NFPA 70E
FOR
Dee Cramer Inc

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.

In order to comply with the federal Occupational Safety and Health Administration Standards (OSHA), this written program has been established for Dee Cramer Inc., (hereafter referred to as "the Company"). State plan OSHA requirements may differ.

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

Pre-Task Electrical Safety Planning:

A written hazard/risk evaluation is to be included in pre-task planning, addressing incident event severity, frequency, probability and avoidance. The pre-task plan, to be developed prior to work on either de-energized or on or near energized equipment, will further address determine levels of acceptable, safe work practices.

Dee Cramer's supervisor for the job must use the pre-task planning process to inform the customer or their representative of any unique or un-anticipated electrical hazards prior to starting work. Information from the owner regarding additional hazards and appropriate control methods must be incorporated into the job task safety plan. All Cramer employees working on the electrical task must be trained to understand the specific hazards associated with electrical energy, per this written program, and such training must be documented and maintained for the duration of the employee's employment.

ASSIGNMENT OF RESPONSIBILITY

Company Management is responsible for:

- overall support and involvement in the program,
- making safety and health a priority in company operations,
- providing adequate funding for programs, and
- leading by example regarding safety and health issues.

Safety Managers/Coordinators

- Evaluate work being performed and determine compliance with this program.
- Provide or assist in the task of specific training for electrical work qualifications.
- Maintain training recordkeeping.
- Periodically review and update this written program.
- Evaluate the overall effectiveness of the electrical safety program on a periodic basis.
- Ensure that all electrical and arc flash PPE is properly inspected and maintained.

Foremen/Supervisors

- Promote electrical safety awareness to all employees.
- Ensure employees comply with ALL 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.
- Ensure employees are provided with and use appropriate protective equipment.
- Notify the Safety Manager of potential hazards requiring assessments, or improvements to the program.

Employees

- Follow the work practices described in this document, including the use of appropriate protective equipment and tools.
- Attend all training required relative to this program.
- Immediately report any concerns related to electrical safety to supervision.
- Properly maintain and inspect all personal protective equipment prior to each use.
- Properly maintain and inspect all electrical safety equipment (insulated hand tools, arc-rated faceshields, etc.).
- Wear all required personal protective equipment – there are no exceptions.
- Inspect the equipment in accordance with manufacturer's guidelines and instructions.
- Report hazardous conditions or other health and safety concerns immediately to their supervisors/foremen/project managers.

PROCEDURES & ELECTRICAL SAFE WORK PRACTICES

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.
- Safety glasses must be worn.
- The required Arc Flash PPE must also be worn when verifying the de-energized state. All arc flash and electrical PPE can be removed once the enclosure has been verified as "dead."

The National Fire Protection Association (NFPA) lists six steps to ensure conditions for electrically safe work.

1. Identify all sources of power to the equipment.

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 drawout-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.

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 Live Equipment."

Lockout/Tagout Program

- Each employee shall be trained in Lockout/Tagout procedures by the Health & Safety Manager.

- **Lockout/tagout application:** Each person who could be exposed to electric energy must be involved in the lockout/tagout process.

- Follow the posted lockout/tagout procedures: 1) Prepare & Notify 2) Shut-Down equipment 3) Isolate Hazardous Energy 4) Apply LOTO Devices 5) Control Stored Energy 6) Verify & Test 7) Begin LOTO work.

- A lock/lockout device with a tag that will be attached to a disconnecting device to prevent the re-energizing of the equipment being worked on without removal of the lock. The lockout device will have a "Danger Do Not Operate" tag with the employee name on the tag. That employee must be the only person who has the key for the lockout device they install, and that employee will be the only person to remove the lock after all work has been completed.

- A tagout device is a tag and a way to attach it that can withstand at least 50 pounds of force. Tagout devices should be used alone only when it is not possible to install a lockout device.

- The tag used in conjunction with a lockout or tagout device must have a label prohibiting unauthorized operation of the disconnecting means or unauthorized removal of the device. It will also be used as a means of identifying the lock holder.

- Electric lockout/tagout procedures should be posted at the machines location.

- **Individual qualified-employee control procedure:** For minor servicing, maintenance, inspection, and so on, on plug-connected equipment, work may be done without attaching lockout/tagout devices if the plug is next to where the employee is working, is always easy to see, and the equipment is never left alone while being serviced.

