

Brevard Public Schools



ELECTRICAL SAFETY AND ARC FLASH PROCEDURE

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INTRODUCTION

The School Board of Brevard County will take every reasonable precaution in the performance of work to protect the health and safety of employees and to minimize the probability of damage to property. The electrical safety requirements contained in this program and in conjunction with the BPS Safety Plan have been established in order to achieve these goals.

Electrical work is an important part of our business. Brevard Public Schools is committed to provide a safe work environment for its employees and contractors performing electrical work. The electrical safety and ARC Flash program outlined below is designed to minimize, and in some instances eliminate, the risks associated with electrical work. It establishes minimum standards to prevent hazardous electrical exposures to personnel, and to ensure compliance with regulatory requirements. (It should be noted that this program does not apply to any systems below 50 volts.)

In order to maximize safety, all employees will:

- Work only on de-energized equipment, unless additional or increased hazards result from de-energizing equipment, or it is not possible to complete critical work due to equipment design or operational limitations; (Energized electrical work shall be performed by written permit only.)
- Be well trained in safe electrical work practices, techniques and understand the specific hazards associated with electrical energy; and be a qualified service technician
- Utilize all required safety and personal protective equipment

Purpose

The purpose of this program is to:

- Ensure the safety of employees who work on or near electrical equipment;
- Ensure understanding and compliance with safe electrical work practices;
- Comply with Current OSHA and NFPA Standards and focus on the following priorities:
 - Provide a safety program with defined responsibilities
 - Determine the degree of arc flash hazard by qualified personnel
 - Use appropriate hazard warnings
 - Provide adequate personal protective equipment (PPE) for technicians
 - Provide documented training to technicians on Lockout/Tag out procedures and the hazards of arc flash
 - Provide appropriate tools for safe work

SCOPE

This program applies to all Brevard Public School employees, contractors, and contracted vendors

RESPONSIBILITIES

District Office: Environmental Health & Safety (EH&S)

- Investigate injury and/or damage reports in collaboration with the Risk Management Office
- Maintenance of training records

- Periodically review and update this written program
- Provide and/or coordinate general training for work units on the content of this program
- Evaluate the overall effectiveness of the electrical safety program annually, and whenever an electrical accident occurs

Supervisors

- Evaluate work being performed and determine compliance with this program
- Lead by example and promote electrical safety awareness to all employees
- Enforce compliance with the provisions of the electrical safety program (Follow progressive discipline)
- Ensure employees receive training appropriate to their assigned electrical tasks and maintain documentation of such training. Training is mandatory for all qualified service technicians covered under this program
- Ensure employees are provided with, and use appropriate protective equipment

Employees (Qualified Service Technicians)

- Follow the work practices described in this document
- Wear appropriate PPE
- Utilize proper tools
- Attend all training required by this program
- Immediately report any concerns related to electrical safety to supervision
- Do not perform any electrical work without proper training and equipment

Technicians are required to work while always keeping safety in mind, and to exercise the right to stop any work that poses a danger to life and property. Any work stoppage due to safety or danger requires the technician to report it immediately to his or her supervisor.

TRAINING

Requirements

Employees working on or near energized or potentially energized electrical circuitry shall be trained in energized electrical safe work practices and procedures, and designated as a qualified service technician after successfully completing the training program.

Qualified Service Technician

Employees must receive training in avoiding the hazards associated with working on or near exposed energized electrical parts prior to performing energized electrical work. Such training will be provided when the employee is initially assigned to the job. Training will be provided and/or coordinated by EH&S. Training will be provided annually, when hazards change, or when new technologies or new types of equipment are introduced to the technicians.

