APPENDIX G. ELECTRICAL SAFETY POLICY – Nov 2024

Purpose
VSC Fire & Security, Inc. (VSC) has established this Policy to provide controls and protection for its employees who are exposed to electrical hazards associated with electrical equipment installation, maintenance, and construction work. This program addresses safe work practices, training requirements, Personal Protection Equipment (PPE) and ground fault protection to ensure the health and safety of VSC employees.

Regulatory Scope
This procedure addresses the regulatory requirements under 29 CFR 1910 Subpart S, 29 CFR 1926 Subpart K and NFPA 70E Standard, *Electrical Safety in the Workplace*, as applicable.

This program has been prepared in compliance with the State and Federal OSHA Standard as noted above. The purpose of this operating procedure is to ensure the protection of VSC employees from accidents and/or injury hazards, while working with or around electrical equipment. The following procedures must be followed. No employee shall operate any electrical equipment without training that documents the employee's knowledge of the equipment including its operation, associated safety devices and procedures. Users must perform a daily pre-use inspection of their equipment and a pre-inspection of the work area prior to beginning any work activities.

Electrically Safe Work Condition (ESWC) Policy statement
When ESWC is required
An electrically safe work condition shall be established by qualified person for work that requires either of the following conditions:

- Work within the limited approach boundary
- Work that increases the likelihood of injury from an arc flash hazard

When ESWC is **not** required
An electrically safe work condition **shall not be required** for work meeting either of the conditions in this section or when the employer can demonstrate that the work must be performed energized due to one or more of the following:

- An electrically safe work condition would introduce additional hazards or increase the risk of injury or damage to health
- An electrically safe work condition is infeasible due to the operational limitations of the work being performed
- An electrically safe work condition is infeasible due to the design of the equipment prohibiting the establishment of such a condition

An electrically safe work condition **shall not be required** for the following work when the employer can verify that the risk of injury or damage to health is of an acceptable level:

- Work involving systems operating at a voltage of less than 50 Volts provided the risk of injury from thermal events is of an acceptable level
- Work involving the normal operation of equipment that exists in a normal operating condition

Responsibilities
Manager

- Shall be responsible for resourcing and implementation of this program.
- Shall review and update this program at intervals not to exceed three years
- Shall be responsible for implementing area-specific safety rules, practices, and procedures contained in this program, and provide training that incorporates such information. Manager may delegate the task of implementing the requirements of this document to an electrically qualified person.
- Task supervisors are responsible for the safety of all persons under their direction. When evaluating task to be completed, task supervisors shall see that persons have fulfilled training requirements, follow location safety rules, and adhere to operating procedures.

Qualified Employees
Only qualified persons may perform testing work on electric circuits or equipment following an energized work permit or an VSC established work procedure. Qualified persons shall be capable of performing work safely on energized circuits. As stated in OSHA 1910.333(c)(2), qualified persons must be capable of working safely on energized circuits and must be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.

- Are responsible for following the proper safety precautions.
- Must know the appropriate tools and devices for each task assigned to them and how to inspect and test those tools and devices before beginning work.
- Shall remain knowledgeable and current on the applicable specifications and rules applying to their jobs.

- Are responsible for keeping unqualified and unprotected persons out of the Limited Approach Boundary and Arc Flash Boundary of energized electrical work unless acting as escorts.
- Shall safeguard the people in their care and ensure that safety regulations are observed.

Unqualified Persons

No employee is permitted to work in proximity to any part of an electric power circuit which the employee could contact in the course of the work, unless the employee is protected against electric shock by de-energizing the circuit and grounding it, or by guarding it effectively by insulation or other means.

- Shall always be aware of possible electrical hazards even when their tasks do not involve electrical work, such as the operation of power tools or mobile cranes, use of ladders, and materials handling, etc.
- Shall not enter an Arc Flash Boundary or Limited Approach Boundary of energized parts unless escorted by a qualified person and wearing the proper Arc-Rated PPE. Unqualified Personnel will not need shock protection PPE, because they are not permitted to cross the Restricted Approach Boundary.

Contractors, Subcontractors and Contracted Services

- Employees of contractors, subcontractors, and contracted services (herein referred to as "contractors") shall follow all safety regulations required through their written Safety Program. Contractors shall certify that their program is in concert with OSHA and the latest NFPA 70E edition and has been updated within the last three years. When such persons are unable to provide their own program, they shall undertake to comply with this program. In such instances, a documented undertaking of compliance is required before work commences.

Common Hazards

Safe work practices must be enforced to prevent electric shock or other injuries resulting from either direct or indirect electrical contact when work is performed near or on energized equipment or circuits. The specific safe work practice must be consistent with the nature and extent of the associated electrical hazard(s).

Job Planning

Knowledge of this document does not make a person qualified. VSC shall determine the appropriate level of electrical work experience and the training required to deem a person qualified for specific electrical work or specific tasks. See training section below.

Risk Assessment

Assess the risk of job hazards which could result in harm and provide means to control the risk using the Hierarchy of Risk Control.

Where the hazard cannot be eliminated, appropriate personal protective equipment and training shall be provided. The risk assessment shall be completed through the Job Safety Plan document, an Energized Electrical Work Permit, and the Job Briefing.

