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1.0 Purpose

It is the policy of Branscome to protect all employees from electrical hazards, including shock, electrocution, arc flash, arc blast, and fires. All electrical work will be conducted in a manner consistent with existing regulations and with recognized safe work practices and in compliance with applicable sections of the most recent edition of NFPA 70E. This Plan establishes safe work practices for all employees working with or near plant-maintained electrical systems.

2.0 Scope

This Plan covers electrical safe work practices for both qualified persons and unqualified persons who work on or near machines, equipment, or circuits that operate above 50 volts and have not been placed in an electrically safe work condition (i.e., not locked/tagged out). It applies to:

- Installations of electric conductors and equipment for equipment & buildings
- Wiring for connection to supply
- Installations of other outside conductors on the premises
- Installations of optical fiber cable where such installations are made along with electric conductors

Qualified employees may be exposed to electrical flash hazards including:

- Arc-flash or sparking
- Arc-blast or explosion
- Electrical shock
- Arc-flash burn
- Arc-flash fire

This Plan does not apply to electrical generation, transmission, and distribution systems.

3.0 Roles & Responsibilities

3.1 Plant Superintendent

The Plant Superintendent has ultimate responsibility for ensuring that the location develops and implements safe electrical & arc flash work practices. In addition, the Plant Superintendent will conduct an annual review of the Electrical & Arc Safety policy and recommend updates as necessary to the Director of Safety.



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3.2 Director of Safety

The Director of Safety will maintain up-to-date edition of the site Electrical & Arc Safety policy and procedures and ensure that employees receive Electrical Safety-Related training and Arc Flash Safety-Related training as applicable and maintain those records.

3.3 Safety Specialist

The Safety Specialist will serve as the Site Electrical Safety Program Coordinator. This includes working with the site Supervisors to establish safe work procedures for site equipment that will ensure safe work practices. In addition, the Safety Specialist will:

- Maintain a list of trained Qualified persons
- Provide Qualified persons appropriate personal protective equipment
- Make sure Qualified persons receive their training.

3.4 Supervisors

Supervisors will work with the Safety Specialist to develop site-specific procedures and implement the Electrical & Arc Flash Safety-Related Work Practice Plan and establish. In addition, Supervisors will:

Develop and institute an electrical safety maintenance program for their area of responsibility.

Monitor the work tasks of their employees.

Implement disciplinary measures for failure to follow safe work practices.

Conduct job safety briefings for employees.

Ensure that employees have the equipment and training suitable to protect them from electrical hazards.

Provide warning labels on all circuit breakers and switch gear.

Secure electrical hazards from employee contact.

Review and approve live work permits to work on or near energized parts.

Ensure that only company qualified persons are allowed to work inside a Limited Approach Boundary.

Ensure that any worker who must cross the Prohibited Approach Boundary is properly equipped and protected from hazards of arc-flash.

3.5 Employees

Most employees are categorized as **<u>unqualified</u>** persons in regards to electrical work. They are responsible for the following:



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- Maintain the workplace in a clean and orderly fashion.
- Use electrical equipment safely.
- Follow all posted electrical safety warnings.
- Follow all electrical safe work procedures provided in this document.
- Report any damaged or defective equipment to their immediate Supervisor.
- 3.5 Qualified Employees

Certain employees are trained to be **<u>qualified</u>** employees at Branscome. They are responsible for the following:

- Following all electrical safe work procedures and electrical safety signage.
- Utilize the proper personal protective equipment when working around electrical equipment.
- Ensure that their work does not create a hazard for unqualified employees working with or around their work tasks.
- Only perform electrical tasks for which they are qualified, trained, and have demonstrated their skills.
- Working safely inside Limited Approach areas and watch out for the safety of their fellow crew members

4.0 Definitions

- 4.1 Arc Flash A dangerous condition associated with the release of energy caused by an electrical arc.
- 4.2 Certified Equipment Equipment that (a) has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner, or (b) is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and (c) bears a label, tag, or other record of certification.
- 4.3 Circuit Breaker (600V nominal or less) A safety device designed to open and close a circuit by non-automatic means and to open the circuit automatically on a predetermined overcurrent without injury to itself when properly applied within its rating.
- 4.4 Circuit Breaker (over 600V nominal) A switching device capable of making, carrying, and breaking currents under normal circuit conditions, and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions, such as those of short circuit.