The following requirements are to be included in the training of qualified service technicians related to the service and operation of electrical equipment and installations:

- Lockout/Tagout training program, including safe work practices and procedures required to safely de-energize electrical equipment (IAW Section 24 of the BPS Safety Plan)
- ARC Flash procedures;
 - Skills and techniques necessary to distinguish exposed energized components from other parts of electrical equipment

- Skills and techniques necessary to determine the nominal voltage of exposed energized parts
- Understanding approach distances and the corresponding voltages to which the employee will be exposed
- Understanding the selection and use of proper work practices, personal protective equipment, tools, insulating and shielding materials, and equipment for working on or near energized parts

NOTE: Qualified service technicians must also be trained in recognizing signs and symptoms of electric shock, heart fibrillation, electrical burns, and proper first aid protocols for these conditions.

Therefore, they must have the following training:

- Basic Cardiopulmonary Resuscitation (CPR)
- Automated External Defibrillator (AED)
- Contacting emergency personnel and basic first aid
- Methods of releasing victims in contact with energized electrical conductors or circuit parts

The designation of qualified service technician will be achieved after an employee has successfully completed all electrical training and met all of the requirements.

PERSONAL PROTECTIVE EQUIPMENT

General Requirements

- Employees working in areas where there are potential electrical hazards must use personal protective equipment (PPE) that is appropriate for the specific work to be performed. The electrical tools and protective equipment must be specifically approved, rated (i.e. ANSI certification), and tested (by the manufacturer) for the levels of voltage to which an employee may be exposed
- Qualified service technicians must wear cotton undergarments (not provided by BPS EH&S)
- The BPS EH&S provides electrical protective equipment (e.g., Arc Flash Gear) required by this program. Such equipment shall include Arc Flash apparel, eye protection, head-protection, hand protection, hearing protection and face shields where necessary
- Employees shall wear nonconductive head protection whenever there is a danger of head injury from electric shock or burns due to contact with live parts, or from flying objects resulting from an electrical explosion
- Employees shall wear protective equipment for the eyes whenever there is a danger of injury from electric arcs, flashes, or from flying objects resulting from an electrical explosion
- Employees shall wear rated rubber insulating gloves where there is a danger of hand or arm contact with live parts or possible exposure to arc flash burn
- Face shields must have arc rating for electrical work. Safety glasses or goggles must always be worn underneath face shields
- Additional illumination may be needed when using tinted face shields as protection during electrical work
- Electrical protective equipment must be selected to meet the criteria established by the National Fire Protection Association (NFPA) and the American Society of Testing and Materials (ASTM)
- Insulating equipment made of materials other than rubber shall provide electrical and mechanical protection at least equal to that of rubber equipment
- PPE must be maintained in a safe, reliable condition and be inspected for damage before each day's use, and immediately following any incident that can reasonably be suspected of having caused damage
- PPE must be checked by the employee before being used. Any defect noticed shall result in the PPE not being used and the work assignment stopped
- Employees must use insulated tools and handling equipment that are rated for the voltages to be encountered when working near exposed energized conductors or circuits

- Any damaged PPE shall be immediately reported to supervisor for replacement
- Any abuse or failure to use PPE will result in progressive discipline
- Tools and handling equipment should be replaced if the insulating capability is decreased due to damage
- Fuse handling equipment (insulated for circuit voltage) must be used to remove or install fuses
- Ropes and hand lines used near exposed energized parts must be non-conductive

WORKING ON DE-ENERGIZED EQUIPMENT

Electrically Safe Condition

The most important principle of electrical safety is to assume all electric circuits are energized unless each involved qualified service technician ensures they are not. Every circuit and conductor must be tested every time work is done on them. Proper PPE must be worn until the equipment is proven to be de-energized. Other PPE may be necessary depending on task.