Hierarchy of Risk Control Methods

During the risk assessment, the qualified person shall ensure that risks are controlled using the following Hierarchy of Controls in this order:

- *Eliminate the hazard* – removal of the energy source(s); e.g., create an electrically safe work condition taking into consideration the failure of the physical lockout system or the infrastructure on which the equipment is built.
- *Substitution* – replacing with less hazardous equipment or materials, e.g., utilization of control voltages less than 50V, the use of internally arc classified equipment, substitution of person with remote racking devices.
- *Engineering Controls* – implementing safety through engineering control and design. These may include the optimization of protective device settings, use of grounding systems such as GFICs at the distribution source instead of portable GFCIs; system interlocks: preventing unauthorized access/operation by mechanically interlocking doors and switches.
- *Awareness* – the use of alerting techniques through warning labels, barricades, and attendants.
- *Administrative Controls* – these types of controls vary from organizational to individual level and will include, among others, compliance with this written program, training of groups, and training of individuals.
- *Personal Protective Equipment* – PPE for arc flash and electrical shock is the last line of defense against electrical hazards. It is important that workers understand that PPE is the last option when the above-mentioned controls fail to eliminate the hazard. PPE is also considered the least effective control.

Shock Risk Assessment

For work involving exposed, energized conductors and circuit parts, a shock risk assessment shall be performed to determine the following:

- If personnel will be exposed to a shock hazard
- The likelihood of occurrence of injury or damage to health due to required work
- Potential severity of injury or damage to health from shock hazard
- Additional protective measures in accordance with "Tools, Equipment and PPE" section of this document.

The following information is required to be documented as part of the shock risk assessment:

- Nominal system voltage
- Limited approach boundary
- Restricted approach boundary
- Personal and other protective equipment required to protect against the shock hazard

Shock Approach Boundaries

Shock approach boundaries for low voltage are identified as the Limited Approach Boundary and the Restricted Approach Boundary. They are

applicable to situations in which approaching personnel are exposed to uninsulated energized electrical conductors or circuit parts (e.g., busbar, terminations, lugs, etc.). Distances associated with various system voltages are defined in Table 1.

Table 1: *Low- Voltage Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts*

Nominal Voltage	Limited Approach Boundary		Restricted Approach Boundary
Phase to Phase	**Exposed Movable Conductor**	**Exposed Fixed Circuit Part**	
Less than 50	Not Specified	Not Specified	Not Specified
50 to 150**	3.0 m (10 ft. 0 in.)	1.0 m (3 ft. 6 in.)	Avoid Contact
151 to 600*	3.0 m (10 ft. 0 in.)	1.0 m (3 ft. 6 in.)	0.3 m (1 ft. 0 in)

*Note: Voltage limited to 600V to align with this program.

** This includes circuits where the exposure does not exceed 120 volts nominal

Arc Flash Hazards

VSC employees are **not authorized** to perform any tasks, test or inspections on electrical equipment requiring the use of arc flash level personal protection equipment.

Working Near Arc Flash Hazards

Alarm panels, conduit and fire protection systems are often in the same area such as mechanical and electrical rooms. VSC alarm & sprinkler technicians commonly enter these areas where equipment is labeled with arc flash information however, at no time shall a VSC qualified person work within an area, where exposed energized electrical work is occurring or where exposed live parts are present. VSC qualified employees are trained as required by OSHA's standard 29 CFR 1910.269 "Training for non-Electrical Workers".

Exception: entry is allowed if no arc flash hazard exists and the qualified VSC employee is working on the alarm panel and/or sprinkler system.

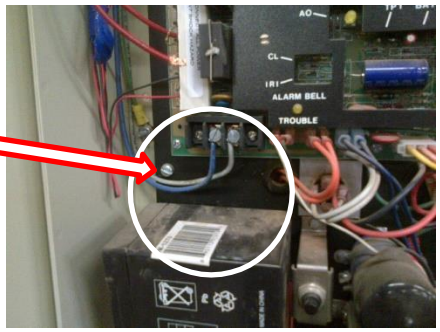
In addition to OSHA training requirements, these general guidelines, although not all-inclusive:

- If maintenance or contractor begins work in panels, after you have started work; stop, and immediately notify the customer.
- Daily inform the customer you will be working in the space and comply with customers' safety planning and notification requirements, including any LOTO programs.
- If any high voltage panel door is open do not attempt to close it. Immediately leave the area and notify the customer.
- Always maintain a 3-foot clearance from the panel door.
- Do not allow tools, equipment, or material to contact panels.
- Do not operate lift equipment near panels without a spotter.
- Do not climb or lean ladder against panel to access or install alarm conduit.
- If the installation or access to alarm equipment conduit requires working above or in contact with live (active) high voltage equipment, contact the alarms department manager and perform a job hazards analysis before starting any work.
- Contact VSC's Safety Department for assistance with questions, concerns, hazard analysis and action plans.

Testing on energized equipment 50 volts or greater

Live parts to which an employee may be exposed, such as fire alarm panels, shall be de-energized before the employee works on or near them, unless it is infeasible due to equipment design or operational limitations. Live parts that operate at less than 50 volts to ground need not be deenergized if there will be no increased exposure to electrical burns or to an electrical arc flash. Employees may perform testing on energized parts of equipment, but the equipment may remain energized only as long as necessary to perform the test or troubleshooting.