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- 4.5 Electrical Safe Work Conditions A state in which the conductor or circuit part to be worked on or near has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to ensure the absence of voltage, and grounded if determined necessary.
- 4.6 Equipment Material, fittings, devices, appliances, fixtures, and apparatus used as part of, or in connection with, an electrical installation.
- 4.7 Flame Resistant (FR) The property of a material whereby combustion is prevented, terminated, or inhibited following the application of a flaming or non-flaming source of ignition, with or without subsequent removal of the ignition source.
- 4.8 Flash Hazard A dangerous condition associated with the release of energy caused by an electric arc.
- 4.9 Flash Hazard Analysis A study investigating a worker's potential exposure to arc-flash energy, conducted for the purpose of injury prevention and the determination of safe work practices and the appropriate levels of PPE.
- 4.10 Flash Protection Boundary An approach limit at a distance from exposed live parts within which a person could receive a second-degree burn if an electrical arc flash were to occur.
 (Note: This is the first issue to be defined in a flash hazard analysis. This boundary defines the point at which FR protection is necessary to avoid "second-degree" burn).
- 4.11 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.
- 4.12 Ground Fault Circuit Interrupter Ground Fault Circuit Interrupter. A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.
- 4.13 Limited Approach boundary An approach limit at a distance from an exposed live part within which a shock hazard exists. Second-degree burn hazards may be present outside of the Limited Approach Boundary and must be considered. (Note: This is the outermost boundary of an activity of a person working near live parts and cannot be crossed by an unqualified person unless escorted by a Qualified person).
- 4.14 NFPA 70E Branscome recognizes the terms defined within NFPA 70E (2011) for electrical and arc flash safety-related practices.



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- 4.15 Prohibited Approach Boundary An approach limit at a distance from an exposed live part within which work is considered the same as making contact with the live part. (Note: Any work that requires a person to cross the Prohibited Approach Boundary is considered to be working on a live part and is subject to all requirements associated with working on live parts).
- 4.16 Qualified Person (NFPA 70E) One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved.
- 4.17 Qualified Person (OSHA) One who has received training in and has demonstrated skills and knowledge in the construction and operation of electrical equipment and installations and the hazards involved.

Federal OSHA Note 1 to the definition of "qualified person:" Whether an employee is considered to be a "qualified person" will depend upon various circumstances in the workplace. For example, 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. (See 1910.332(b)(3) for training requirements that specifically apply to qualified persons.)

Federal OSHA Note 2 to the definition of "qualified person:" 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.

- 4.18 Restricted Approach Boundary An approach limit at a distance from an exposed live part within which there is an increased risk of shock due to electrical arc-over combined with inadvertent movement, for personnel working in close proximity to the live part.
- 4.19 Shock Hazard A dangerous condition associated with the possible release of energy caused by contact with or approach to live parts.
- 4.20 Unqualified Person An employee who is not a qualified person.

Unqualified person may utilize electric energy for mechanical, chemical, heating, lighting, or similar useful purpose.

- 4.21 Work Near Live Parts Any activity inside a Limited Approach Boundary.
- 4.22 Infeasible Causing catastrophic results



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5.0 References

- 29 CFR 1910.301 399 (Subpart S) Electrical
- 29 CFR 1910.147: Control of Hazardous Energy
- 29 CFR 1910.137 & .137: Personal Protective Equipment
- VA Code: §59.1-406 et sec.: High Voltage Line Safety Act
- National Fire Protection Association 70E: Standard for Electrical Safety in the Workplace, 2011.
- NEC 2011 as referenced by OSHA

6.0 Arc Flash Safety Program

QUALIFIED EMPLOYEES ARE ALLOWED TO WORK ON OR AROUND ENERGIZED EQUIPMENT ONLY WHEN IT IS INFESAIBLE TO SHUT DOWN THE EQUIPMENT.