- Voltage rated gloves and leather protectors must be worn
- Electrically insulated shoes should be worn
- Safety glasses must be worn
- The required Arc Flash PPE must also be worn

There are six steps to ensure conditions for electrically safe work:

1. Identify all sources of power to the equipment. Check applicable up-to-date drawings, diagrams, and identification tags
2. Remove the load current, and then open the disconnecting devices for each power source
3. Where possible, visually verify that blades of disconnecting devices are fully open or that pullout type circuit breakers are fully withdrawn
4. Apply lockout/tagout devices in accordance with BPS EH&S policy
5. Test each phase conductor or circuit part with an adequately rated voltage detector to verify that the equipment is de-energized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Check the voltage detector before and after each test to be sure it is working
6. Properly ground all possible sources of induced voltage and stored electric energy (such as capacitors) before touching. If conductors or circuit parts that are being de-energized could contact other exposed conductors or circuit parts, apply ground-connecting devices rated for the available fault current

The process of de-energizing is "live" work and can result in an arc flash due to equipment failure. When de-energizing, follow the procedures described in "Working On or Near Energized Equipment" (see below).

Lockout/Tagout Program

All qualified service technicians will be trained on, and follow the requirements of the Brevard Public Schools EH&S Lockout/ Tagout program (Section 24, BPS Safety Plan). This is a prerequisite for any electrical work. Contractors will provide verification of a Lockout/Tagout program to the Facility Manager Coordinator or Designee.

VEHICULAR AND MECHANICAL EQUIPMENT

No Brevard Public School employee shall use or allow to be used any vehicular or mechanical equipment (e.g., portable lifts and bucket trucks) within 50 feet of overhead transmission, distribution, or power substation.

WORKING ON OR NEAR ENERGIZED EQUIPMENT

Working on live circuits means actually touching energized parts; while working near live-circuits means working close enough to energized parts to pose a risk even though work is done on de-energized parts.

Common tasks where there may be a need to work on or near live circuits include:

- Taking voltage measurements
- Opening and closing disconnects and breakers
- Racking breakers on and off the bus
- Removing panels and dead fronts

- Opening electric equipment doors for inspection
 - When opening and closing disconnects, use the left-hand rule when possible (stand to the right side of the equipment and operate the disconnect switch with the left hand)

Energized Electrical Work Permit

- If live parts cannot be placed in an electrically safe condition (de-energized), work to be performed shall be considered energized electrical work and shall be performed by written permit only. No one should ever work on energized equipment without a helper
- *Work related to testing, troubleshooting, and voltage measuring may be completed without a permit provided appropriate safe work practices and PPE are used*
- The permit must be originated by the qualified service technician
- Energized Work Permits shall be submitted to the Supervisor for approval and will be signed off by the facility official (Principal, AP, or Building Manager) indicating that they are aware that energized electrical work is being conducted within their facility
- *The permit must be posted in an appropriate location where the energized work is taking place for the duration of the task*

Approach Distances to Exposed Live Parts

The National Fire Protection Association (NFPA) defines three approach distances for shock hazards and one for arc flash.

- The **Limited Approach Boundary** is the distance from an exposed live part within which a shock hazard exists
- The **Restricted Approach Boundary** is the closest distance to exposed live parts a qualified person can approach without proper PPE and tools. Inside this boundary, accidental movement can put a part of the body or conductive tools in contact with live parts or inside the prohibited approach boundary. To cross the Restricted Approach Boundary, the qualified person must:
 - Have an energized work permit that is approved by the supervisor or manager responsible for the safety plan
 - Use PPE suitable for working near exposed live parts and rated for the voltage and energy level involved
 - Be certain that no part of the body enters the prohibited space
 - Minimize the risk from unintended movement by keeping as much of the body as possible out of the restricted space; body parts in the restricted space should be protected
- The **Prohibited Approach Boundary** is the minimum approach distance to exposed live parts to prevent flashover or arcing. Approaching any closer is comparable to making direct contact with a live part. To cross the Prohibited Approach Boundary, the qualified person must:
 - Have specified training to work on exposed live parts

- Have a plan with proper written work procedures and that justifies the need to work that close
- Use PPE appropriate for working near exposed live parts and rated for the voltage and energy level involved

The **Flash Protection Boundary** is the 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. To cross the Flash Protection Boundary, the qualified person must:

