

OAK GROVE SCHOOL DISTRICT

ELECTRICAL SAFETY PROGRAM

INTRODUCTION

Electrical work is an important part of our business. The Oak Grove School District is committed to provide a safe work environment for its employees and contractors performing electrical work. The electrical safety program outlined below is designed to minimize, and in some instances eliminate, the hazards associated with electrical work. It establishes minimum standards to prevent hazardous electrical exposures to personnel, and to ensure compliance with regulatory requirements.

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;
- Be well trained in safe electrical work practices and understand the specific hazards associated with electrical energy; and
- Utilize all required safety and personal protective equipment.

OBJECTIVE

This program establishes minimum standards to prevent hazardous electrical exposures to personnel and ensure compliance with regulatory requirements applicable to electrical systems. Working on equipment in a de-energized state is **required** unless de-energizing introduces an increased hazard or is infeasible. This program is designed to help ensure that energized electrical is performed safely by qualified electrical workers, who are trained and provided with the appropriate safe work procedures, protective equipment and other controls. The program is intended to protect employees against electrical shock, burns and other potential electrical safety hazards as well as comply with regulatory requirements.

Federal Occupational Safety and Health Administration Standards (OSHA) bases its electrical safety standards (found in 29 CFR Part 1910 Subpart S and 29 CFR Part 1926 Subpart K) on the comprehensive information found in NFPA 70E. It focuses on protecting people and identifies requirements that are considered necessary to provide a workplace free of electrical hazards. In order to comply with the federal Occupational Safety and Health Administration Standards (OSHA), as well as NFPA 70E, this written program has been established for Oak Grove School District (hereafter referred to as "the District").

All District projects and facilities are included and comply with this program. Copies of this written program, including a copy of the applicable OSHA Standards, are available for review by any employee.

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 70 E standards and focus on the following priorities:

1. Provide a safety program with defined responsibilities;
2. Determine the degree of arc flash hazard by qualified personnel;
3. Use appropriate hazard warnings;
4. Provide adequate personal protective equipment (PPE) for workers;
5. Provide documented training to workers on Lockout/Tagout procedures and the hazards of arc flash;
and
6. Provide appropriate tools for safe work.

The overall effectiveness of this program shall be assessed by the Oak Grove School District Safety Committee at least annually.

SCOPE

This program applies to all Oak Grove School District employees and contractors.

RESPONSIBILITIES

Managers of Maintenance and Operations, Fred Dickey and Anthony Valdez

- Evaluate work being performed and determine compliance with this program;
- Provide or assist in the task of specific training for electrical work qualifications;
- Maintenance of training records;
- Periodically review and update this written program;
- Provide or coordinate general training for work units on the content of this program;
- Evaluate the overall effectiveness of the electrical safety program at least annually, and whenever an electrical accident occurs.
- Lead by example and promote electrical safety awareness to all employees;
- Enforce compliance with the provisions of the electrical safety program;
- Ensure employees receive training appropriate to their assigned electrical tasks and maintain documentation of such training;
- Develop and maintain a listing of all qualified employees under their supervision; and
- Ensure employees are provided with, and use appropriate protective equipment.

Employees (Qualified Electrical Workers)

Follow the work practices described in this document, including the use of appropriate protective equipment and tools;

- Attend all training required by this program;
- Immediately report any concerns related to electrical safety to supervision; and

- Do not perform any electrical work without proper training and equipment.

Employees are also encouraged to work with safety always in mind, and to exercise the right to stop any work that poses a danger to life and property.

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 electrical worker.

Qualified Electrical Worker (QEW)

Employees must receive training in avoiding the electrical hazards associated with working on or near exposed energized parts prior to performing energized electrical work. Such training will be provided when the employee is initially assigned to the job. This training will be either provided or coordinated by the Manager of Maintenance and Operations. Refresher training will be provided every year, when hazards change, or when new technologies or new types of equipment are introduced to the worker.

The following requirements are to be included in the training of Qualified Electrical Workers (i.e., individuals who have skills and knowledge related to the construction and operation of electrical equipment and installations):

- The Lockout/Tagout Training Program, including safe work practices required to safely de-energize electrical equipment;
- Universal electrical safety procedures;
- Skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment;
- Selection and use of proper work practices,
- Personal protective equipment, tools, insulating and shielding materials, and equipment for working on or near energized parts; and
- General First Aid training; including contacting emergency personnel.