6.1 Electrical Accident Prevention

6.1.1 Hazards

The following electrical hazards may be present at Branscome:

Direct	Indirect
Electrocution	Falls
Shock	Back Injuries
Burns*	Cuts to the Hand
Arc Flash/Blast	

*Burns are the most common.

6.1.2 Electrical Accidents

Electrical accidents can occur because of the following reasons:

- Unsafe equipment and/or installation
- Unsafe workplaces caused by environmental factors
- Unsafe work practices

6.1.3 Purchasing

All equipment, new electrical equipment, and appliances purchased will be listed by a nationally recognized testing laboratory (NRTL) such as Underwriters Laboratory (UL). Any plug-in electrical equipment or extension cords will be of Heavy Duty rating.



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6.1.4 Electrical Preventive Maintenance Program

Electrical equipment will be a component of Branscome's routine maintenance program to ensure safe and reliable operation of electrical wiring, GFCI outlets, protection devices, and operating equipment such as switches, circuit breakers, utilization equipment, flexible cords, and appliances.

A qualified electrician shall inspect all electrical tools and equipment for defects on an as needed basis but not less frequently than quarterly.

6.1.5 Safe Work Practices

Safety-related work practices shall be used to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits which are or may be energized. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards.

6.1.6 Environmental Factors

The following environmental factors are to be considered when maintaining or using electrical equipment:

- Wet or damp locations
- Damage by heavy asphalt material
- Proximity to flammable materials or heat sources
- 6.1.7 During normal Work operations
 - Each electrical breaker or switch must be labeled with the area or equipment that it serves.
 - Each breaker box or switch gear must be marked with a label containing the available incident energy or required level of PPE
 - All cabinet doors and electrical enclosures must be kept closed at all times.
- 6.2 Arc Flash Safety Plan General Duties
 - 6.2.1 Working on or near live parts

If Branscome **Qualified employees** must perform work on or near live parts operating at 50 volts or more which cannot be placed in an electrically safe work condition, then work to be performed must be:



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- considered energized electrical work; and
- performed by written permit only
- 6.2.2 Electrical Hazard Analysis

Prior to working on energized electrical systems, Branscome **Qualified** workers must perform the following electrical hazard analyses:

- Shock Hazard Analysis
- Flash Hazard Analysis
- Branscome **Qualified** workers will use the Hazard/Risk Analysis Evaluation procedure found at Annex F of NFPA 70E in order to:
- identify electrical hazards
- determine the degree of risk
- select the proper PPE and safe work procedures
- 6.2.3 Energized Electrical Work Permit

All work on or near exposed live parts must be authorized by a written permit.

Branscome **Qualified** workers will complete the Energized Electrical Work Permit (see Appendix A of this chapter).

The permit must be kept on file until the work is completed.

6.2.4 Periodic Assessment

Branscome's Director of Safety and Safety Specialist will periodically review this arcflash safety program, work practices and procedures.

6.3 General Electrical Safe Work Practices

6.3.1 Employee Practices

The following are general safe work practices that must be followed:

- Use approved Lockout/Tagout Procedures
- Respect warning signs, fences, and cages.
- Use GFCI whenever working with tools and equipment.
- Inspect work tools and GFCI's (including manual testing) prior to use to ensure no visual or operational defects.
- Only repair equipment which you are authorized to repair.
- Use three-prong plugs, double-insulated tools and safety switches.



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- Keep machine guards in place.
- Keep equipment clean.
- Never use worn or frayed cords.
- Never use equipment with missing or damaged strain relief.
- Never carry electrical equipment or portable tools by the cord.
- Never fasten cords with staples, hang from nails, or suspend from wires.
- Never run cords through holes in walls, ceilings, doorways, or windows without proper protection.
- Do not block electrical panels.
- Never wear metal objects when working near live electricity.
- Use only non-conductive ladders such as fiberglass.