Examples of exposed power source >50v



As per NFPA 70 Article 760.33 states, "A listed surge protective device shall be installed on the supply side of a fire alarm control panel in accordance with Part II of Article 242. **However, while surge protectors are adept at handling overvoltage, it's crucial to understand that they are not designed primarily to avoid electric shock.** The 120 volts connection to the surge protector is often not insulated and this exposes the technician to electrical shock.

Only a qualified person as defined by OSHA1910.333(c)(2 is allowed to perform live test of alarm panels.

Surge protector

Personal Protective Equipment (PPE)

The pre-job Job Hazard Analysis (JHA) which identifies electrical hazards and established the necessary equipment. At minimum, it is expected that each employee will adhere to the following:

- PPE will be properly maintained and inspected for damage before each use.
- Specified PPE must be used when there is potential contact with an exposed electrical source.
- VSC issued hard hats have an electrical safety rating and Employees will only wear VSC issued hard hats.
- Employees will wear protective eye/face equipment to protect from the hazards of arcs, flashes, or from flying objects that occur due to electrical explosions.
- Employees will wear heavy duty, composite toed, over the ankle, construction grade work boots. Steel toe safety shoes are not to be worn when working around electrical hazards as the steel toe can act as a conductor which can lead to serious injury or death.
- Employees shall wear non-melting clothing. This would include materials made of cotton, wool or silk. No nylon or polyester blends shall be worn.
- Damaged electrical safety PPE must be replaced before performing any tasks.
- Protective shields, barriers, or insulating materials will be used to protect against shock, burns, or other electrical related injuries while the employee is working near exposed energized parts.

Factors Requiring additional PPE: (testing live panels)

Weather the test probes are designed so that the hands can slip off the insulated handle and; Weather there are other exposed energized parts that the hands might contact during testing.

If either of these conditions are present, the use of additional PPE would be warranted.

NONE Slip probe

Probes requiring use of insulating gloves.

Employees will use appropriate PPE required to provide protection against hazards associated with a task. Shock protective equipment shall

be used anytime there is a potential shock hazard. This includes conducting troubleshooting with a multimeter.

Conductors and parts of electric equipment that have been de-energized but have not been Locked-out or Tagged-out must be treated as energized parts.

Testing of Live Panels: Cheater Cords

1. A UL listed " Cheater Cord" that is manufactured for the specific task shall be used.
2. Any electrical cord that has had the "female" end cut off to use for this purpose is prohibited. (see below)
3. To prevent shock, a manufactured cheater cord shall be used. These devices are specifically manufactured to be used for the purpose of testing the alarm panels and are UL listed devices. Cheater cord cannot be more than 10ft in length with a male grounded plug (outlet plug-in)on one end and fork spade connectors on the other end (panel terminal connectors). The fork spade connectors are color coded to match the cheater cord wires Black, White and green. (see below)
4. Prior to any test procedure you must ensure the panel cannot be activated by locating the circuit breaker that provides the 120V supply. The breaker circuit must be locked out and tagged out at the breaker panel.
5. The 120V Circuit must be disconnected from the alarm panel. This creates the hazard of exposed wiring from the 120V circuit.
6. The fork spade terminals connectors of the cheater cord are installed onto the alarm panel terminals and then the male end plugged into an electrical outlet inside the panel room or within reach of the technician.
7. Before performing tasks in any electrical panel or equipment with exposed circuits, technicians will review and comply with PPE requirements specified in Appendix G. "Electrical Safety Policy" and Appendix H. "Lockout/Tagout Safety Policy" found in the VSC Health & Safety Program.
8. Not complying with this procedure could result in severe electrical shock.

Correct UL listed device

Emergency Response Plan

The job safety plan shall include an emergency response plan to determine the following:

- Contact method for emergency services
- Location of first-aid kit,
- Location of automated external defibrillator (AED),
- Location of other applicable safety and rescue equipment such as retrieval device, fire blankets, extinguishers, etc.
- Method of safe contact release to be used in event of serious electrical shock

Note: Workers shall not make contact with an injured person unless the injured person is removed from the energy source or the energy source is removed, and the area is safe. Always call for emergency assistance before starting any first aid. Do not make contact with or try to remove burned clothing.

Investigations

Any incident that resulted in harm or could have likely resulted in harm to a person or damage to equipment shall be reported and documented. Incident investigations shall be performed to determine:

- Root cause of incident
- Methods of hazard prevention/mitigation
- Plan for process improvement.

Line management and the safety department will determine whether a formal investigation is required. The safety department will trend and analyze incidents to determine areas of improvement. Electrical incidents must be investigated using the existing investigation procedure. If an investigation procedure does not exist, the safety department will ensure that a suitable procedure, addressing investigation guidelines with the necessary forms, is developed and workers are trained on the procedure.

Contractor incidents shall be independently reviewed by the contracting company, formally reported to the safety department, and be included in the safety trending and analysis.

Auditing

Each employee shall be assessed annually to determine if he/she is meeting the expectations as an electrical qualified person. Has the appropriate PPE for their task, is maintained their equipment in good working order and is following all VSC standards and procedures.

Training

VSC will provide electrical safety training to all employees whose job requires exposure to electrical hazards. Any employee who does not comply with this training will be subject to discipline, up to and including termination of employment.

Employees must be trained in and possess the knowledge for the safety-related work practices required by 1910.331 through 1910.335 that pertain to each job assignment.