- **Return to service:** Once work is completed and lockout/tagout devices removed, tests and visual inspection must confirm that all tools, mechanical restraints, electric jumpers, shorts, and grounds have been removed. Only then is it safe to re-energize and return to service. Employees responsible for operating the equipment and needed to safely re-energize it should be out of the danger zone before equipment is re-energized.

- **Temporary release:** If the job requiring lockout/tagout is interrupted for testing or positioning equipment, follow the same steps as in return to service (above).

Working On or Near Energized Equipment – ARC Flash Protection

NOTE: OSHA and NFPA 70E standards require that electrical equipment and systems operating at 50 volts or greater be de-energized before any employee works on or near them. De-energizing must be used as the primary method of worker protection from electrical hazards.

Achieving an Electrically Safe Work Condition:

- all electrical circuit conductors and parts are to be considered Energized or "Live" until: All sources of energy are removed – The disconnecting means is under lockout/tagout – The absence of voltage is verified by an approved voltage testing device, and – Where exposure to energized facilities exists, they are temporarily grounded.

When it can be justified that energized work must be performed, including if de-energizing introduces increased or additional hazard(s) or is infeasible due to equipment design or operation limitation, only qualified individuals are to perform energized work in accordance with this policy.

Note: Unqualified persons are NOT permitted to enter work spaces that are required to be accessible only to Qualified employees. Only qualified employees are to complete tasks such as testing, troubleshooting and voltage measuring within the limited approach boundary.

Examples of Increased or Additional Hazards:

Interruption of life support equipment – Deactivation of emergency alarm systems – Shutdown of hazardous location ventilation equipment

Examples of Infeasibility due to Equipment Design or Operational Limitations:

Diagnostics and testing/troubleshooting – Circuits that form an integral part of a continuous process that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment.

Energized Electrical Work Permit (EEW):

If live parts are not placed in an electrically safe work condition, work shall be performed by written permit only.

Exception: Diagnostics, testing, troubleshooting, voltage measuring shall be permitted to be performed without an EEW permit, provided appropriate safe work practices and personal protective equipment is provided and used.

Job Briefing Checklist:

Before starting any job, the employee in charge shall conduct a job briefing with the employees involved. The briefing shall cover such subjects as hazards associated with the job, work procedures involved, special precautions, energy source controls, and personal protective equipment requirements (example included with this written program) Copies of completed checklists are to be maintained as work record and as a pre-task plan for similar checklist projects in the future.

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

Precautions

When working on de-energized the parts, but still inside the flash protection boundary for nearby live exposed parts:

- If the parts cannot be de-energized, barriers such as insulated blankets must be used to protect against accidental contact or PPE must be worn.
- 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 (such as 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 space or enclosed spaces (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 entry program.

Personal Protective Equipment

Overview:

SSMWI sheet metal workers are not to work on or around any energized system over 480 volts without additional instruction, not covered within this written program and document.

All work on energized systems and equipment greater than 50 volts and at or less than 480 volts will require PPE per NFPA 70E Hazard Category 2 (HC2.

This PPE will be required before opening the access door or removing the panel to any energized unit/equipment, as well as while performing measurements, trouble shooting or other required services.

General Requirements

- Employees working in areas where there are potential electrical hazards must be provided with and 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 of which an employee may be exposed.

- 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. Leather 'protector' gloves shall be worn over the rubber insulating gloves.

- Face shields without arc rating shall not be used 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.

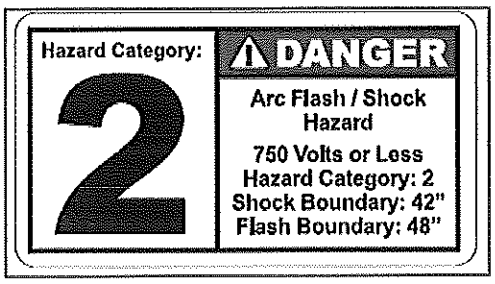
- Electrical Protective Equipment must be selected to meet the criteria established by the American Society of Testing and Materials (ASTM) and by the America National Standards Institute (ANSI).

- 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 circuit. Tools and handling equipment should be replaced if the insulating capability is decreased due to damage. Protective gloves must be used when employees are working with exposed electrical parts above fifty (50) volts.
- Fuse handling equipment (insulated for circuit voltage) must be used to remove or install fuses when the fuse terminals are energized. 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 while that person is working near exposed energized parts that might be accidentally contacted or where dangerous electric heating or arcing might occur.