6.3.2 Qualified Employees

Additional practices for Qualified Employees include:

- Maintain electrical equipment according to manufacturer's standards.
- Use appropriate NFPA 70E safe working practices for potential Arc Flash
- Use only approved NFPA 70E compliant PPE and tools while working with and around electrical installations.
- Never wear metal objects when working around electricity
- Label all electrical disconnects and switches

6.3.3 Unqualified Employees

Additional procedures for Unqualified Employees include:

- Ensure that cord and plug equipment and extension cords are maintained and stored properly.
- Notify a Qualified Employee to perform electrical equipment repair.
- Report all unlabeled electrical disconnects and switches to maintenance for proper labeling.
- Never spray electrical equipment with water or other conductive liquids.

6.4 Electrically Safe Work Conditions

6.4.1 Electrically Safety Work Conditions

Wherever possible, live parts to which employees may be exposed must be put into an **electrically safe work condition,** unless de-energizing creates more or worse hazards or is not practical because of equipment design or operational limitations. Only **Qualified Employees** are allowed to work on or around "**live**" electrical parts.



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The process of voltage testing electrical equipment and de-energizing is "live" work and can result in an arc flash

6.4.2 Less Than 50 Volts

Live parts that operate at less than 50 volts to ground need not be de-energized if there will not be increased exposure to electrical burns or to explosion due to electric arcs.

6.4.3 Procedures for De-Energizing Equipment

The following procedures relate to de-energizing equipment:

- Disconnect all circuits and equipment to be worked on from all electrical energy sources.
- Use the "left-hand rule" when opening or closing disconnects (stand to the right of the equipment and operate the disconnect switch with the left hand).
- Release stored electrical energy by discharging capacitors and short-circuiting and grounding high capacitance elements, as recommended by the manufacturer.
- Stored non-electrical energy in devices that could re-energize electric circuit parts shall be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.

6.4.4 Lockout/Tagout Program

Where any employee is exposed to contact with parts of fixed electric equipment or circuits which have been de-energized, the parts energizing the circuits shall be locked out in accordance with the requirements of Branscome's Lockout/Tagout Program.

6.5 Working On or Near Energized Parts

6.5.1 Absolutely Necessary

This section applies to work performed on exposed live parts (involving either direct contact or contact by means of tools or materials) or near enough to them for employees to be exposed to any hazard they present.

This is only allowed when absolutely necessary and the reasons are properly documented. The fact that it is inconvenient or will interrupt production is not an adequate reason. The excuse that the worker did not have authority to shut of power supplies is also not an adequate excuse



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6.5.2 Additionally Practices

Other safety-related work practices shall be developed and used to protect employees who may be exposed to the electrical hazards involved. Such work practices shall protect employees against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object.

6.5.3 Working On or Near Live Circuits

Common tasks where employees may need to work on or near live circuits include:

- Taking voltage measurements
- Opening and closing disconnects, breakers or switch gear
- Racking breakers on and off the bus
- Removing panels and dead fronts
- Opening electric equipment doors for inspection
- 6.5.4 Authorized Employees

Only **Qualified Employees** may work on electric circuit parts or equipment that has <u>not</u> been de-energized under the procedures of these standards. Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials and insulated tools as outlined in NFPA 70E.

At Branscome, the only employees authorized to work on live or energized parts are Qualified Electricians with specialized training who have demonstrated their skills and knowledge.

6.5.5 Energized Electrical Work Permit

Before work begins on any system containing live electrical parts that are not deenergized, an Energized Electrical Work Permit must be completed by the qualified person and signed off by a Supervisor. This form is located in Appendix A.

Exemption - Work performed on or near live parts by qualified electricians such as testing, troubleshooting, and voltage measuring may be permitted without an energized electrical work permit, provided that a hazard analysis is performed, and appropriate work practices and personal protective equipment are used.