Employees who face a risk of electric shock from electrical hazards that are not reduced to an acceptable risk level by the electrical installation requirements must be trained in electrical safety-related work practices as required by sections 1910.331 through 1910.335 and NFPA 70E.

Employees are either qualified persons or unqualified persons when working on or near exposed energized parts. Qualified persons have training, whereas unqualified persons have little or no electrical training, in how to recognize and avoid the electrical hazard(s) of working on or near exposed energized parts. Unqualified persons are not allowed to cross the restricted approach boundary at any time.

Training for Qualified Employees

A qualified employee is one who is permitted to work on or near exposed energized parts and is trained in the following:

- The knowledge necessary to distinguish exposed live parts from other parts of electrical equipment.
- The knowledge necessary to determine the nominal voltage of exposed live parts.
- The clearance distances to/from the corresponding voltages.
- The proper use of special precautionary techniques, PPE, insulating and shielding materials, and insulated tools.
- General equipment requirements as provided in the national standards.
- How to perform contact release for someone who is being shocked (refresher training must occur annually)
- Trained in first aid, CPR and AED.
- Recordkeeping will include: employee name, training topic including course content, and date of training.

Retraining Requirements

Retraining must occur when there are changes to the Electrical Safety Policy or if VSC management has reason to believe that an employee who performs tasks on electrical components or exposed to electrical hazards demonstrates a lack of knowledge and skill required to follow the electrical safe work practices, then the employee will be retrained. Circumstances where retraining is required include, but are not limited to:

- Change in job assignment.
- Change in machines, equipment or processes that present a new hazard.
- Change in the Lockout/Tagout procedure.
- Situations that arise in which retraining appears necessary to ensure electrical safe work practices and/or safe Lockout/Tagout procedures.
- Recordkeeping will include: employee name, training topic including course content, and date of training.

Ground Fault Protection Program

<u>Employers Responsibility</u>

Out of concern for the safety and health of our employees, VSC will comply with Ground Fault Protection Regulations found at 29 CFR 1926.404 (b)(1)(ii).

All electrical equipment & tools used by VSC employees will be connected to a properly working GFCI. This means that the GFCI must be tested by the foreman prior to use each day. The GFCI must be plugged into a grounded outlet that is in good condition and has the proper cover plate installed. The GFCI must always be located ahead of the extension cord and the power cord of the equipment being used. Therefore, the GFCI must be plugged directly into the wall outlet, not into an extension cord. This method will ensure that the people, extension cord(s), and the equipment are protected from an electrical fault.

<u>Insulation and Grounding</u>

Insulation and *Grounding* are two recognized means to prevent injury during electrical equipment operation. Conductor insulation may be provided by a material in which electric current does not flow freely. Placing nonconductive material such as plastic around the conductor does not provide an electrically safe work condition. Only materials that are tested and used in accordance with their testing method may be used as an insulating material. Grounding may be achieved through the use of a direct connection to a known ground conductor. This is also referred to as a grounded conductor or a system or circuit conductor that is intentionally grounded.

Consider, for example, the metal housing or enclosure around a motor or the metal box in which electrical switches, circuit breakers, and controls are placed. Such enclosures protect the equipment from dirt and moisture and prevent accidental contact with exposed wiring. Depending on how it was installed or maintained this enclosure may or may not have an effective ground.

There is a hazard associated with housings and enclosures. Removal of the ground or a malfunction within the equipment—such as deteriorated insulation— may create an electrical shock hazard. Metal enclosures are connected to ground to eliminate the shock hazard. Normally if an energized wire contacts a grounded enclosure, a ground fault results which normally will trip a circuit breaker or blow a fuse. This wire is called an *equipment grounding conductor*. Most portable electric tools and appliances are grounded by this means. There is one disadvantage to grounding: a break in the grounding system may occur without the user's knowledge.

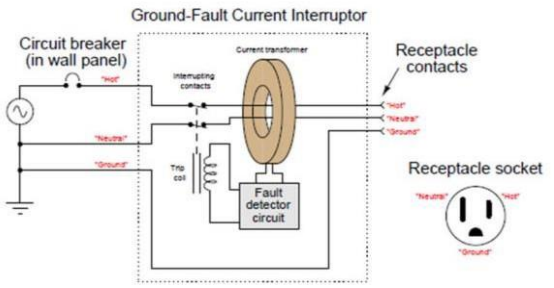
Insulation may be damaged by vibration, poor craftsmanship, hard usage on the job or simply by aging. If this damage causes the conductors to become exposed, shock, burn, and fire hazards could be created. Double insulation may be used as additional protection on the live parts of a tool, but double insulation does not provide protection against defective cords and plugs or against heavy moisture conditions.

The use of a ground-fault circuit interrupter (GFCI) is one method used to overcome grounding and insulation deficiencies.

WHAT IS A GFCI?

The ground-fault circuit interrupter (GFCI) is a fast-acting circuit breaker which senses small imbalances in the circuit caused by current leakage to ground and, in a fraction of a second, shuts off the electricity. The GFCI continually matches the amount of current going to an electrical device, against the amount of current returning from the device, along the electrical path. Whenever the amount "going" differs from the amount "returning" by approximately 5 milliamps, the GFCI interrupts the electric power within as little as 1/40 of a second. (See diagram below.)