A. Each of our company's facilities, regardless of their size of function, shall have an electrical arc flash assessment conducted by a qualified NFPA 70E consultant. The arc flash assessment shall be updated whenever significant changes are made to the processes or facility. The hazard assessment will include proper identification and labeling of the hazard categories of all of our electrical enclosures.

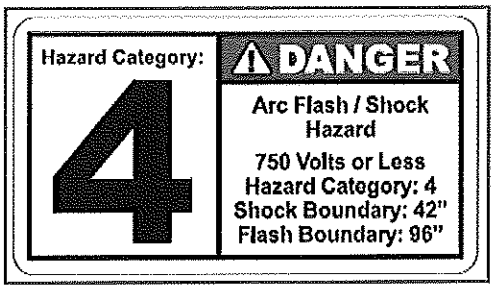
B. Switchboards, disconnects, bussplugs, panel boards, industrial control panels, motor control centers, and all other applicable electrical enclosures in our facilities shall be labeled to indicate the presence of an arc flash and shock hazard. The required labels shall also indicate the hazard category level (which dictates the personal protective equipment) necessary to prevent injuries resulting from these hazards.

The majority (95% +/-) of the electrical enclosures at in our facilities, as well as at our client's locations will be classified as Hazard Category 2 (HC2) under NFPA 70E. These HC2 enclosures are required to be labeled with the following labels:



Common Examples:
- HVAC Control Panels
- Rooftop AC Units
- Breaker Panels
- 480V Disconnects
- 220, 277, 480V Motors

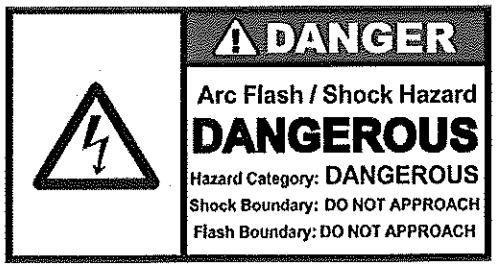
A relatively smaller number (4% +/-) of electrical enclosures that we enter will be classified as Hazard Category 4 (HC4) under NFPA 70E. These HC4 enclosures are required to be labeled with the following labels:



Common Examples:

- Switchgear
- "Draw Out" Racking type Switchgear
- Motor Control Centers (MCCs)
- Step Down Transformers of 112.5 kVA or greater
- Buss Switches of 100A or greater

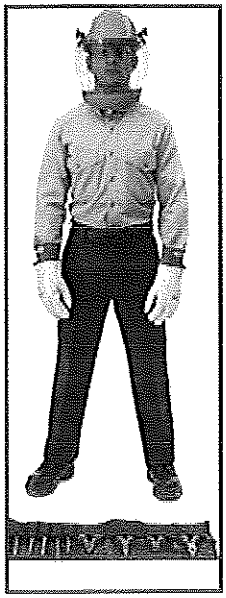
Less than 1% of the electrical enclosures that we have at our locations, and that we will observe in the field, will be classified as Hazard Category DANGEROUS under NFPA 70E. These HC: DANGEROUS enclosures are required to be labeled with the following labels:

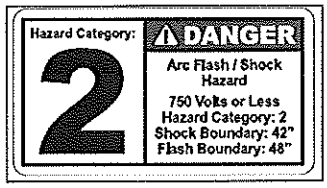


PLEASE NOTE THAT ANY ENCLOSURE MARKED AS HAZARD CATEGORY "DANGEROUS" CANNOT BE ENTERED BY OUR EMPLOYEES. HAZARD CATEGORY DANGEROUS ENCLOSURES CANNOT BE WORKED IN LIVE AND MUST BE CERTIFIED DE-ENERGIZED BY A MEDIUM/HIGH VOLTAGE PROFESSIONAL (I.E. PUBLIC UTIILITY).

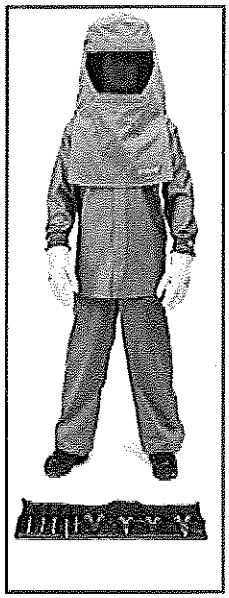
General Requirements for Proper PPE Usage and Maintenance