6.5.6 Insulated Tools and Equipment



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When working near exposed energized conductors or circuit parts, each **Qualified Employee** shall use:

- insulated tools or handling equipment rated for the voltage level worked on
- fuse handling equipment, insulated for the circuit voltage, when removing or installing fuses when the fuse terminals are energized
- nonconductive ropes and hand lines when used near exposed energized parts
- protective shields, protective barriers, or insulating materials to protect each employee from shock, burns, or other electrically-related injuries while that employee is working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur

Also:

- Doors or hinged panels shall be secured during the work to prevent their swinging into an employee and causing the employee to contact exposed energized parts.
- When normally enclosed live parts are exposed for maintenance or repair, they shall be guarded to protect unqualified persons from contact with live parts.

6.5.7 Illumination

Employees may not enter spaces containing exposed energized parts unless illumination is provided that enables the employees to perform the work safely. Employees may not reach blindly into areas which may contain energized parts.

6.5.8 Conductive Materials and Equipment

Conductive materials and equipment that are in contact with any *part of an* employee's body shall be handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts. If an employee must handle long dimensional conductive objects (such as ducts or pipes) in areas with live parts, the hazard must be minimized by the use of insulation, guarding, or material handling techniques. Non-conductive fish tapes must be used when pulling wire through conduit that contains energized conductors or when entering an enclosure with exposed live parts.

6.5.9 Portable Ladders

Portable ladders shall be of the non-conductive type (fiberglass) if they are used where the employee or the ladder could contact exposed energized parts.

6.5.10 Conductive Apparel



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Conductive articles of jewelry and clothing (including but not limited to bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) may not be worn if they might contact exposed energized parts, unless they are rendered non-conductive by covering, wrapping, or other insulating means.

6.5.11 Housekeeping Duties

- Where live parts present an electrical contact hazard, employees may not perform housekeeping duties at such close distances to the parts that there is a possibility of contact, unless adequate safeguards (such as insulating equipment or barriers) are provided.
- Electrically conductive cleaning materials may not be used in proximity to energized parts unless procedures are followed which will prevent electrical contact.
- The employees are responsible for taking the necessary actions to properly protect themselves, other employees, and equipment from harm/damage by using the proper protective equipment and/or procedures to allow housekeeping duties to be performed safely

6.5.12 Interlocks

Only a qualified person following the requirements of this section may defeat an electrical safety interlock, and then only temporarily while he or she is working on the equipment. The interlock system shall be returned to its operable condition immediately after this work is completed.

6.5.13 Confined or Enclosed Workspaces

When an employee works in a confined or enclosed space (such as a manhole, vault or pit) that contains exposed energized parts, the employer shall provide, and the employee shall use, protective shields, protective barriers, or insulating materials as necessary to avoid inadvertent contact with these parts.

6.5.14 Alerting Techniques

When necessary, Branscome will use one or more alerting techniques to warn employees of electrical hazards, including:

- safety signs and tags
- barricades



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• attendants

6.6 Shock Hazard Analysis and Approach Rules

6.6.1 Shock Hazard Analysis

When necessary, Branscome will use one or more alerting techniques to warn employees of electrical hazards, including:

- safety signs and tags
- barricades
- attendants
- 6.6.2 Shock Approach Boundaries

Shock approach boundaries are categorized as:

- Limited Approach
- Restricted Approach
- Prohibited Approach

Refer to Table 130.2(C) of NFPA 70E for specific distances for approach boundaries to live parts for shock protection.

6.6.3 Limited Approach Boundary

Only Branscome Qualified personnel may cross the Limited Approach Boundary.

6.6.4 Restricted Approach Boundary

Only Branscome **Qualified** personnel who are wearing approved PPE for protection against shock may cross the Restricted Approach Boundary.

6.7 Flash Hazard Analysis and Alternative PPE Rule

6.7.1 PPE Alternative Rule

Branscome will normally follow the PPE alternative rule set forth at NFPA 70E 130.3(B) which allows use of the PPE requirements of NFPA 70E 130.7(C)(9) in lieu of a detailed Flash Hazard Analysis.

