Electrical Safety Program

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Electrical Safety Program

Purpose

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

Electrical energy is one of the most potentially devastating hazards the worker will face in their respective tasks. If this hazard is not avoided or the associated risk limited with work practices or PPE, it can result in death or serious harm. Workers must be trained to understand and avoid the hazards of electrical energy as far as their respective job will put them into direct or indirect contact with this hazard.

The purpose of this electrical safety procedures document is the following:

- To establish the association of the hazard and the impact of the hazard on the human body.
- To direct activity appropriate for the electrical hazards based on voltage levels, energy levels, and circuit conditions.
- To establish workplace requirements for safe work practices for all employees who must perform work or be exposed on or around electrical conductors or circuit parts.
- To ensure safety of employees working with or around electrical hazards.
- To determine safe work practices through defined procedures with defined responsibilities.
- To identify the means by which these hazards will be labeled or otherwise identified throughout the facility.
- To provide possible mitigation strategies to lessen the electrical hazards.
- To comply with OSHA, NFPA 70E and other applicable governing bodies, codes, standards, and laws.

Principles

The following principles will determine the procedures and policies for the Electrical Safety Program:

- De-energize when possible. The primary goal is zero voltage!
- All conductors are to be considered energized until proven to be de-energized.
- Plan every job. The approach and step-by-step procedures to complete work must be discussed by supervisors and workers before beginning the job.
- Document procedures (including but not limited to work procedures, LOTO, Electrical Safety Program, etc.) and continuous improvement of these procedures.
- Identify the hazards through engineering analysis and risk assessments.

- Periodically inspect/evaluate electrical equipment.
- Maintain electrical equipment's installation and integrity.
- Use the right tools for the job.
- Assess qualified electrical worker's abilities with defined metrics.
- Mitigate hazards when possible with engineering or administrative controls.
- Anticipate problems. If it can go wrong, it might go wrong.
- Provide training to all workers effected, qualified and unqualified.
- Personal Protective Equipment is used as a last resort.

Responsibilities

Department Head/Designee

The Department Head/Designee is responsible for the following:

- Ensure that managers are following procedural requirements as defined in this document.
- Ensure that pressure is not applied to management and workers that could force unsafe activities.
- Ensure that EHS completes annual audits.
- Provide support and funding for PPE.

Maintenance & Electrical Supervisors

Supervisors overseeing crews of electrical/controls workers are responsible for the following:

- Promote electrical safety to all employees.
- Conduct annual field audits to assure compliance with the program, LOTO and work procedures.
- Ensure employees receive training appropriate to the tasks to which they are assigned.
- Ensure employees are provided with and use PPE and tools.
- Require maintenance staff to follow safe work practices and holds staff accountable to safe work practices.
- Procure, maintain, inspect and issue required PPE, tools, equipment, meters, and ladders as required to perform electrical work safely.
- Ensure that all electrical workers have access to written electrical safety programs.
- Develop work procedures to promote consistency in electrical work tasks.

Qualified Electrical Workers

Workers directly exposed to electrical hazards (qualified) are responsible for the following:

- Follow the policies and procedures of the electrical safety program.
- Use, store, and maintain provided PPE, tools, and test instruments appropriately per applicable industry codes and standards and per manufacturer's recommendations.
- Attend all training required for the Electrical Safety Program.
- Report electrical safety hazards to a supervisor and/or EHS.

- Be responsible for understanding material presented in training and in the written electrical safety program, and ask questions concerning material that is not understood.

Department of Environmental Health & Safety

Environment Health & Safety is responsible for the following:

- Annually audit that each department within the campus to ensure that they are meeting the requirements of the written electrical safety program.
- Review the Electrical Safety Program and revise, as necessary.
- Maintain Electrical Safety Training records.
- Ensure that training requirements identified in this program are met.

Electrical Safety Committee

The Electrical Safety Committee is responsible for the following:

- Review and update the program as needed.
- Provide overall technical oversight and guidance.