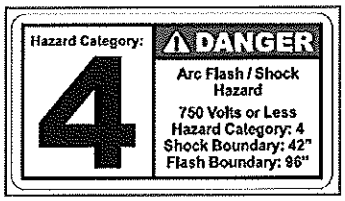
The following Personal Protective Equipment requirements are applicable to the hazard category listed:





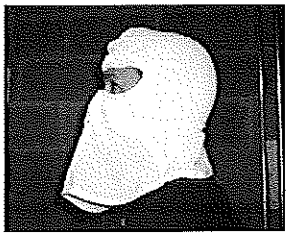
Voltage	**480V or Less**
Clothing	**Flame Resistant (FR) Long Sleeve Shirt and Pants of at least 8 cal/cm^2 ATPV**
Gloves	**Class 00 Rubber Electrical Gloves with Leather Protector Gloves**
Other PPE	**Safety Glasses, Class E-Rated Hardhat with a Face Shield and Chin Cup of at Least 8 cal/cm^2 ATPV, FR Balaclava, Ear Plugs, Leather Shoes**
Tools	**Insulated Tools Only**





Voltage	**480V or Less**
Clothing	**40 cal/ cm^2 ATPV Flame Resistant (FR) Arc Suit, worn over the Flame Resistant (FR) Long Sleeve Shirt and Pants of at least 8 cal/cm^2 ATPV**
Gloves	**Class 00 Rubber Electrical Gloves with Leather Protector Gloves**
Other PPE	**40 cm^2 ATPV Arc Hood, Ear Plugs, Leather Shoes**
Tools	**Insulated Tools Only**

BALACLAVA
A balaclava provided additional head and neck protection which the faceshield and hardhat cannot provide alone. The balaclava must be made of FR fabric and is only worn for Hazard Category 2 tasks. See picture below:



UNDERGARMENTS
All employees will be properly trained on the importance of wearing ONLY 100% cotton undergarments. Synthetic materials, such as poly/cotton blends, Under Armor, etc., pose a serious burn hazard in the event of an arc flash event.

WET WEATHER GEAR
Any clothing or protective wear worn over the FR garments, such as wet weather gear, shall also be made of flame-resistant fabric. Synthetic rain gear, such as traditional nylon rain jackets, ponchos or slickers, pose a serious burn hazard in the event of an arc flash event.

COLD/WINTER WEATHER GEAR
Any clothing or protective wear worn over the FR garments, such as cold weather or winter weather gear (Carhartt jackets, vests, parkas, etc.), shall also be made of flame-resistant fabric.

FR REMINDER
Any garment that an employee wears while performing live electrical tasks are required to be made of FR fabric. The only exception to this is the undergarments which are required to be 100% cotton.

Requirements for Proper PPE Usage and Maintenance

A. Protective equipment must be stored and used in accordance with manufacturer's recommendations. Regular tests and inspections will be required to ensure that any equipment is still fit for purpose and use. Equipment can include but is not limited to voltage-rated gloves, arc-rated hard hats and face shields, safety glasses, hearing protection, safety footwear and flame resistant (FR) clothing.

B. All Flame Resistant Clothing (FRC) shall be laundered and maintained according to the manufacturer's specifications. Employees are not permitted to make alterations to any FR apparel. It is recommended that a uniform company be contacted to discuss the proper care and maintenance/laundering/repair of the FR garments.

C. In addition to the flame resistant clothing, applicable employees will also be provided with insulated hand tools, arc-rated hardhat and faceshield, and electrically-insulated rubber gloves.

D. It is recommended that Class 00 gloves be provided to each qualified person. Class 00 gloves, along with the leather protector gloves, when worn in tandem, provide the necessary protection from electrocution and arc flash energy. Bear in mind that Class 00 gloves only provide voltage protection up to 500V. If exposures of greater than 500V is anticipated, gloves with higher voltage protection shall be required.

E. Electrically-insulated rubber gloves are required to be inspected each day (prior to use) by the qualified employee, and, every six (6) months by a certified third party.

F. Any additional PPE (fall protection, etc.) shall be determined by a hazard assessment of the task.

G. Prior to establishing an electrically safe work condition, all qualified persons within the flash protection boundary of a presumed live component must be suitably protected with personal protective equipment for that specific hazard category. Once an electrically safe work condition has been established and verified, electrical personal protective equipment can be removed.

H. Conductive articles of clothing or jewelry (such as watchbands, bracelets, rings, key chains, pens, necklaces, metalized aprons cloth with conductive thread, metal headgear, metal frame glasses, etc.) shall not be worn where they present an electrical contact hazard with live parts, unless they are rendered non-conductive by covering or wrapping with insulated material.