GFCI – Ground fault current interrupter



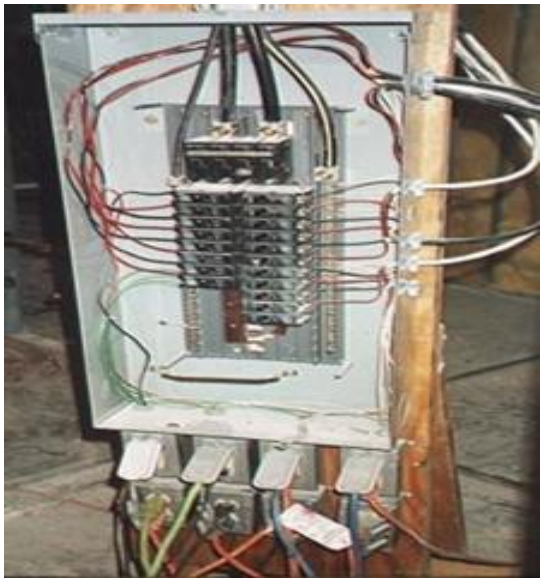
However, the GFCI will not protect the employee from line-to-line contact hazards (such as a person holding two "hot" wires or a hot and a neutral wire in each hand). It only provides protection against the most common form of electrical shock hazard, the ground fault. It also provides protection against fires, overheating, and destruction of insulation on wiring if current leaks to ground.

Electrical Safety on construction sites

Temporary electrical power supply on construction sites

- Temporary electrical panels provided by the general contractor (GC) must comply with 29 CFR. 1926 Subpart K, “Wiring Design and Protection Standards”. Dead front and outer panel door and covers must be in place and closed on all temporary breaker panels.
- VSC employees must conduct visual inspection of power supply for proper circuit protection, insulation, and grounding prior to using any temporary or portable power supply. Branch power distribution cables to temporary electrical panels must not be on the floor, ground, or in other locations where employees can be exposed to the branch power cable.
- Ensure portable or temporary electrical panel, outlets, and support structure are in safe condition. Do not use panels with base structure in standing water. Do not touch or attempt to connect or disconnect cords in outlets if you are standing in water or your hands are wet.
- GFCI's are used on all 120-volt, single phase 15 and 20-ampere temporary wiring on construction sites.
- The use of non-approved shop made extension cords are prohibited such as Portable flex cord or rigid cable with metal outlet boxes as seen here…

Immediately report any damaged or unsafe electrical power sources to the General Contractor and notify other VSC employees not to use the unsafe temporary power sources. DO NOT ATTEMPT TO MAKE ANY REPAIRS OR ALTERATION OF DAMAGED OR UNSAFE PANELS or POWER CORDS.



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Outdoor Electrical Panels

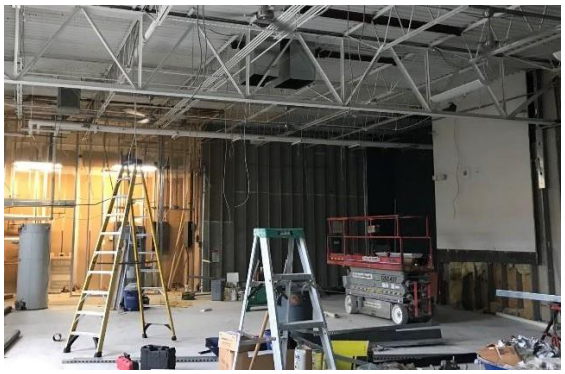
- Ensure temporary panels, outlets and connections located outdoors are designed with the correct weather proofing components.
- Ensure panel is not standing in water. Do not touch or attempt to connect or disconnect cords from outlets if you are standing in water.
- Do not run extension cords from panel to work zone in area where traffic or heavy equipment can run over them.

When a temporary power outlet or extension cord length exceeds 100 ft in total distance from tools or equipment follow these guidelines:

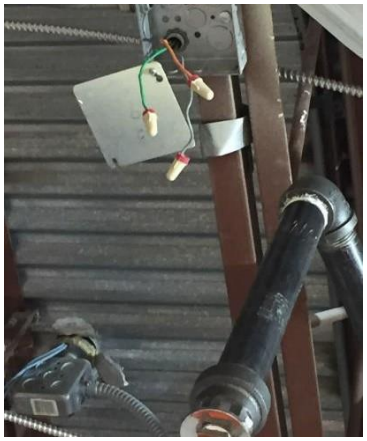
- Relocate power machine, equipment or tool closer to the power source.
- Request GC to establish additional temporary power supply closer to our work zone
- Rent a portable generator as needed.
- Do not plug multiple extension cords together
- Do not use extension cords longer than 100 feet.

Demo and renovation projects.

VSC employees often work on renovation projects to install additional fire protection on an existing fire and alarm system.
These types of jobs can expose employees to shock hazards of exposed LIVE utilities caused by electrical contractors removing conduit, wiring and fixtures as seen in pictures below.



Actual VSC renovation jobs. Every wire hanging from ceiling is LIVE!



DO NOT ASSUME EXPOSED WIRES, FIXTURES AND CONDUIT ARE DEAD.

Stop work and leave the area when exposed to these type of shock hazards. Immediately notify your supervisor and the general contractor. Employees are not allowed to return to these work zones until all electrical hazards have been locked out or properly covered to prevent contact.