Unqualified Electrical Workers

Maintenance workers who are restricted from doing electrical work as their respective tasks do not require such work are responsible for the following:

- Attend electrical safety training for unqualified workers.
- Report any concerns to appropriate management.
- Do not engage in work that is not approved for unqualified workers.

Electrical Hazards

In order to avoid and/or mitigate a hazard, a worker must first understand the nature and extent of the hazard. Electrical energy presents hazards that, if not avoided, could or will result in death and/or serious injury.

Historically, we have seen in general industry that for every 300 non-electrical recordable injuries, one is a fatality. For electrical recordable injuries, for every 10 incidents, one is a fatality. This correlation directly shows that there are few 'second chances' granted by accidents involving electrical injury.

The electrical hazard can be divided into three distinct hazards: electric shock, arc flash, and arc blast.

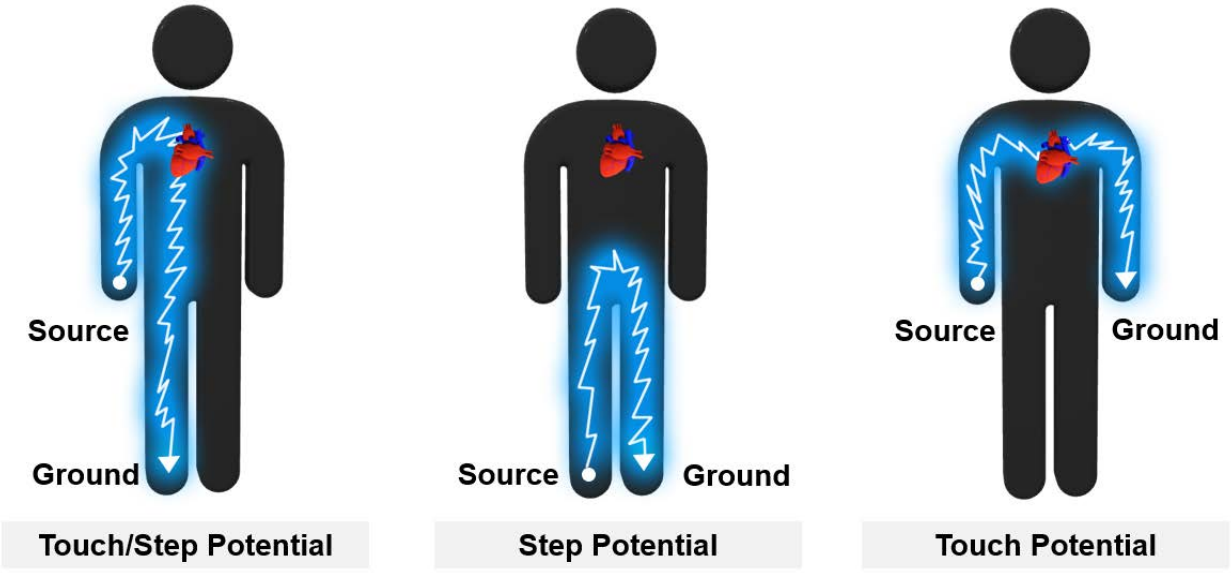
Electric Shock Hazard

The electric shock hazard is the more apparent hazard of electricity. Since the inception of electricity as a viable means of conveying power on a large scale, workers have been aware of the risk of electric shock. This is the passage of current through the human body. When enough current passes through the body, an electrocution may happen which is a fatality. **The concern of fatalities due to electrocution may occur on voltages from 50 volts and above per the NFPA 70E, NEC, and OSHA.**

The human body offers about 1000 ohms of resistance to the flow of electric current. The least damaging amount of electric current through the human body is in the 4-6 milliamp region (0.004 – 0.006 Amps). If a worker were to come into contact with a 480 Volt electrical conductor or circuit part, they could potentially conduct 480 milliamps of current according to Ohm's Law. This is enough current to cause respiratory paralysis (30-75 milliamps), cause ventricular fibrillations (100-200 milliamps), and clamp the heart to stop beating (200-500 milliamps).

