PPE. Work on equipment 40cal/cm² is not allowed without Senior management, Engineering, and Safety approval.**
- Establish an arc flash protection boundary based on engineering assessments and potential exposure.
Unless noted in the arc flash data the restricted boundary is 15' for all District work.
 - Employees performing overhead work are considered working within the restricted arc flash boundary and must wear a minimum of cat 2 (8 cal/cm²) rated clothing.
 - If work is being performed at ground level, precautions must be made to limit people from entering the 15' arc flash boundary.
 - If there is potential for an unauthorized person entering the arc flash boundary precautions must be put in place by setting up a physical barrier or assigning a spotter.

Personal Protective Equipment (PPE)

All employees or contractors, who perform work on or near exposed energized electrical conductors or interact with energized electrical equipment that poses an arc flash hazard, must wear the category of AR clothing and PPE required for the calculated amount of incident energy available from the electrical equipment or conductor to be maintained.

The Arc Flash Risk Assessment performed on the District's electrical systems determine the calculated amount of incident energy. It is important to note that AR clothing is not a primary means of protection and

may not eliminate all injuries sustained from an arc flash. All AR clothing worn by District employees throughout their work shift must be approved and issued by the District.

Contractor, vendor, and visitors are responsible for providing their own PPE that complies with the District's Arc Flash Data Sheets or equipment arc flash labels.

Clothing Requirements

- Category 2 (8 cm/2) is the District's minimum outer protection while performing typical electrical work. When performing work in an arc flash boundary sleeves must be rolled down to protect the arms and shirts tucked in to protect from the "chimney" effect in the event of an arc flash.
- Employees must wear underlayers or garments made of 100% natural fiber or arc rated materials. Underlayers or garments made with fibers that melt such as acetate, nylon, polyester, polypropylene, and spandex must not be worn under AR garments.
- Layering may be used for exposure up to 20 cm².
- 40 calorie arc suits will be made available to employees exposed to exposures above 20 cm².
- If a garment becomes contaminated or damaged during the course of the day, you cannot perform work within the arc flash boundary.

Eye, Face, Hand, and Foot Protection

See Arc Flash Hazard Summary chart with specific details regarding approach distances, administrative controls, and PPE.

- Eye Protection: Eye protection must be worn at all times when working within a category 2 arc protection boundary.
- E-rated Hard hat or Helmet
- Face shield: See Arc Hazard Data Sheet or equipment labels.
- Footwear: Substantial leather or equivalent must be worn when performing work within a restricted boundary.
- Hand Protection: Arc rated gloves or insulated gloves with leather keepers must be worn when working in a restricted boundary.
- Arc suits will be provided to employees who work in areas that have potential exposure over 20cal/cm² to 40cal/cm². District provided arc suits include a full hood and body protection, gloves must be rated for 40cal/cm².

Arc Rated Clothing Program

- The District will provide affected employees with arc rated garments at no cost.
- Management and Safety will work in collaboration to add remove workgroups from the AR Clothing Program as determined by potential exposure.
- The following work groups, based on exposure are daily use employees: Linemen, Wiremen, Equipment Operators, Meter Electricians, Hydro Electricians, Relay, Line Helpers, and Customer Service Field Representatives.
- Employees who have limited exposure or duration will be provided with an arc rated coverall or, at Management's discretion, be provided an allowance to purchase arc rated clothing from an approved vendor.

Training

Affected employees must be trained on the contents of this program to include:

- District provided arc flash data and assessments.
- Use and care of PPE.
- Arc flash hazards and mitigation.

Arc Flash Hazard Summary

This Arc Flash Hazard Summary provides estimated arc flash hazards for various voltages and locations throughout the Snohomish County PUD electrical system and summarizes the use of PPE including Arc-Resistant apparel.

Arc Flash Hazard:

- Arc flash hazards are where second degree burns or greater are likely to occur to the body during an arc flash event measured in calories per centimeter (cal/cm^2). A 2 cal/cm^2 exposure is likely to cause second degree burns.
- This summary is based on planned work being performed on energized lines and equipment.

Note: Arc flash hazards also exist when working near energized facilities such as performing excavations or working in proximity to remote operated equipment.

Arc Flash Boundary:

- The arc flash boundary is the distance from an arc flash event that a person is not likely exposed to an arc flash less than 2 cal/cm^2
- The arc flash boundary for all employees within 15' of the arc flash hazard noted below and when performing tasks such as excavating near energized conductors, vault entry and working in an energized substation where switching may occur.

PPE:

- 8 cal/cm² (Category 2) clothing is the minimum outermost layer required while performing work within an arc flash boundary. Shirt sleeves must be down, buttoned up and tucked when performing work from the ground.
- For exposures over 8 cal/cm² you must layer to achieve full body protection that meets or exceeds the estimated hazard listed in the table below. Note: Refer to the Tyndale Layering app.
- Hand protection must meet or exceed the estimated hazard listed in the table below. Secondary and primary gloves with keepers provide adequate protection.
- For open air hazards, safety glasses are required unless face shield with balaclava is noted.
- Apparel worn under arc rated apparel cannot be made from flammable materials such as polyester, nylon, acetate, or anything that can increase the extent of injury in the event of an arc flash.

Voltage	Line or Equipment Type	Hot Line Hold ON	Hot Line Hold OFF	Open Air	Working Distance	MAD	Face Shield and Balaclava	Hazard cal/cm ²
120-240V	<u>Padmount</u> Secondaries	x	x	x	24"	No Contact	Recommended	5 *See Note 1
120-240v	Meters	x	x	x	18"	N/C	Recommended	4
120-240v	Overhead Transformers	x	x	x	24"	N/C	No	6 *See Note 2
120-480v	MCC / Other Misc. See equipment arc flash hazard label.	x	x	x	18"	14"	Yes	40+ *See Note 3
120-240v	Pedestals, vaults, hand holes	x	x	x	18"	N/C	Recommended	5
480v	Pedestals, vaults, hand holes	x	x	x	18"	14"	Recommended	8
480v	Overhead Secondaries	x	x	x	24"	14"	No	6
480v	<u>Padmount</u> Secondaries	x	x	x	24"	14"	Recommended	5
480v	Meters				18"	14"	Yes	20 Cal
12.5kv	Overhead Distribution	x		x	36"	2'3"	No	2.5
12.5kv	Overhead Distribution		x	x	36"	2'3"	No	30 Cal *See Note 3
12.5	Underground	x			48"	2'3"	Yes	17 *See Note 4
12.5	Underground		x		48"	2'3"	Yes	30 Cal *See Notes 3 and 4
12.5	Live Front Equipment	x			72"	2'3"	Yes	15.9 *See Note 5
12.5	Live Front *Arc Suit Required *		x		72"	2'3"	Yes *See Notes	40+ *See Note 3
115kv	All	x		x	72"	4'8"	No	4
230kv	All	x		x	130"	10'2"	No	4

Notes:

1. For transformers rated under 1000 kva.
2. For transformers under 1000 kva.
3. Consult Safety and Engineering for additional PPE/Hazard Analysis.
4. No work should be performed inside of an energized primary vault with the exception of vaults containing dead front gear with arc flash protection. When lifting elbows from outside of the vault, defer to overhead open-air calculations.
5. Hotline Hold is not required for switching when all covers are secure and in place, for any work performed with doors open, follow the layering requirements in this column.