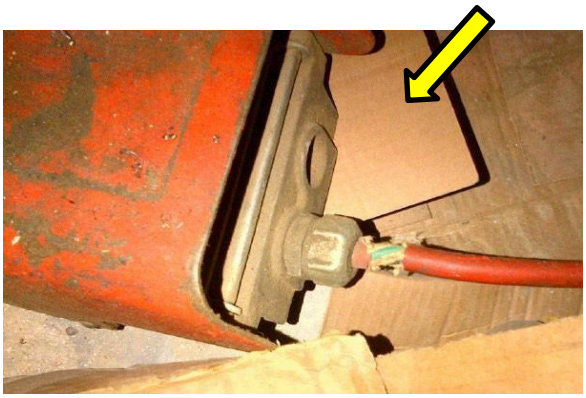
<u>WHAT ARE THE HAZARDS?</u>

With the wide use of portable tools on construction sites, the use of flex cords is often necessary. Hazards are created when cords, cord connectors, receptacles, and cord and plug-connected equipment are improperly used and maintained.

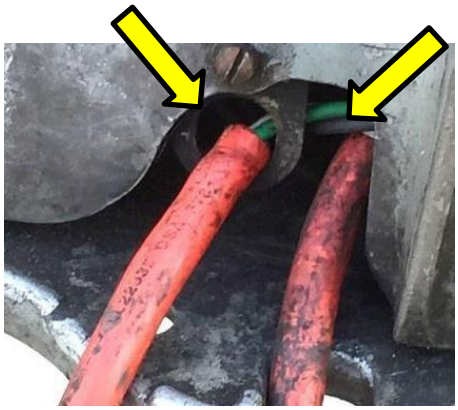
Generally, flexible cords are more vulnerable to damage than fixed wiring. Flexible cords must be connected to devices and fittings to prevent tension at joints and terminal screws. Because the cord is exposed, flexible, and unsecured, joints and terminals become more vulnerable.

Flexible cord conductors are finely stranded for flexibility, but the strands of one conductor may loosen from under terminal screws and touch another conductor, especially if the cord is subjected to stress or strain.

A flexible cord may be damaged by activities on the job, by door or window edges, by staples or fastenings, by abrasion from adjacent materials, or simply due to aging. If the electrical conductors become exposed, there is a danger of shock, burns, or fire. A frequent hazard on a construction site is a cord assembly with strained or damaged connections as see here:



Damaged foot pedal cable



Missing strain relief at the box entrance

When a cord connector (plug) is wet, hazardous leakage current can occur resulting in a potential shock hazard. The shock hazard is not limited to the plug, it can travel down the cable or water path until a fault occurs or a path to ground is established at which time someone could be shocked.

When the leakage current of tools is below 1 ampere, and the grounding conductor has a low resistance, no shock should be (felt or experienced. However, should the resistance of the equipment grounding conductor increase, the current through the body also will increase. Thus, if the resistance of the equipment grounding conductor is significantly greater than 1 ohm (unit of electrical resistance), tools with even small leakages become hazardous.

PREVENTING AND ELIMINATING HAZARDS

GFCIs can be used successfully to reduce electrical hazards on construction sites. Tripping of GFCIs—interruption of current flow— is sometimes caused by wet connectors and tools. It is good practice to limit exposure of connectors and tools to excessive moisture by using watertight or sealable connectors.

Providing more GFCIs or shorter circuits can prevent tripping caused by the cumulative leakage from several tools or by leakages from extremely long circuits.

To prevent and eliminate hazards:

- Electrical tools must be inspected daily before use.
- Damaged electrical tools or equipment must be tagged and removed from service immediately.

Portable Generators

Receptacles on a two-wire, single-phase portable or vehicle-mounted generator rated not more than 5kW (kilowatt), where the circuit conductors of the generator are insulated from the generator frame and all other grounded surfaces, need not be protected with GFCI's. VSC will not use generators exceeding 5kW.

Fuel powered generators must be set up so that CO exhausts does not discharge into interior of building or where CO can accumulate causing a hazardous atmosphere.

Electrical Equipment Usage and Repair

All electrical equipment, extension cords, and GFCI's are to be in good condition, with grounding prongs intact, no wiring splices, exterior covering/insulation intact, and all factory installed tool safety devices in place. The following guidelines also apply:

- GFCI, extension cords, and equipment must be inspected (prior to use) daily for damage.
- All extension cords must be #14 gauge or greater.
- No cord will be run through doorways or windows unless the window or door is secured in an open position.
- All extension cords run throughout construction areas will be suspended off the floor using non-metallic ties.
- Splicing or taping of extension cords as a means of repair is not permitted.

Tool/equipment cords can be repaired by replacing the cord or installing the proper male end connection. However, when this is performed the tool/equipment will not be used until it has been checked by a qualified electrician to ensure the polarity is maintained.

- Strain relief grips should be used when repairing or replacing tool and equipment cords that have been pulled loose from the equipment to avoid future damage of the same type

Example of repair:

These connectors are <u>unauthorized</u> and a violation of VSC policy no repair shall be made to VSC extension cords unless repair is made by a licensed qualified electrician.

This is an example of an authorized connector for flex cords.

Electrical tape is not an approved repair method for damaged cords.