Condition	Resistance (ohms)	
	Dry	Wet
Finger Touch	40,000 - 1,000,000	4,000 - 15,000
Hand Holding Wire	15,000 - 50,000	3,000 - 6,000
Finger-Thumb Grasp	10,000 - 30,000	2,000 - 5,000
Palm Touch	3,000 - 8,000	1,000 - 2,000
Human Body	200 - 1,000	

Current Through Body	Effect on Body
0.5 - 3 mA	Tingling Sensations
3 - 10 mA	Muscle Contractions and Pains
10 - 40 mA	"Let-go" Threshold
30 - 75 mA	Respiratory Paralysis
100 - 200 mA	Ventricular Fibrillations
200 - 500 mA	Heart Clamps Tight
1500 mA +	Tissue & Organs start to burn



This diagram shows the possible flow of current through the body. Obviously, any time current is flowing through the heart, the worker's life is at serious risk.

Protection from the shock hazard is achieved first by hazard avoidance, second by engineering mitigation and change of work practices, and lastly by dielectric mediums such as insulated gloves, insulated tools, rubber shoe soles, and other dielectric materials.

Arc Flash Hazard

When the insulating medium no longer offers sufficient resistance to the flow of electric current, an arc can occur. If enough electrical energy is present, this arc will ionize the air surrounding it causing a traumatic and explosive event called an arc flash.

This event can result in temperatures in excess of 35,000 degrees Fahrenheit, which may cause life changing human injury up to and including death and catastrophic equipment damage.

The main risk associated with arc flash is ignition of polyester or cotton clothing. When this ignition occurs, the worker may receive significant burn injuries resulting in death or months in burn units. Workers may also have vision loss or damage due to the immense light emitted in the visible, UV, and infrared spectrums.

These events may be the result of human error (i.e., dropping metal tools into the circuit or panel enclosures), equipment failure (i.e., rusted blades of a disconnect), and an innumerable assortment of other factors.

Arc Blast Hazard

Though an arc flash and an arc blast may be part of the same short circuit event, it is important to distinguish between the two hazards as the arc flash is a thermal heat event while the arc blast is a violent physical force causing solid and molten shrapnel to fly out from the source.

The arc blast is a traumatic event caused by pressure and sound waves resulting from the arcing event. These pressure waves may throw a human body, rupture eardrums, and present other potentially traumatic injury to the human body.

Training Requirements

Workers who are exposed or may be exposed to energized electrical conductors or circuit parts 50 Volts to ground or greater, shall be trained to understand the specific hazards associated with electrical energy. They shall also be trained in electrical safe work practices and procedures as defined in the Qualified Electrical Worker and Unqualified Worker sections below. Both Qualified Electrical Workers and Unqualified Workers are required to be trained. They shall be trained to identify and understand the relationship between electrical hazards and possible injury. Each worker must understand which specific activities he or she is qualified and authorized to do. The training shall establish employee proficiency in the work practices required by OSHA and NFPA's 70E for electrical work.

Workers shall be trained to understand the hazards that pertain to their respective job & title responsibilities. A worker tasked with general electrical maintenance shall have a thorough understanding of electrical safety and the principles of all written documents related to the electrical safety program that impact their assigned work tasks whether routine, repetitive, or occasional. Workers tasked with simple or singular electrical tasks only, may not need to understand and utilize all aspects of the Electrical Safety program, only those that pertain to their specific jobs.