6.7.2 Flash Hazard Analysis



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Branscome **Qualified** workers will perform a flash hazard analysis when the PPE alternative rule (noted above) is not used.

The Flash Hazard Analysis will determine:

- capacity of the electrical circuit to deliver thermal burn from an arcing fault;
- the Flash Protection Boundary; and
- the PPE workers must use within the Flash Protection Boundary
- 6.7.3 Flash Protection Boundary < 600V

If the PPE alternative rule is not used, the following will apply.

For systems that are 600 volts or less, Branscome will use a default Flash Protection Boundary of 4 feet provided the system capacity does not exceed 300 kA cycles.

If the default is not used, Branscome will calculate the Flash Protection Boundary based upon the formula given at NFPA 70E 130.3(A). See also Annex D of NFPA 70E.

6.7.4 Flash Protection Boundary > 600V

If the PPE alternative rule is not used, the following will apply.

For systems above 600 volts, the Flash Protection Boundary is the distance at which the incident energy equals 5 J/cm.

6.7.5 Incident Energy Exposure Level

If the PPE alternative rule is not used, the following will apply.

The Flash Hazard Analysis must determine and document the incident energy exposure of the worker (expressed in calories per square centimeter) in order for a worker to select flame-resistant (FR) clothing that can mitigate exposure to a potential arc flash

6.8 Personal Protective Equipment

6.8.1 Hazard Assessment

Before any task is performed on or near exposed energized conductors or circuit parts, the competent person must determine the degree to which the worker must be exposed to an electrical safety hazard and to select the proper personal protective equipment.



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Branscome will determine the hazard/risk category for a worker's task based upon information at Table 130.7(C)(9)(A) of NFPA 70E. The selection of required PPE is based upon information at Table 130.7(C)(10) of NFPA 70E.

6.8.2 Qualified Persons

Qualified persons working in areas where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed. The choice of equipment is dependent on the results of the hazard assessment.

- 6.8.3 Types of Electrical Protective Equipment
 - Insulating Blankets
 - Insulating Covers
 - Line Hose
 - Rubber Gloves
 - Rubber Sleeves
 - Class E hardhats
 - Nonconductive shoes
 - Eye and face protection
 - Flash Protection Clothing

6.8.4 Flash Protection Boundary PPE

Branscome **Qualified** employees working within the Flash Protection Boundary must wear appropriate protective clothing and other PPE in order to protect against the thermal effects of an arcing fault. This may include protection for:

- Head, Eyes, Face, Neck and Chin
- Body
- Hands and Arms
- Feet and Legs
- 6.8.5 Inspection

Insulating equipment must be inspected before each day's use and immediately following any incident that may have caused damage. Gloves are also given an air test.

6.8.6 Air Test Procedure



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- Grab the glove by the cuff, flip it around several times to make a seal, and then roll the glove toward the fingers. An air pocket will form within the glove.
- Hold tightly the rolled portion of the glove and inspect the inflated exterior of the glove for cracking or any degradation of the insulating material surface. Forcing air into the glove will expose any damage to the insulating material that might otherwise have not been seen when performing only a visual inspection.
- In addition, you will also want to carefully inspect the glove for any holes in the insulating material. To inspect for a hole in the glove, hold the glove close to your ear. If you hear air escaping from the glove or if the glove will not hold pressure, the glove is damaged and shall be removed from service.

6.8.7 Use Of PPE

- If the insulating capability of protective equipment may be subject to damage during use, the insulating material shall be protected.
- Employees shall wear non-conductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts.
- Employees shall wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion. This protection shall be based on flash hazard analysis as indicated in Article 130.3 of NFPA-70E.

6.8.8 Storage

Insulating equipment must be stored in a location that protects it from light, temperature extremes, excessive humidity, ozone, and other injurious conditions.

6.8.9 Care & Maintenance

Protective equipment shall be maintained in a safe, reliable condition and shall be periodically inspected or tested, as required by 29 CFR 1 910.137 and NFPA 70E.