The designation of Qualified Electrical Worker shall be determined by the immediate supervisor upon the employee's successful completion of these 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, and tested for the levels of voltage to which an employee may be exposed.
- The district provides personal protective equipment required by this program.
- 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 rubber insulating gloves where there is a danger of hand or arm contact with live parts or possible exposure to arc flash burn.
- Where insulated footwear is used as protection against step and touch potential, dielectric overshoes shall be required. Insulated soles shall not be used as primary electrical protection.
- 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 American Society of Testing and Materials (ASTM) and by the American National Standards Institute (ANSI).
- 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. • 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. 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.
- Protective shields, barriers or insulating materials must be used to protect each employee from shock, burns, or other electrical injuries that might result from that person's accidentally contacting energized equipment, or where dangerous electric heating or arcing might occur.

Flame-Resistant (FR) Apparel

- FR apparel shall be visually inspected before each use. FR apparel that is contaminated or damaged shall not be used. Protective items that become contaminated with grease, oil flammable liquids, or combustible liquids shall not be used.
- The garment manufacturer's instructions for care and maintenance of FR apparel shall be followed.
- When the apparel is worn to protect an employee, it shall cover all ignitable clothing and allow for movement and visibility.
- FR apparel must cover potentially exposed areas as completely as possible. FR shirt sleeves must be fastened and FR shirts/jackets must be closed at the neck.
- Non-melting, flammable garments (i.e., cotton, wool, rayon, silk, or blends of these materials) may be used as under layers beneath FR apparel.
- Fibers that can melt, such as acetate, nylon, polyester, polypropylene, and spandex shall not be permitted in fabric under layers next to skin. (An incidental amount of elastic used on non-melting fabric underwear or socks shall be permitted.)

- Garments worn as outer layers over FR apparel (i.e., jackets or rainwear) must also be made from FR material.
- Flash suits must permit easy and rapid removal by the user.

Rubber Insulating Equipment

- Rubber insulating equipment includes protective devices such as gloves, sleeves, blankets, and matting.
- Insulating equipment must be inspected for damage before each day's use and immediately following any incident that could have caused damage.
- Insulating equipment found to have defects that might affect its insulating properties, must be removed from service until testing indicates that it is acceptable for continued use. This testing must be performed by at least two qualified workers.
- Where the insulating capability of protective equipment is subject to damage during use, the insulating material shall be protected by an outer covering of leather or other appropriate materials.
- Rubber insulating equipment must be tested according to the schedule supplied by the manufacturer.
- Rubber insulating equipment must be stored in an area protected from light, temperature extremes, excessive humidity, ozone, and other substances and conditions that may cause damage.
- Repairs to rubber insulating equipment are not allowed; damaged equipment shall be disposed of, and new equipment acquired.

Insulated Tools and Materials

- Only insulated tools and equipment shall be used within the Limited Approach Boundary (see p. 13) of exposed energized parts.
- Insulated tools shall be rated for the voltages on which they are used.
- Insulated tools shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.
- Fuse or fuse holder handling equipment, insulated for the circuit voltage, shall be used to remove or install a fuse if the fuse terminals are energized.
- Ropes and hand-lines used near exposed energized parts shall be nonconductive.
- Portable ladders used for electrical work shall have nonconductive side rails.

Entry Restrictions

- Barricades shall be used in conjunction with safety signs to prevent or limit access to work areas containing live parts. Conductive barricades shall not be used where they might cause an electrical hazard. Barricades shall be placed no closer than the Limited Approach Boundary.
- If signs and barricades do not provide sufficient protection, an attendant will be assigned to warn and protect pedestrians. The primary duty of the attendant shall be to keep an unqualified person out of the work area where an electrical hazard exists. The attendant shall remain in the area as long as there is a potential exposure to electrical hazards.