Qualified Electrical Worker

Employees shall receive training in avoiding the electrical hazards associated with working on or near exposed energized parts prior to performing energized electrical work. Such training will be provided initially with refresher training every three years or when workplace conditions change. The following items are to be included in the training for a Qualified Electrical Workers:

- Demonstrate an acceptable working knowledge of the National Electrical Code for each level of electrical responsibilities.
- Establish an Electrically Safe Work Condition (ESWC).
- Elements of the written Electrical Safety Program based on OSHA and NFPA 70E regulations.
- Skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
- Perform on-the-job training with a qualified electrical worker.
- Skills and techniques necessary to determine the nominal voltage of exposed live parts.
- Procedures for working in and around limited, restricted, and arc flash boundaries as defined in the written Electrical Safety Program.
- Information and application of arc flash and shock hazard labels.
- Selection and use of personal protective equipment, tools, insulating and shielding materials and equipment for working on or near energized parts.

- Selection of an appropriate test instrument to verify the absence of voltage, including interpreting indications provided by the device and a demonstrated understanding of all limitations of each specific voltage detector that might be used.
- Shall demonstrate knowledge in methods of release of employees from contact with exposed energized electrical conductors or circuit parts. These workers shall also be trained in recognizing signs and symptoms of electric shock, and electric burns.
- Demonstrate knowledge of acceptable work activities as required by law and all applicable University policies and procedures.

They shall have the following training:

- Basic Cardiopulmonary Resuscitation (CPR) and Automatic External Defibrillator (AED) and first aid every 2 years.
- Methods of release of workers (who are 'hung up' on energized electrical conductors or circuit parts.) annually.

Varying Levels of Qualified Electrical Worker

Qualifying electrical workers shall be performed by an authorized supervisor. A qualified electrical worker shall only be trained by a qualified person. Many workers tasked with electrical specific tasks will have varying levels of assignments with varying levels of hazards.

Management shall use the following designations for varying levels of qualified electrical workers. The tasks performed in each level can vary from facility to facility.

Mechanical/Controls/HVAC Technicians - Level 1

This is an electrical worker who is tasked with maintaining controls systems that will not exceed 480 volts and/or servicing HVAC units with a single electrical disconnecting means. The systems these workers may be servicing may include alarms, electrical metering, emergency lighting, HVAC, and rooftop/exhaust units.

These workers will be performing tasks such as the following:

- Basic testing & troubleshooting.
- Using a rated voltage meter for testing electrical components on their respective lines.
- Accessing electrical equipment in the same enclosures as voltages exceeding 480 volts, but not working on electrical components with a nominal voltage exceeding 480 volts.
- Performing basic testing/troubleshooting on HVAC, rooftop/exhaust units, for equipment with a single electrical disconnecting means.

Electricians/Skilled Trades Technicians - Level 2

This is a highly skilled electrical worker with extensive experience and knowledge of electrical power distribution systems. This worker should consistently demonstrate knowledge of safety protocols as well as the NEC and NFPA 70E.

These workers will be performing tasks such as the following:

- Electrical testing & troubleshooting.
- Using a rated voltage meter for testing electrical components.
- Accessing electrical motor control Centers, panelboards, and controls.
- Replacing fuses, circuit breakers, contactors, VFDs and other electrical components within their abilities.
- Determine if qualified to perform electrical work.
- Installing new wiring for new or repurposed equipment.
- Installing and bending conduit for new or repurposed installations.
- Accessing or servicing switchgear or switchgear.
- Accessing equipment with fuses or circuit breakers.
- Accessing and working electrical enclosures with a nominal voltage exceeding 1000 Volts.
- Making electrical terminations on electrical wire with a nominal voltage exceeding 1000 Volts.
- Using non-contact voltage testers to verify absence of voltage on electrical equipment with a nominal voltage exceeding 1000 Volts.

Unqualified Worker

Employees shall receive training in any electrical safety related work practices that are necessary for their safety in the performance of their job duties. The training must focus on hazard recognition and avoidance. Such training will be provided when the employee is initially assigned to the job and refresher training will be provided every three years or when conditions change. The following items are to be included in the training of Unqualified Workers:

- Electrical hazards including fire, electric shock, arc flash, arc blast and other injuries that are common with electrical work.
- How to recognize and avoid these hazards, including how to recognize a limited approach boundary and warning signs or labels.
- Activities that are prohibited for Unqualified Workers.
- Clarification of which tasks they are qualified for and which tasks they are not qualified for as some workers may be qualified for some tasks, but not other tasks.