I. All unqualified personnel shall be kept a safe distance from exposed energized components. Safe distance shall be the longer of the two boundaries (Shock and Flash Protection).

Insulated Tools and Materials

- Only insulated tools and equipment shall be used when exposed to 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 removed 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.

Access-Limiting Equipment

- 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. These barricades are designed to prevent un-qualified and/or unprotected workers from entering the electrical hazard area.

- 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.

Mechanical and Electrical Service Technicians, - General Work Plan

Carefully plan each job well before you have to start the work. Mark sure that you have all the proper tools, equipment and permits (if required) Think through the electrical safety program procedures so that you can easily incorporate them into the troubleshooting, maintenance and/or repair processes.

Anticipate unexpected events by thinking through all conceivable possibilities. Remain cognizant of possible unexpected events by giving your undivided attention/concentration to the task.

Never approach a unit with exposed, energized electrical conductors and/or circuit parts closer than 4 feet without following the safe work practices and personal protective equipment requirements described in this section. The 4 foot approach and protection boundary is the greater of the two boundaries established for Qualified Persons for shock and arc flash protection. The 4 foot boundary applies to any conductive objects that you might be carrying as well.

Before opening the access door or removing the panel to any energized unit/equipment, inspect/evaluate it to ensure that you know its voltage capacity. All new HVAC units/equipment are required to be labeled showing the available incident energy or the required level of ppe. If there is no label on equipment/unit, evaluate hazard risk based on the unit voltage and ampacity. Also, ensure that all visible parts appear to be in good condition. (If the unit is pushing more than 480 volts this program does not apply. Before you proceed, obtain and follow an electrical safety program established for units/equipment pushing the higher voltage of the unit you will be servicing.

If possible de-energize equipment before removing panel and re-energize to troubleshoot.

If de-energizing is not practical, evaluate the hazard risk:
High Hazard Situations;
Look for obvious signs of damage to the unit/equipment disconnects (where applicable) and conduit/wiring between services disconnects and the unit/equipment (where applicable).
Look the unit/equipment over carefully for common causes of arc flash such as:
Dust and other impurities that could provide a path for electrical current
Corrosion, which can create impurities on insulation surfaces
High humidity, rain or condensation that could result in water vapor on insulation material which can cause flashover to ground.
The potential for spark discharge caused by accidental tool or spare parts contacting exposed, energized electrical conductors and/or circuit parts
Diagnostic testing when line voltage connections are located in same electrical panels
Unshielded terminal blocks
Capacitors including VFD (drives can be hot several minutes after shut down)
Electrical breaker panels
Checking inside disconnects over 208 volts

Work on incoming power side of equipment
If unsure of risk potential do not proceed – CALL for assistance

If the hazard risk is high, before opening the access door or removing the panel to any energized unit, put on the following personal protective equipment:

a. 8 calorie flame resistant (FR) overalls
b. Ear plugs
c. Safety Glasses
d. Balaclava with Class E hardhat with attached 8 calorie arc rated face shield
e. Class 00 rubber gloves
f. Leather protective gloves (over rubber gloves)

Be sure to use only properly selected/rated voltage testers (multimeters) and ammeters to test electrical circuits. Visually inspect all testing equipment including the leads, cables, power cords, probes and connectors before each use.

If you see any signs of damage do not use the testing equipment. Attach a "Danger-Do Not Use" sign to the equipment and take it out of service immediately. Give it to the warehouse manager as soon as possible.

Use all testing equipment in conformance with the manufacturers' recommendations.

Only use the testing equipment that is provided by the company. Never use light up type testing equipment. Always verify test instruments before and afer an absence of voltage testing.

Before testing voltage on electrical conductors and/or circuit parts test the meter on a known, live source. Then test the electrical conductors and /or circuit parts. Finish by testing the meter again on a known live source. If you detect any inconsistencies or discrepancies with the meter, take it out of service immediately as described above and repeat this process with a properly selected/rated replacement meter.

Use only properly rated insulated tools to conduct troubleshooting as necessary to determine what's wrong with the unit.

As soon as you have identified the problem, stand to one side of the external service disconnect. Shut off the power. Lockout the disconnect supplying the unit when lockout procedures are required. If lockout is necessary, follow the company's lockout procedures as described in this program. (This step does not apply to units/equipment with built in interlocking disconnects).

Test the unit to ensure that the power has been shut off.

Discharge any stored energy such as the current in the capacitors.