Electrical repairs

Employees are not allowed to perform repairs, test, inspections, or replacement of electrical components of equipment or tools requiring the disassembly of the equipment or tools. Only a qualified electrician or the manufacture can repair, test, or inspect internal electrical components of equipment or tools.

VSC recognizes that on multiple trade jobsites, equipment is located in close proximity and is sometimes shared by each trade. For safety reasons, VSC employees must not use other trades equipment, and likewise other trades must not be permitted to use VSC equipment.

Tools and Equipment

VSC employees must ensure their tools and equipment are in good working condition and in good working order. At minimum, it is expected that each employee will adhere to the following:

- Protective shields, barriers, or insulating materials will be used to protect against shock, burns, or other electrical related

injuries while the employee is working near exposed energized parts.

- All work area(s) is/are adequately lit.
- Only tools and equipment that are properly insulated and designed for work around electrical hazards are permitted.
- When fuse terminals are energized, fuse-handling equipment will be used to remove or install fuses.
- Any insulating tool or equipment found to be defective or worn to the point that it no longer provides the indicated insulating capability will be returned to VSC management for replacement or repair.
- Portable ladders must have non-conductive side rails if they are used where the employee or the ladder could contact exposed energized parts. Employees may not enter spaces containing exposed energized parts if an arc flash hazard exists.

Listed and Rated Test Equipment and 1000V Insulated Hand Tools

Each person shall use listed and rated insulated hand tools meeting ASTM F 1505 and test equipment within the Restricted Approach Boundary of exposed electrical conductors or circuit parts where tools or handling equipment might make accidental contact. When using and caring for hand tools, personnel shall keep them clean and in proper working condition.

Wearing Conductive Articles

Conductive articles of jewelry and clothing (i.e. watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or unrestrained metal frame glasses, etc.) must not be worn where they present an electrical contact hazard with live parts, unless such articles have been rendered non-conductive by covering, wrapping, or other acceptable insulating means.

Overhead Lines

OSHA's preferred method of protecting employees working near overhead power lines is to de-energize and ground the lines when work is to be performed near them. When a worker is working in the vicinity of overhead lines, whether in an elevated position or on the ground, the person must maintain a minimum distance of **20 feet** from the power line. This may include involving other companies in the process.

The purpose of this approach distance is to prevent contact with and/or arcing from energized overhead power lines. The approach distance applies to tools, lifting equipment, scaffolds, ladders and materials (i.e. pipe), which are used by employees, as well as to the employees themselves.

If work is to be performed near overhead lines, a site specific JHA & Safety Plan will be developed with the minimum following requirements:

- The lines must be de-energized and grounded, or other protective measures must be provided before work is started.
- If the lines are to be de-energized arrangements must be made with the person or organization that operates or controls the electric circuits involved so they can de-energize and ground them.
- If protective measures, such as guarding, isolating, or insulating are provided, these precautions must prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

Note: VSC will comply with VSC Electrical Safety Policy or the Owner or General Contractors electrical safety program whichever is more stringent, as long as the program meets the regulatory requirements referenced in the Regulatory Scope.

Vehicular and Mechanical Equipment

All VSC vehicles and mechanical equipment will also maintain a clearance distance of 20 feet from power lines. Employees standing on the ground may not contact the vehicle, or mechanical equipment, or any of its attachments when this clearance is not maintained.

Alerting Techniques

VSC will use the following techniques to warn and protect employees from hazards that could cause injury due to electric shock, burns, or failure of electric equipment parts:

- Safety Signs, Tags and Barricades
    - Live electrical equipment will be tagged, covered, shielded, enclosed, or otherwise protected by covers, barriers, or platforms to prevent undue contact by unqualified persons or objects.
    - The minimum clear distances for these signs and barricades are:

0 – 150	Nominal Voltage to Ground	3 feet
151 – 600	Nominal Voltage to Ground	4 feet
601 – 2500	Nominal Voltage to Ground	5 feet
2501 – 9000	Nominal Voltage to Ground	6 feet
9001 – 25,000	Nominal Voltage to Ground	9 feet
25,001 – 75K	Nominal Voltage to Ground	10 feet
Above 75K	Nominal Voltage to Ground	12 feet

    - For spaces that do not allow 3 feet or more clearance, the minimum distance from the circuit will be 30 inches.
    - Conductive barricades will not be used where they might cause an electrical contact hazard.
- Attendants
    - If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant will be stationed to warn and protect employees.

Lockout/Tagout (Electrical Sources)

VSC employees who are exposed to electric equipment or circuits which have been de-energized will Lockout and Tagout the circuits that energize those parts as described in the "*Lockout/Tagout Safety Policy*", Appendix H. of the VSC Health & Safety Program.