Retraining

This training should occur in a classroom, on-the-job, or a combination of the two. Workers shall receive additional training (or retraining) under any of the following conditions:

- If annual performance audit or an inspection indicates that the employee is not complying with safety-related work practices.
- If new technology, new types of equipment, or changes in procedures necessitate the use of safety-related work practices that are different from those that the worker would normally use.
- If the worker must employ safety-related work practices that are not normally used during his or her regular job duties.
- Full retraining shall be performed at intervals not to exceed 3 years.

Annual Field Audits

The Department Head/Designee must determine through annual supervision that the guidelines outlined in this electrical safety program are being followed by conducting annual field audits on all electrical workers.

Documentation of Training and Experience

Directors and Managers shall maintain documentation of field audits for Qualified and Unqualified Workers and submit these records to Environmental Health and Safety. Documentation shall be stored by EHS and shall be maintained for the duration of the workers employment. Documentation is necessary to demonstrate that individuals have met the training and experience requirements for the types of work being performed. Documentation shall contain the content of the training, each employee's name, and dates of training at a minimum. Supervisors will maintain on the job retraining documentation.

Certificates of completion shall be issued and stored as workers complete training.

Annual Field Audit Requirements

Annual field audits shall be performed by a qualified supervisor on an annual basis for all qualified electrical workers. Qualified electrical workers must pass all sections of their annual field audit respective to their qualified 'level' as outlined below.

If a worker fails any portion of the annual field audit, the worker must be retrained in areas of deficiencies in knowledge. On the field audit form, areas have been designated that always require retraining and re-auditing. These areas are indicated by a blacked-out section under the 'Field Corrected' column. If a worker fails one of the 'blacked out' sections on the field audit, they must be retrained and re-audited. All other areas may be 'field corrected' by the supervisor. If workers demonstrate less than the required knowledge requirement, retraining and re-auditing must be completed.

If a worker fails the audit and must be retrained, the annual field audit retraining form must be completed, and a follow up field audit must be scheduled by the supervisor where the worker must demonstrate he has learned the required electrical safe work practices. This field audit is to be within one week of the failed audit. Additional failed field audits should be referred to EHS.

Workers performing electrical tasks will be classified according to the training they have received, knowledge and by performance on an annual field audit. All qualified electrical workers will fall into one of the following categories:

Level	Roles/Responsibilities
1	Mechanical/Controls/HVAC Technicians
2	Electricians/Skilled Trades Technicians

Approach Boundaries

An arc flash incident may send an explosive burst outward burning employees in the vicinity. Therefore, precautions shall be taken to limit the entrance into these boundaries.

Because the presence of electricity presents the arc flash and shock hazard, boundaries are defined for each hazard in a unique way.

Shock Hazard Boundaries

Electric current may pass through the body when a worker contacts an energized electrical conductor or circuit part However, within a certain distance it can be reasonably assumed that the worker may accidentally come into contact with the electrical conductor or circuit part. Therefore, there are two distinct boundaries defined in NFPA 70E:

1. Limited Approach Boundary
2. Restricted Approach Boundary

Determining Shock Protection Boundaries

These boundaries are determined by tables in the NFPA 70E standard.

Shock Boundaries

Nominal System Voltage	Limited Approach Boundary	Restricted Approach Boundary
50-150 Volts	42 inches	Avoid Contact
151-750 Volts	42 inches	12 inches
751 V-15 kV	60 inches	26 inches

Procedures for Shock Protection Boundaries

The following procedures shall be adhered to when approaching these shock protection boundaries.

- Unqualified workers shall be outside the Limited Approach Boundary at all times unless they are accompanied by a qualified electrical worker (i.e., for purposes of examination by a supervisor).
- Unqualified workers shall never be allowed inside the Restricted approach boundary even with the proper PPE.
- Insulated tools shall be used at all times within the Restricted Approach Boundary.
- Insulated gloves shall be worn at all times within the Restricted Approach Boundary.