PORTABLE ELECTRICAL EQUIPMENT AND EXTENSION CORDS

The following requirements apply to the use of cord-and-plug-connected equipment and flexible cord sets (extension cords):

- Extension cords may only be used to provide temporary power. Extension cords are considered to be temporary wiring, and must also comply with the section on “Temporary Wiring” in this program;
- Portable cord-and-plug-connected equipment and extension cords must be visually inspected before use on any shift for external defects such as loose parts, deformed and missing pins, or damage to outer jacket or insulation, and for possible internal damage such as pinched or crushed outer jacket. Any defective cord or cord-and plug-connected equipment must be removed from service;
- Extension cords must be of the three-wire type. Extension cords and flexible cords must be designed for hard or extra hard usage (for example, types S, ST, and SO). The rating or approval must be visible;
- Job-made extension cords are forbidden per the electrical code;
- Personnel performing work on renovation or construction sites using extension cords, or where work is performed in damp or wet locations, must be provided, and must use, a ground-fault circuit interrupter (GFCI);
- Portable equipment must be handled in a manner that will not cause damage. Flexible electric cords connected to equipment may not be used for raising or lowering the equipment;
- Extension cords must be protected from damage. Sharp corners and projections must be avoided. Flexible cords may not be run through windows or doors unless protected from damage, and then only on a temporary basis. Flexible cords may not be run above ceilings, or inside or through walls, ceilings or floors, and may not be fastened with staples or otherwise hung in such a fashion as to damage the outer jacket or insulation;
- Cords must be covered by a cord protector or tape when they extend into a walkway or other path of travel to avoid creating a trip hazard;
- Extension cords used with grounding-type equipment must contain an equipment grounding conductor (i.e., the cord must accept a three-prong, or grounded plug);
- Attachment plugs and receptacles may not be connected or altered in any way that would interrupt the continuity of the equipment-grounding conductor. Additionally, these devices may not be altered to allow the grounding pole to be inserted into current connector slots. Clipping the grounding prong from an electrical plug is prohibited;
- Flexible cords may only be plugged into grounded receptacles. The continuity of the ground in a two-prong outlet must be verified before use. If an ungrounded receptacle is identified, it shall be reported to the Electrical Shop for corrective action;
- All portable electric equipment and flexible cords used in highly conductive work locations, such as those with water or other conductive liquids, or in places where employees are likely to contact water or conductive liquids, must be approved for those locations;
- Employee's hands must be dry when plugging and unplugging flexible cords and cord-and-plug connected equipment if energized equipment is involved;

- If the connection could provide a conducting path to employees hands (for example, if a cord connector is wet from being immersed in water), the energized plug and receptacle connections must be handled only with insulating protective equipment;
- Locking type connectors must be properly locked into the connector;
- Lamps for general illumination must be protected from breakage, and metal shell sockets must be grounded;
- Temporary lights must not be suspended by their cords unless they have been designed for this purpose; and
- Portable lighting used in wet or conductive locations, such as tanks or boilers, must be operated at no more than 12 volts or must be protected by GFCIs.

TEMPORARY WIRING

Temporary electrical power and lighting installations of 600 volts or less, including flexible cords, cables, and extension cords, may only be used during and for renovation, maintenance, repair, or experimental work. The duration for temporary wiring used for decorative lighting for special events and similar purposes may not exceed 90 days, and no extension cords shall be used for this purpose. The following additional requirements apply:

- Ground-fault protection (or GFCI) must be provided on all temporary-wiring circuits, including extension cords, used on construction sites;
- In general, all equipment and tools connected by cord-and-plug must be grounded. Double-insulated tools and appliances with two-prong plugs are acceptable;
- Feeders must originate in an approved distribution center, such as a panel board, that is rated for the voltages and currents the system is expected to carry;
- Branch circuits must originate in an approved power outlet or panel board;
- Neither bare conductors nor single wire earth returns may be used for the wiring of any temporary circuit;
- Receptacles must be of the grounding type. Unless installed in a complete metallic raceway, each branch circuit must contain a separate equipment-grounding conductor, and all receptacles must be electrically connected to the grounding conductor;
- Flexible cords and cables must be of an approved type and suitable for the location and intended use. They may only be used for pendants, wiring of fixtures, connection of portable lamps or appliances, elevators, hoists, connection of stationary equipment where frequently interchanged, prevention of transmission of noise or vibration, data processing cables, or where needed to permit maintenance or repair. They may not be used as a substitute for fixed wiring, run through holes in walls, ceilings or floors, run through doorways, windows or similar openings, attached to building surfaces, or concealed behind building walls, ceilings or floors;
- Suitable disconnecting switches or plug connects must be installed;
- Lamps for general illumination must be protected from accidental contact or damage, either by elevating the fixture or by providing a suitable guard. Hand lamps supplied by flexible cord must be equipped with a handle of molded composition or other approved material, and must be equipped with a substantial bulb guard; and

- Flexible cords and cables must be protected from accidental damage. Sharp corners and projections are to be avoided. Flexible cords and cables must be protected from damage when they pass through doorways or other pinch points.