Once the unit is "tested dead" and any stored electrical current has been discharged, you may remove your PPE including gloves, hardhat, arc-rated face shield, balaclava, and ear plugs. Also, if necessary due to extreme heat or other conditions, you may remove the flame resistant (FR) clothing. (The above step does not apply to units/equipment with built in interlocking disconnects. If you're working on a unit in high hazard conditions with a built in interlocking disconnect, keep all of your PPE on at all times throughout the troubleshooting and repair/maintenance process)

Complete repairs/maintenance on the unit.

Remove all of your tools and materials from inside the unit.

Close the access door or replace the panel.

Put on all PPE described in step #5

Remove the lockout device if applicable.

Stand to one side of the external service disconnect and start the power (This step does not apply to units/equipment with built in interlocking disconnects).

Ensure that the structural integrity of the unit (enclosure) is in good condition.

If you encounter any unusual first time procedures, write them down and report them to you supervisor. Give the supervisor a copy of your written procedures.

Do NOT allow "Unqualified Person" to come with 10 feet of any unit that is not in an electrically safe work condition. The unit's door or panel must be closed and there must be no exposed energized electrical conductors and /or circuit parts for an unqualified person to approach safely.

SUPERVISORS:

Ensure that all of your technicians have received the proper electrical safety training as described in this program before you allow them to begin work. Ensure that they receive a copy of this program and understand the program's principles, controls and specific electrical safety training requirements. Assess their abilities by testing them on the knowledge they need to protect themselves from electrical hazards.

Participate with each technician in conducting a daily, short term job briefing before servicing any HVAC device to cover anticipated electrical safety hazards, safe work practices and/or personal protective equipment issues as deemed necessary.

Working Space About Electric Equipment

Spaces About Electric Equipment

- Sufficient access and working space shall be provided and maintained about all electric equipment to permit ready and safe operating and maintenance of such equipment. Enclosures that house electric apparatus and are controlled by lock and key shall be considered accessible to qualified persons.

Working Spaces

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
0-150	900mm(3 ft)	900 mm(3 ft)	900mm(3 ft)
151-600	900mm(3 ft)	1m(3-1/2 ft)	1.2 m (4 ft)

Illumination

- Illumination shall be provided for all working spaces about service equipment, switchboards, panel boards, or motor control centers installed indoors. Additional lighting outlets shall not be required where the work space is illuminated by an adjacent light source. In electrical equipment rooms, the illumination shall not be controlled by automatic means only.

Dedicated Equipment Space

- All switchboards, panel boards, distribution boards, and motor control centers shall be located in dedicated spaces and protected from damage. *Exception: Control equipment that by its very nature or because of other rules of the standard must be adjacent to or within sight of the operating machinery shall be permitted in those locations.*

TRAINING

Requirements

Workers near energized, or potentially energized electrical circuitry of fifty (50) volts to ground or greater, shall be trained in energized electrical safe work practices and procedures and retrained as necessary.

Qualified Electrical Worker

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 and refresher training will be provided annually or when conditions change.

The following items are to be included in the training of Qualified Electrical Workers:

- 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 electric equipment.
- Skills and techniques necessary to determine the nominal voltage of exposed live parts.
- Selection and use of proper work practices, personal protective equipment, tools, insulating and shielding materials and equipment for working on or near energized parts.
- Recognition of electrical shock and electrical arc flash/blast hazard potentials, how to minimize the risk of arc flash incidents, and the proper care and maintenance of arc flash PPE.

  Our company will have employees trained in recognizing signs and symptoms of electric shock, heart fibrillation, electric burns, and proper first aid protocols for these conditions. They must have the following training:

  - Basic Cardio Pulmonary Resuscitation (CPR/AED)

- Contacting emergency personnel and basic first aid

Retraining

Is to be conducted when the employee is not complying with safety-related work practices or when workplace changes necessitate the use of safety-related work practices that are different from those that the employee would normally use. Required retraining will be performed at intervals not to exceed 3 years.

Documentation of Training and Experience

Our company will document that all required training has been provided. Training sign-in sheets will be part of this documentation. A qualified instructor will be utilized for this training and training certificates will be required from said instructor.

PROGRAM REVIEW

This program will be reviewed at least annually by the Supervisors and the Safety Manager and updated as necessary.