Definitions

Term	Definition
Accessible (as it applies to equipment)	Admitting close approach; not guarded by locked doors, elevation, or other effective means.
Approved	Acceptable to the authority having jurisdiction
Arc Flash Hazard	A source of possible injury or damage to health associated with the release of energy caused by an electric arc. *Note 1:* The likelihood of occurrence of an arc flash incident increases when energized electrical conductors or circuit parts are exposed or when they are within equipment in a guarded or enclosed condition, provided a person is interacting with the equipment in a manner that could cause an electric arc. An arc flash incident is not likely to occur under normal operating conditions when enclosed energized equipment has been properly installed and maintained. *Note 2:* See NFPA 70E, Table 130.5(C) for examples of tasks that increase the likelihood of an arc flash incident occurring.
Authority Having Jurisdiction (AHJ)	An organization, office, or individual responsible for enforcing the requirements of a code or standard or for approving equipment, materials, an installation or a procedure.
Authorized (as applied to persons)	A Qualified person identified by management to perform a specific task.
Barricade	A physical obstruction intended to prevent contact with equipment or energized electrical conductors and circuit parts or to prevent unauthorized access to a work area.
Close Proximity	Close enough to reach, fall into or otherwise accidentally contact an energized conductor or part.
Conductive	Suitable for carrying electric current.
Electrical Hazard	A dangerous condition such that contact or equipment failure can result in electric shock, arc-flash burn, thermal burn, or blast.
Electrical Safety	A system of identifying hazards associated with the use of electrical energy and taking precautions to reduce the risk associated with those hazards.
Electrically Safe Work Condition	A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to verify the absence of voltage, and, if necessary, temporarily grounded for personnel protection.
Energized	Electrically connected to or having a source of voltage.
Energized Electrical Work Permit (EEWP)	A document completed by the task supervisor and authorized by management which permits certain energized work inside the restricted approach boundary.
Equipment	A general term including material, fittings, devices, appliances, luminaries, machinery, apparatus, and the like, used as a part of, or in connection with, an electrical installation.
Energized Work Practice (EWP)	A detailed procedure for performing an electrical task that is part of a written program.
Exposed (as applied to energized electrical conductors or circuit parts)	Capable of being inadvertently touched or approached nearer than a safe distance by a person. This term is applied to electrical conductors or circuit parts not suitably guarded, isolated, or insulated.
Grounded (effectively grounded)	Intentionally connected to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to limit the buildup of voltages to levels below which may result in undue hazard to persons or to connected equipment.
Ground Fault	An unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and normally non-current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.
Ground Fault Circuit Interrupter (GFCI)	A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a ground fault current exceeds the value established for a Class A device.
High Voltage	50 volts and greater.
Job Safety Plan	A documented, step-by-step analysis of a task, including hazard identification, methods of controlling or eliminating all hazards, and all information to complete the task safely with no undue health risks. *Note:* This can also be identified by other names; e.g., Job Safety Analysis.

Labeled	Equipment or materials displaying a label, symbol, or other identifying mark of an organization (i.e., U.L.) acceptable to the authority having jurisdiction. The identifying organization is concerned with product evaluation and maintains periodic inspection of production of labeled equipment or materials. This labeling indicates the manufacturer complies with appropriate standards or performance in a specified manner.
Live Parts	Energized, conductive components.
Minimum Approach Distance	The closest distance a High Voltage Qualified employee is permitted to approach an energized high voltage object. Crossing this distance is considered being in contact with the object.
Qualified Person	One who has demonstrated the skills and knowledge related to the construction and operation of the electrical equipment and installations and who has received safety training to recognize and identify the hazards and reduce the associated risks.
Risk Assessment	An overall process that identifies hazards, estimates the likelihood of occurrence of injury or damage to health, estimates the potential severity of injury or damage to health, and determines if protective measures are required. *Note:* As used in this program, arc flash risk assessment and shock risk assessment are types of risk assessments.
Shock Hazard	A source of possible injury or damage to health associated with current through the body caused by contact or approach to energized electrical conductors or circuit parts. *Note:* Injury and damage to health resulting from shock is dependent on the magnitude of the electrical current, the power source frequency (e.g., 60 Hz, 50 Hz, dc), and the path and time duration of current through the body. The physiological reaction ranges from perception, muscular contractions, inability to let go, ventricular fibrillation, tissue burns, and death.
Task Qualified Person	A non-electrical employee who receives safety training to perform a specific electrical task and who demonstrates the ability to perform all duties safely shall be considered to be a qualified person for that specific task only. A Job Safety Plan (JSP) must be written by a qualified person for all tasks performed by task qualified persons.
Unqualified Person	Any person not recognized by location management as being qualified for electrical tasks but works around electrical hazards.
Utilization Equipment	Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes.
Work, Electrical ("Work")	Interaction with electrical equipment for the purpose of operation, maintenance, testing and troubleshooting, isolation, repair, installation, removal, or similar action that includes indirect or direct involvement by personnel. *Note:* Examples of tasks considered to be electrical work include, but are not limited to: voltage testing, tightening connections, thermography, replacement of components, racking of circuit breakers, operating disconnect handles both in-person and remotely, establishing an electrically safe work condition, commissioning, etc.
Working Distance	The distance between a person's face and chest area and a prospective arc source. The incident energy will increase as the working distance decreases.
Working Near	Any activity inside the limited approach boundary or arc flash boundary.
Working On (energized electrical conductor or circuit parts)	Crossing the restricted approach boundary or intentionally coming in contact with energized electrical conductors, circuit parts, or equipment with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing. There are two categories of "working on": "Diagnostic testing" is work by taking readings or measurements of electrical conductors, circuit parts, or equipment with approved test equipment that does not require making any physical change to the conductors, circuit parts, or equipment; "repair work" is any work physically altering the electrical conductors, circuit parts, or equipment (such as making or tightening connections, removing or replacing components, etc.).