WET AREAS

Work in wet or damp work locations (i.e., areas surrounded or near water or other liquids) should not be performed unless it is absolutely critical. Electrical work should be postponed until the liquid can be cleaned up. The following special precautions must be incorporated while performing work in damp locations:

- Only use electrical cords that have GFCIs;
- Place a dry barrier over any wet or damp work surface;
- Do not work in areas where there is standing water;
- Remove standing water before beginning work;
- Do not use electrical extension cords in wet or damp locations; and
- Keep electrical cords away from standing water.

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 worker 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.

- Voltage rated gloves and leather protectors must be worn.
- Electrically insulated shoes should be worn.
- Approved insulating mats must be used.
- 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 draw-out type circuit breakers are fully withdrawn;
4. Apply lockout/tagout devices in accordance with a formal, written 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; and
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 electrical workers will be trained on, and follow the requirements of the district's Lockout/ Tagout program. This is a prerequisite for any electrical work. (For work performed as part of a Facilities Planning/Facilities Improvement project, the contractor will provide verification of a Lockout/Tagout program to the Manager.)

VEHICULAR AND MECHANICAL EQUIPMENT

No district personnel shall use vehicular or mechanical equipment (e.g., portable lifts) 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; and
- 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). **It is imperative that workers ensure that only one hand is in contact with the equipment.**

Energized Electrical Work Permit

- If live parts are not placed in an electrically safe condition, work to be performed shall be considered energized electrical work and shall be performed by written permit only by the Manager or Chief Facilities Chief, Operations-Maintenance.
- 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 electrical worker.
- Energized Work Permits shall be submitted to the appropriate supervisor.
- 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:

1. Have an energized work permit that is approved by the supervisor or manager responsible for the safety plan;
2. Use PPE suitable for working near exposed live parts and rated for the voltage and energy level involved;
3. Be certain that no part of the body enters the prohibited space; and
4. 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:

1. Have specified training to work on exposed live parts;
2. Have a plan with proper written work procedures and that justifies the need to work that close;
3. Provide a risk analysis that includes the competency of the workers;
4. Have (2) and (3) approved by authorized management, and documented through the issuance of an Energized Electrical Work permit; and
5. 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:

1. Use PPE appropriate for working near exposed live parts and rated for the voltage and energy level involved;
2. 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; and
3. When working on de-energized parts and inside the flash protection boundary for nearby live exposed parts:
 - a. If the parts cannot be de-energized, use barriers such as insulated blankets to protect against accidental contact or 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.
- When an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed live parts, the employee shall use protective shields, barriers, or insulating materials as necessary to avoid contact with these parts. Doors, hinged panels, and the like shall be secured to prevent them from swinging into employees. (Refer to the Confined Space Program.)

ENERGIZED ELECTRICAL EQUIPMENT SAFETY PROGRAM

Equipment Labeling

Switchboards, panel boards, industrial control panels, and motor control centers must be labeled to warn workers 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 workers 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.
- The DANGER label in Figure 1 (or its equivalent) shall be used when information is not presently available. This is the minimum NEC 110.16 requirement.

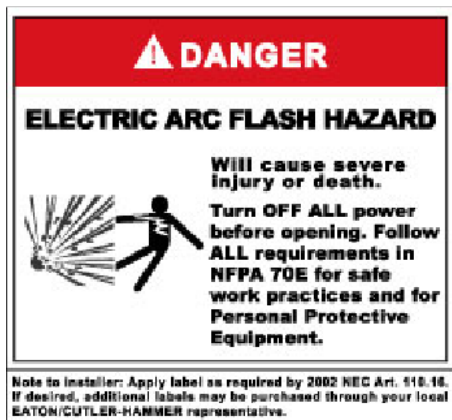


Figure 1 - Minimum Required Labeling

The **DANGER** label should remind a qualified worker who intends to open the equipment for analysis or work that:

- Electric arc flash hazard exists;
- Power shall be turned off before opening; and
- All requirements of NFPA 70E for safe work practices must be followed, and to wear appropriate personal protective equipment (PPE) for the specific hazard.