6.8.10 PPE Certification

The Safety Coordinator shall certify in writing that the required Flash Protection Boundary hazard assessment for PPE has been performed.

6.8.11 PPE Training

Employees will be trained in the proper selection, care, maintenance and use of PPE.



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6.9 Portable Electric Equipment

6.9.1 This section applies to the use of cord- and plug-connected equipment, including flexible cord sets (extension cords).

6.9.2 Handling

- Portable equipment shall be handled in a manner which will not cause damage.
- Flexible electric cords connected to equipment may not be used for raising or lowering the equipment.
- Flexible cords may not be fastened with staples or otherwise hung in such a fashion as to damage the outer jacket or insulation.
- Flexible cords may not be run through doorways or windows where they might be damaged
- Flexible cords may not be used as a substitute for permanent wiring.

6.9.3 Visual Inspection

- Portable cord- and plug-connected equipment and flexible cord sets (extension cords) shall always be visually inspected before use for external defects and for evidence of possible internal damage.
- Cord- and plug-connected equipment and extension cords which remain connected once they are put in place and are not exposed to damage need not be visually inspected until they are relocated.
- Defective or damaged items shall be removed from service until repaired or replaced.
- 6.9.4 Grounding Type Equipment
 - A flexible cord used with grounding-type equipment shall contain an equipment-grounding conductor.
 - Attachment plugs and receptacles may not be connected or altered in a manner which would prevent proper continuity of the equipment grounding conductor at the point where plugs are attached to receptacles. Additionally, these devices may not be altered to allow the grounding pole of a plug to be inserted into slots intended for connection to the current-carrying conductors.
 - Removal of ground plugs is prohibited.
 - Adapters (i.e., "cheaters") that interrupt the continuity of the equipment grounding connection may not be used.
- 6.9.5 Wet or Damp Work Locations



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- Portable electric equipment and flexible cords used in highly conductive work locations (such as those inundated with water or other conductive liquids), or in job locations where employees are likely to contact water or conductive liquids, must be approved for those locations.
- Ground fault circuit interrupters (GFCI) shall be used at the outlet, either as a permanent outlet or as a temporary GFCI plug-in.
- 6.9.6 Connecting Attachment Plugs
 - Employees' hands may not be wet when plugging and unplugging flexible cords and cord- and plug-connected equipment if energized equipment is involved.
 - Energized plug and receptacle connections may be handled only with insulating protective equipment if the connection could provide a conducting path to the employee's hand.
 - Locking-type connectors shall be properly secured after connection.

6.9.7 Surge Protectors

- Surge protectors or power strips are only permitted in office areas or for computer applications and must not be used for maintenance or operations.
- Surge protectors or power strips must not be connected to each other.

6.9.8 Extension Cords

Employees using extension cords to power tools and/or equipment shall use GFCI protection. The following rules apply:

- All extension cords must be grounding type, made with UL- or FM-listed parts, and must be in good physical condition.
- Extension cords may not be lengthened, or "repaired" with tape.
- Extension cords shall not be run through holes in walls, ceilings or floors.
- Extension cords may not be plugged into power strips. Power strips may not be connected to each other (i.e., "piggy-backed").
- An extension cord should not be run across high traffic areas or used in applications where potential damage to the cord might occur.
- The use of an extension cord must not create a trip hazard.
- Extension cords shall not be attached to building surfaces or used in lieu of fixed wiring of a structure.
- Extension cords shall not be run through doorways or windows, or concealed behind walls, ceilings or floors.



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- 6.10 Test Instruments and Equipment
 - 6.10.1 Authorized persons

Only **Qualified Employees** may perform testing work including voltage testing on electric circuits or equipment.

6.10.2 Visual Inspection

Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects and damage before the equipment is used. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service, and no employee may use it until necessary repairs and tests to render the equipment safe have been made.