The annual review includes the following:

- Review all electrical practices and procedures to determine compliance with this program.
- Review any updated OSHA, NFPA and/or industry data to help improve the overall program.
- Review all accidents or incidents, and update procedures to minimize the risk of those types of accidents or incidents from occurring.
- Evaluate the efficacy of the procedures specified in this program in the context of work activities, and update as necessary.

EXHIBIT 1 – TERMS AND DEFINITIONS

- **Authorized Lockout/Tagout Employee** - A person who has completed the required hazardous energy control training and is authorized to lockout or tagout a specific machine or equipment to perform service or maintenance. A person must be certified as an Authorized Lockout/Tagout Employee in order to apply a lock or tag to control hazardous energy. All Authorized Lockout/Tagout Employees must be trained in:
    - Electrical Safety/Lockout/Tagout Training
    - Equipment specific procedures in their individual work units
- **Balaclava** – a piece of protective apparel that is made of flame resistant fabric. It is worn over the head to protect the neck, face and head during an arc flash event. It is worn under the hardhat and faceshield.
- **Confined space** - An enclosed space which has limited egress and access, and has an atmospheric hazard (e.g., explosive atmosphere or asphyxiating hazard) and/or other serious safety hazards (e.g., electrical hazard).
- **Damp location** - Partially protected locations subject to moderate degrees of moisture, such as some basements.
- **De-energized electrical work** - Electrical work that is performed on equipment that has been previously energized and is now free from any electrical connection to a source of potential difference and from electrical charges.
- **Disconnecting (or Isolating) switch** - A device designed to close and/or open an electric circuit.
- **Dry location** - Locations not normally subject to dampness or wetness, as in the case of a building under construction.
- **Energized electrical work** - Repair, maintenance, troubleshooting, or testing on electrical circuits, components, or systems while energized (i.e., live). Only Qualified High Voltage Electrical Workers are permitted to work on energized circuitry of 50 volts/25 amps to ground or greater.
- **Energy source** - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.
- **Exposed electrical parts** - Energized parts that can be inadvertently touched or approached nearer than a safe distance by a person. Parts not suitably guarded, isolated, or insulated. Examples include terminal contacts or lugs, and bare wiring.
- **Ground Fault Circuit Interrupt (GFCI)** - A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds a predetermined value that is less than that required to operate the over-current protective device of the supply circuit.
- **Ground** - A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth or to some conducting body that serves in place of the earth.
- **Hazardous Location** - An area in which an airborne flammable dust, vapor or gas may be present and would represent a hazard if a source of ignition were present (see National Fire Protection Association (NFPA) Class I & II and Division 1 & 2).

- **Interlock -** An electrical, mechanical, or key-locked device intended to prevent an undesired sequence of operations.

- **Isolating Switch** - A switch intended for isolating an electric circuit from the source of power. It has no interrupting rating, and is intended to operate only after the circuit has been opened by some other means.

- **Life Safety Equipment** - Equipment that provides critical protection for safety in the event of an emergency or other serious hazard. Life safety equipment, which is electrically energized, should be worked on using Energized Electrical Equipment (EEW) procedures to ensure that the protection provided by the equipment is not lost (e.g., fire alarm and evacuation).

- **Lockout** - The placement of a lock on an energy-isolating device according to procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

- **Lockout / tagout** - A standard that covers the servicing and maintenance of machines and equipment in which the unexpected re-energization of the equipment or release of stored energy could cause injury to employees. It establishes performance requirements for the control of such hazardous energy.

- **Qualified Electrical Worker –** A qualified person trained and knowledgeable of construction and operation of equipment or a specific work method and is trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method.

    - Qualified electrical workers shall be familiar with the proper use of the special precautionary techniques, personal protective equipment (PPE), including arc-flash, insulating and shielding materials, and insulated tools and test equipment. A person can be considered qualified with respect to certain equipment and methods but is unqualified for others.

    - An employee who is undergoing on-the-job training and who, in the course of such training, has performed duties safely at his or her level of training and who is under the direct supervision of a qualified person shall be considered to be qualified.

    - Only a Qualified Electrical Worker is allowed to work on energized circuits.

      Note One: Whether a person is considered to be a "qualified" person will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered "qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment.

      Note Two: An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

- **Remote-control Circuit** - Any electric circuit that controls any other circuit through a relay or an equivalent device.

- **Service** - The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served.

- **Service Equipment** - The necessary equipment, usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the entrance of supply conductors to the building and intended to constitute the main control and means of cutoff of the supply.

- **Setting Up** - Any work performed to prepare a machine or equipment to perform its normal production operation.