The second **DANGER** label in Figure 2 (or its equivalent) shall be used when a qualified electrical worker or electrical engineer determines the values of the shock and flash protection information.

⚠ DANGER	
Arc Flash & Shock Hazard Appropriate PPE Required	
FLASH PROTECTION	SHOCK PROTECTION
Flash Hazard Category: <u>-1</u>	VAC Shock Hazard When: _____
Min. Arc Rating (cal/cm ²): _____	Limited Approach Boundary: _____
Flash Protection Boundary: _____	Restricted Approach Boundary: _____
PPE: <input type="checkbox"/> Tablet and long pants (natural fibers)	Prohibited Approach Boundary: _____
<input type="checkbox"/> Safety glasses	PPE: <input type="checkbox"/> Class _____
	<input type="checkbox"/> Voltage _____
	<input type="checkbox"/> _____
	<input type="checkbox"/> _____
Equipment ID: _____	

Figure 2 - The Preferred Label

When arc flash and shock data are available for industrial control panels, labels shall include information on flash hazard boundary, the hazard category, required PPE, minimum arc rating, limited approach distances, restricted approach distances and prohibited approach distances.

An unqualified person must not be near open energized equipment.

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 manager upon request.

The plan was approved at the January 16, 2015 Safety Committee Meeting. The plan was reviewed and updated on 8/2016 and 8/2017.

APPENDIX A

Arc Flash Hazards

Implementation Procedures

Immediately place minimum required danger labels on equipment required to be labeled by NEC 110.16 (see Figure 1).

Until an arc flash hazard analysis can be made, a qualified Electrical Worker using NFPA Table 130.7(C)(9)—*Hazard/Risk Category Classifications and Use of Rubber Insulated Gloves and Insulated and Insulating Hand Tools*—shall for each situation:

1. Determine the hazard/risk category;
2. Determine the requirements for the use of V-rated gloves, where V-rated are defined as gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done;
3. Determine the requirements for the use of V-rated tools, where V-rated are defined as tools rated and tested for the maximum line-to-line voltage upon which work will be done.

Arc Flash Hazard Analysis

The district will ensure that a flash hazard analysis is completed as required by NFPA.

1. The arc flash hazard analysis shall only be completed by a licensed electrical engineer.
2. The arc flash hazard analysis shall be completed on all major electrical system upgrades or renovations.
3. The arc flash hazard analysis shall be done for all new electrical system installations.
4. The district will prioritize arc flash hazard analysis for cases where:
 - Some equipment may be old, or possibly in poor condition, creating a greater potential for flashover.
 - Equipment requires greater than average maintenance.
 - Frequent use of high hazard/risk category personal protective equipment during the conduct of maintenance; qualified electrical workers are frequently wearing high hazard/risk PPE.

An Arc Flash Hazard analysis will be performed for any equipment where employees might approach an exposed electrical conductor or a circuit part that has not been put in an electrically safe condition.

An arc flash hazard analysis includes the following actions:

1. Collect data on the facility's power distribution system:
 - a. Arrangement of components on a one-line drawing with nameplate specifications of every device, and
 - b. Lengths and cross-section area of all cables;
2. Contact the electric utility for information including the minimum and maximum fault currents that can be expected at the entrance to the facility;
3. Conduct a short circuit analysis followed by a coordination study;
4. Feed the resultant data into the NFPA 70E-2000 or IEEE Standard 1584-2002 equations:

- a. These equations produce the necessary flash protection boundary distances and incident energy to determine the minimum PPE requirement.
 - b. Install preferred danger label(s) on equipment (see Figure 2);
5. For systems of 600 volts and less, the flash protection boundary is 4 feet, based on an available bolted fault current of 50 kA (kiloamps) and a clearing time of 6 cycles (0.1 seconds) for the circuit breaker to act, or any combination of fault currents and clearing times not exceeding 300 kA cycles (5000 ampere seconds); and
6. For other fault currents and clearing times, see NFPA 70E.