Arc Flash Boundary

A worker shall not be within the Arc Flash Boundary without the appropriate level of Arc Rated (AR) PPE. This level of PPE shall be determined by the AF PPE Level assigned to the equipment as indicated on the

arc flash warning label or by the AF PPE Category Method. The label shall always take precedence in determining the arc flash boundary.

For each electrical installation, one AF PPE Level or AF PPE Category will be assigned (determined by whether the incident energy analysis has been performed yet), and one level of PPE will be donned appropriately whenever the arc flash boundary is crossed for each installation. A worker may not wear less PPE when within the arc flash boundary. The arc flash boundary for systems 50 volts or greater shall be the distance at which the incident energy equals 5 J/cm² (1.2 cal/cm²).

Identify the arc flash boundary from the AF label on the electrical equipment. If no label is present, the boundary shall be set per NFPA 70E Category method identified in the next section.

PPE Selection shall be in accordance with the PPE section of this document.

Barricades, Attendants, or Other Means of Preventing Access within Boundaries

The Arc Flash Boundary may be further from the electrical installation than the Limited Approach Boundary, or the Arc Flash Boundary may be closer to the electrical installation than the Limited Approach Boundary.

The boundary that is furthest from the electrical installation is the boundary where limiting means shall be applied to prevent access.

An unqualified worker may not understand the boundary system; therefore, use additional means to impede the unqualified worker from entering either the Limited Approach Boundary or the Arc Flash Boundary. The primary means of preventing access shall be a barricade system. Barricades should be used in conjunction with safety signs to prevent or limit employee access. These barricades shall also be non-conductive in nature so that it cannot cause further risk as an electrical hazard. If the barricade system is not adequate as determined by management or a qualified electrical worker performing electrical work, then prevent access by using an attendant

When the incident energy method has not been performed on the electrical enclosure, the following method shall be used for selecting barrier distances.

AF PPE Category Method (Unlabeled) Boundaries

AF PPE Category	Arc Flash Boundary
2	5 feet
4	20 feet

Electrical PPE

Personal Protective Equipment (PPE) is not a substitute for engineering controls or work practices and is required whenever an electrical hazard exists. For many tasks, work must be performed in an energized state; therefore, PPE shall be used.

There are two basic types of electrical PPE:

1. Dielectric PPE employing an insulating material to protect the worker from the electric shock hazard.
2. Arc Rated or Arc Flash PPE to protect the worker from the arc flash hazard (thermal heat).

Often both types of electrical PPE must be used together.

Shock Hazard PPE

The following PPE will be followed to limit exposure to the shock hazard:

- Shoes with leather uppers and rubber soles shall be used by all workers within the Limited Approach Boundary.
- Qualified electrical workers may identify the need for other types of insulated materials or equipment that may be necessary when performing various electrical tasks. Alternate insulating materials and equipment shall not be used without consent of management.

If there is a danger of hand and arm injury from electric shock, employee should wear rubber insulating sleeves along with the rubber insulated gloves and leather protectors. Rubber insulated gloves shall be rated for the voltage for which the gloves will be exposed.

Arc Flash PPE (Criteria for Selection)

Arc flash PPE shall be selected either by an applied method based on the Tables in NFPA 70E or based on a label generated using the incident energy method. Refer to "Arc Flash Risk Assessment" for clarification.

The following PPE is required to limit exposure to the arc flash hazard:

- Arc Rated Clothing with a minimum cal/cm^2 rating greater than the cal/cm^2 rating as determined by the arc flash risk assessment shall be worn at all times by a worker who is within the Arc Flash Protection Boundary on all electrical installations with a rating of AF PPE Level 1, 2, 3, or 4.
- Workers within the Arc Flash Boundary of PPE Level - electrical installations shall wear cotton or other natural fibers. Please note that the only instances when PPE Level - may be worn is when an incident energy analysis has determined that the cal/cm^2 rating is less than 1.2 cal/cm^2.