- **Switching Devices** - Devices designed to close and/or open one or more electric circuits. Included in this category are circuit breakers, cutouts, disconnecting (or isolating) switches, disconnecting means, interrupter switches, and oil (filled) cutouts.

- **Tagout** - The placement of a tagout device on an energy-isolating device according to procedure to indicate that the equipment may not be operated until the tagout device is removed.

- **Voltage (of a circuit)** - The greatest root-mean-square (effective) difference of potential between any two conductors of the circuit concerned.

- **Voltage, high** - Circuits with a nominal voltage more than 50 volts.

- **Voltage, low** - Circuits with a nominal voltage less than or equal to 50 volts.

- **Voltage, nominal** - An approximate value assigned to a circuit or system for the purpose of conveniently designating its voltage class, e.g., 120/240, 480/277, and 600.

- **Wet location** - Installations subject to saturation with water or other liquids.

DEFINITIONS (for arc flash safety)

- **Arc blast** - A pressure wave containing gaseous forms of metal created from an electrical current fault. The arc blast may be of sufficient intensity to knock a standing person down or off a ladder. The arc blast may also be of sufficient intensity to produce human injury.

- **Arc flash** - The arc flash may be composed of radiant and convective energy, arc blast vapors, molten metal droplets, sound pressure, shock waves, intense light, and projectiles.

- **ATPV** - Arc Thermal Performance Exposure Value. The minimum incident arc energy in calories per centimeter squared capable of causing the onset of a second-degree burn. ATPV is defined in American Society for Testing of Materials standard F1959/F 1959/M as a test method for flame retardant clothing.

- **Boundary, Flash Protection** - The linear distance in all directions from an exposed energized electrical component that is just far enough away from the source to prevent permanent injury from an arc flash due to a fault current.

- **Boundary, Limited Shock** - The linear distance in all directions from an exposed energized electrical part that defines the safe approach distance for unqualified persons.

- **Break-open threshold energy (EBT)** - Maximum incident energy values that do not cause Flame Resistant (FR) material to break-open, and do not cause second degree burns on skin covered by the FR material.

- **Current limiting devices** - Certain types of fuses or circuit breakers that, when interrupting current within its current-limiting range, will reduce the current in the faulted circuit to a substantially lower magnitude. Properly selected current limiting devices can limit the let-through energy to a level within the rating of downstream circuit components, even in the presence of high available system short-circuit current.

- **Electrically Safe Work Condition** - De-energizing and securing energy sources to ensure employee safety. An electrically safe work condition is established by:
  - *Identifying all sources of the electrical supply*
  - *Opening the disconnecting device for each supply*
  - *Visually inspecting where possible, the disconnecting device to ensure that the switch has opened*
  - *Locking out all disconnecting devices to prevent unexpected re-energization*
  - *Testing the circuit with an adequately rated test device (voltage tester or volt ohmmeter). The performance of the test instrument must be verified before and after each use*
  - *Grounding the phase conductors or components if induced voltage or stored electrical energy is present.*

- **Electrical Systems** - Systems and associated equipment, which provides for the generation, transmission, conversion, distribution and use of electrical power.

- **Fault current** - An electrical current that is following the path of least resistance, either from one phase to another, or to ground. This alternate path may be insufficient to contain the current, resulting in damage from extreme heat, fire, or flying components.

- **High Voltage** - Voltage exceeding 600 Volts A.C. and D.C.

- **Incident energy** - Energy from arc, both radiant and convective, that is actually received per unit area, in calories/cm2

- **Low Voltage** - Voltage less than 600 Volts A.C. and D.C.

- **Qualified Person** - A person with relevant education and experience to enable him or her to avoid dangers which electricity may create, and are authorized and competent to carry out specific work on the electrical distribution system.

- **Senior Qualified Person** - Appointed person who has direct management responsibility for the electrical power distribution system. Must be a Qualified Engineer.

- **Unqualified Person** - Person adequately trained to enable him/her to avoid dangers which electricity may create but are not authorized to work on electrical systems.

- **Voltage Tester** - A device capable of measuring the presence of voltage. These may be either solenoid operated or digital indicating. These units may also incorporate special features, such as the ability to indicate continuity. For the purposes of this procedure it does not include tick-tracers.

- **Volt-Ohm Meter (VOM)** - A metering device capable of measuring continuity, voltage, and current. These units may also incorporate other special features, such as the ability to indicate capacitance and true Root Mean Square (RMS). These devices are also called multimeters.