6.10.3 Rating of Equipment

Test instruments and equipment and their accessories shall be rated for the circuits and equipment to which they will be connected and shall be designed for the environment in which they will be used

- 6.11 Electric Power & lighting Circuits
 - 6.11.1 Routine Opening and Closing of Circuits

Load-rated switches, circuit breakers, or other devices specifically designed as disconnecting means will be used for the opening, reversing, or closing of circuits under load conditions. Cable connectors not of the load break type, fuses, terminal lugs, and cable splice connections may not be used for such purposes, except in an emergency.

6.11.2 Reclosing Circuits After Protective Device Operation

After a circuit is de-energized by a circuit protective device, the circuit may not be manually reenergized until it has been determined that the equipment and circuit can be safely energized. The repetitive manual reclosing of circuit breakers or reenergizing circuits through replaced fuses is prohibited.

When it can be determined from the design of the circuit and the overcurrent devices involved that the automatic operation of a device was caused by an overload rather than a fault condition, no examination of the circuit or connected equipment is needed before the circuit is reenergized.



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6.11.3 Overcurrent Protection Modification

Overcurrent protection of circuits and conductors may not be modified, even on a temporary basis, beyond that allowed by the installation safety requirements for overcurrent protection.

7.0 Training

- 7.1 Employee Training
 - 7.1.1 Qualified Persons
 - Qualified persons will be trained before they are permitted to perform work on electrical utilization systems or equipment.
 - Unqualified persons will be trained before they work near electrical utilization systems or equipment.
 - 7.1.2 Employee Classes

Listed below are employees who may face electrical risks and who shall be trained as qualified employees:

- Electricians
- Supervisors
- Mechanics
- Maintenance Staff
- Operators

Other employees must be trained if their job assignments bring them close enough to energized parts of electrical circuits operating at 50 V or more.

7.1.3 Qualified Persons

Electrical training for qualified persons will include on-the-job demonstrations, exercises, and classroom sessions. Qualified employees will be trained on:

- Safety-related work practices, including proper selection and use of PPE, that pertain to their respective job assignments
- Skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment



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- Skills and techniques necessary to determine the nominal voltage of exposed live parts, clearance distances, and the corresponding voltages to which the qualified person will be exposed
- The clearance distances specified by regulation (29 CFR 1910.333(c)) and the corresponding voltages to which the qualified person will be exposed
- Procedures on how to perform their jobs safely and properly
- How to lockout/tagout energized electrical circuits and equipment safely
- Use of temporary protective grounding equipment
- Use of testing equipment
- Work permit and work authorization procedures
- Use, inspection, and care of personal protective equipment
- Proper clothing and other PPE required for arc flash or arc blast protection
- 7.1.4 Unqualified persons

Unqualified employees will be trained in and familiar with the safety-related work practices that pertain to their respective job assignments.

Any employees who are at risk of electric shock but who are not qualified persons will be trained in:

- Electricity-related safety practices that pertain to their job and work area; and
- Any electricity-related safety practices that are necessary for their safety
- 7.1.5 Refresher Training

Refresher training will be given to qualified and unqualified persons at least annually to provide an update on new regulations and electrical safety criteria. Additional training will be provided whenever:

- New types of electrical utilization systems or equipment are introduced to the workplace
- A new hazard is identified
- New electrical tasks are created
- Electrical injuries occur
- Proper procedures are not being followed.

8.0 Documentation

8.1 Training Records



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Branscome's Director of Safety will keep written documentation of all training. The records will be made available to OSHA/VOSH, the controlling contractor or any affected employee.

8.2 Program Review Update

This Plan will be reviewed annually and updated. In addition it will be updated whenever:

- New types of electrical utilization systems or equipment are introduced into the workplace
- Evaluations of workplace hazards, injuries, and near-misses demonstrate that the current plan is outdated or not effective
- When regulatory or national consensus standards change that require this Plan to be updated

9.0 **Document History**

Number	Effective Date	Purpose	Author
Original	May, 2006		
Revision 1	January, 2012		Alvin Trotman
Revision 2	August, 2013	Revise Sec 6.1.4 to include requirement for periodic inspections of electrical equipment.	Alvin Trotman