- Untreated polyester or other untreated synthetic fibers shall not be worn within the Arc Flash Boundary as they will melt during an arc flash event and embed in the skin of the worker. This includes undergarments.
- Arc rated hardhat with face shield and balaclava shall be worn when within the Arc Flash Boundary on all electrical installations AF PPE Level 1 & 2.
- Arc Rated pants and shirts, or coveralls shall be worn when within the Arc Flash Boundary on all electrical installations AF PPE Level 1 & 2.
- Arc Rated beekeeper Style Hoods with bibs or suit shall be worn when within the Arc Flash Boundary on all electrical installations AF PPE Level 3 & 4.
- Leather protector gloves shall be worn within the Arc Flash Boundary at all times.
- Arc Rated apparel shall cover all ignitable clothing and allow for movement and visibility.
- AR apparel must cover potentially exposed areas as completely as possible.
- Fibers that can melt, such as acetate, nylon, polyester, polypropylene, and spandex shall not be permitted in fabric under-layers next to skin. (An incidental amount of elastic used on non-melting fabric underwear or socks shall be permitted).
- All AR fabrics must be rated according to ASTM F-1506.
- AR garments shall be the outermost layer in order to be rated to the hazard, which the worker will be exposed.
- All PPE such as high visibility vests, fall-protection equipment, etc. worn while performing electrical work shall be arc rated.

Arc Rated PPE shall adhere to the following table for minimum Arc Ratings when the incident energy analysis has been performed:

Site Specific AF PPE Level Table

AF PPE Level	Arc Rating or ATPV
-	Natural Fibers
1	Minimum 4 cal/ cm^2
2	Minimum 8 cal/ cm^2
3	Minimum 25 cal/ cm^2
4	Minimum 40 cal/ cm^2
Dangerous	NO SAFE PPE EXISTS

Hearing Protection

Hearing protection shall be worn to protect from the possibility of sound waves that may rupture eardrums when working within the arc flash boundary. To provide the most hearing protection from arc blast, employees shall wear canal insert earplugs. These shall be worn on all energized electrical work and 'change of state' electrical work. Employees shall wear hearing protection whenever working within the arc flash boundary. Hearing protection may also be required for other environmental noise conditions. Refer to the Florida State University Hearing Conservation Program for more information.

Vision Protection

Vision Protection (part of arc rated face shield) to filter out hazardous light emissions from an arc flash in the UV, infrared, and visible spectrum is required for all work classified as either AF PPE Category 1

and up as well as AF PPE Level 1 and up. The face shields shall be Arc-Rated to the ASTM F2187 Standard.

Safety glasses rated to the ANSI Z87.1 standard shall be worn underneath face shields for additional protection.

Clothing not Permitted

The following clothing will not be permitted for work on or near energized electrical conductors or circuit parts:

- Untreated Polyester clothing shall never be worn for electrical work.
- Untreated or non-AR clothing such as coats or jackets shall not be worn over the top of AR clothing during electrical work.
- Non-AR High Visibility vests worn over AR clothing shall be removed before performing electrical work.
- Undergarments containing spandex or other melting materials shall not be worn while performing electrical work.
- Synthetic material wicking undergarments shall not be worn.

Clothing Care and Inspection

The following are requirements for care and inspection of arc rated clothing:

- AR apparel shall be visually inspected before each use. Torn or damaged garments shall not be used.
- AR apparel shall be repaired with materials that maintain the garments rating and shall be done per garment manufacturer's requirements.
- AR apparel that is contaminated shall not be used. Protective items that become contaminated with grease, oil, flammable liquids, or combustible liquids shall not be used.
- Garments shall be laundered per garment manufacturer's requirements. Use only approved detergents.
- Fabric softeners or dryer sheets shall not be used.
- The garment manufacturer's instructions for care and maintenance of AR apparel shall be followed.