- Use PPE appropriate for working near exposed live parts and rated for the voltage and energy level involved
- For systems of 600 volts and less, the flash protection boundary is 4 feet, based on an available bolted fault current of 50 kA and a clearing time of 6 cycles for the circuit breaker to act, or any combination of fault currents and clearing times not exceeding 300 kA cycles
- When working on de-energized parts and inside the flash protection boundary for nearby live exposed parts. If the parts cannot be de-energized, to protect against accidental contact wear proper PPE

Other Precautions

- Employees shall not reach blindly into areas that might contain exposed live parts.
- Employees shall not enter spaces containing live parts unless illumination is provided that allows the work to be performed safely
- Conductive articles of jewelry and clothing (including, but not limited to, watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn where they present an electrical contact hazard with exposed live parts
- Conductive materials, tools, and equipment that are in contact with any part of an employee's body shall be handled in a manner that prevents accidental contact with live parts. Such materials and equipment include, but are not limited to long conductive objects such as ducts, pipes, tubes, conductive hose and rope, metal-lined rules and scales, steel tapes, pulling lines, metal scaffold parts, structural members, and chains

ENERGIZED ELECTRICAL EQUIPMENT SAFETY PROGRAM

Equipment Labeling

Switchboards, panel boards, industrial control panels, and motor control centers must be labeled to warn Technicians of potential electric arc flash hazards.

- The term Industrial Control Panel covers every enclosure that may contain exposed energized conductors or components
- Marking (labeling) is intended to reduce the occurrence of serious injury or death due to arcing faults to Technicians working on or near energized electrical equipment
- Markings (labels) shall be located so they are visible to personnel before examination, adjustment, servicing, or maintenance of the equipment
- Identification of equipment with missing or illegible marking

CONTRACTOR EMPLOYEES

- Safety programs used by contractors must meet or exceed all applicable guidelines of this Electrical Safety Program
- Contractors are required to comply with applicable Safety and Health regulations such as OSHA, NFPA, and EPA
- Contractors may be required to submit copies of their safety program to the Facilities Management Coordinator upon request

REFERENCES

- OSHA CFR 1910
- OSHA CFR 1926
- NFPA 70-E
- BPS EH&S Safety Plan

APPENDIXES

- Appendix A – Energized Electrical Work Permit



APPENDIX - A Energized Electrical Work Permit

To be reviewed by Supervisor prior to start of work. Only valid for named electrically qualified person(s) and day issued.

Date: ____/____/____ Start time: ____:____ am/pm

Work Order # / Project: _____

Building Location: _____

Panel Location: _____

Description of Work to be Performed: _____

Specific Reason Equipment Circuit Cannot be De-energized:

Maximum Voltage Present: _____

Number of Voltage Sources Present: _____

Personal Protective Equipment (PPE) worn/used:

- | | |
|---|---|
| <input type="checkbox"/> Hard Hat | <input type="checkbox"/> Insulated Gloves |
| <input type="checkbox"/> Safety Glasses | <input type="checkbox"/> Insulated Mats |
| <input type="checkbox"/> Face Shield/ Hood | <input type="checkbox"/> Insulated Blankets |
| <input type="checkbox"/> Flash Resistant Jacket | <input type="checkbox"/> Insulated Sleeves |
| <input type="checkbox"/> Flash Resistant Bibs | <input type="checkbox"/> Hearing protection |

Additional PPE Required: _____

Name of Qualified Person doing the work: _____

*Name of Qualified Person Assisting: _____

***On all energized circuits or equipment carrying two hundred seventy-seven (277) volts or over, as a safety measure, there must be at least two (2) personnel on the job site.**

**Work Authorized by: _____ Title: _____ Date: _____

****Work may only be authorized by Supervisor or above**

***Facility Official: _____ Title: _____ Date: _____

*****Facility Official (Principal, AP, or Building Manager) must be notified of any energized electrical work occurring within their facility**

Work Completed: Date: ____/____/____ End time: ____:____ am/pm