Insulated Glove Requirements

The following requirements shall be required for care and inspection of insulated gloves:

- Insulated gloves shall be field tested prior to each use. This involves inflating the glove and ensuring that there are no gaps in the insulation.
- Insulated gloves shall be replaced and/or lab tested by management at intervals not to exceed 6 months.
- Insulated gloves are to be removed from service if there is any defects, gaps, or malformations.

The following table shall be used for selecting insulated gloves as determined by the nominal voltage:

Class	Voltage
00	0-500
2	501-17,000
4	17,001-36,000

Electrical Test Instruments

Instruments used for measuring, testing, tuning, verifying, or calibrating electrical conditions shall be maintained properly and rated to work on the circuit to which they are applied. The improper use of electrical test instruments may lead to serious injury and/or death.

Only qualified electrical workers shall perform tasks such as testing and troubleshooting using electrical test instruments within the limited approach boundary.

The following is required when selecting test equipment:

- All Electrical test instruments such as voltmeters must meet Underwriters Laboratories (UL), the Institute of Electrical and Electronics Engineering (IEEE), and ANSI/ISA S82.02 (Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use) consensus standard requirements should be purchased or used.
- Voltmeter shall be a minimum of a Category III for the voltage on which they will be used. This Cat III rating shall be confirmed as displayed on the outer case of the instrument.
- Test equipment shall be rated at the voltage on which they are used for testing.
- All test instruments shall be tested prior to use.
- All test instruments shall be visually inspected before use for any defect and removed from service if found defective.
- Test leads shall be examined before each use of the test equipment and removed from service if any gaps are found in the insulation.
- Test instruments for electrical equipment or circuits with a nominal voltage that exceeds 1000 Volts require non-contact voltage testers that are mounted to hot sticks. Contact meters shall not be used for voltages exceeding 1000 Volts.
- Workers must verify the absence of voltage with a contact voltmeter before establishing an Electrically Safe Work Condition (ESWC). (Except when voltage exceeds 1000 Volts, then a non-contact meter may be used.)
- Contact between the voltmeter leads and an energized conductor must not exceed the duty cycle specified on the meter's manufacturer label.
- Prior to using a voltmeter, a Qualified Electrical Worker shall receive comprehensive voltage testing training on the specific meter that the worker will be using. This training shall be documented. This training can generally be provided by the manufacturer of the voltage meter.
- Proximity detectors DO NOT comply with the performance requirements of NFPA 70E and shall not be used in place of voltmeters and therefore should not be used by qualified electrical workers for verifying absence of voltage. (This excludes voltages exceeding 1000 Volts)
- As the fusing is a crucial element on the rating of the voltmeter, all fuse replacements (when necessary) shall be replaced with the manufacturers recommended fuse.

Insulated Tools and Equipment

Insulated tools and equipment shall be used within the Restricted Approach Boundary. The following factors shall be considered for working with insulated tools and equipment:

Use of insulated tools and equipment shall only be used if an electrically safe work condition cannot be established. A live electrical work permit shall be completed before this type of work is attempted.

- Insulated tools shall be rated for the voltages on which they are used.
- Insulated tools shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.
- Portable ladders used for electrical work shall have nonconductive side rails.
- All insulated tools and equipment shall be rated according to ASTM F-1505.
- Electrical protective equipment shall be maintained in a safe, reliable condition.
- Insulating equipment shall be inspected before each day's use and immediately following any incident that may raise suspicion of having caused damage.

Classifications of Electrical Work

When working within the Limited Approach Boundary or arc flash boundary of electrical conductors or circuit parts, work shall be classified as either energized, de-energized, testing & troubleshooting, or change of state.

De-Energized Work

De-energized work is work performed on a circuit that has been put into an Electrically Safe Work Condition (ESWC).

All electrical conductors or circuit parts shall be considered energized until verified to be de-energized through the process of achieving an ESWC (Electrically Safe Work Condition), which is outlined in the following section.

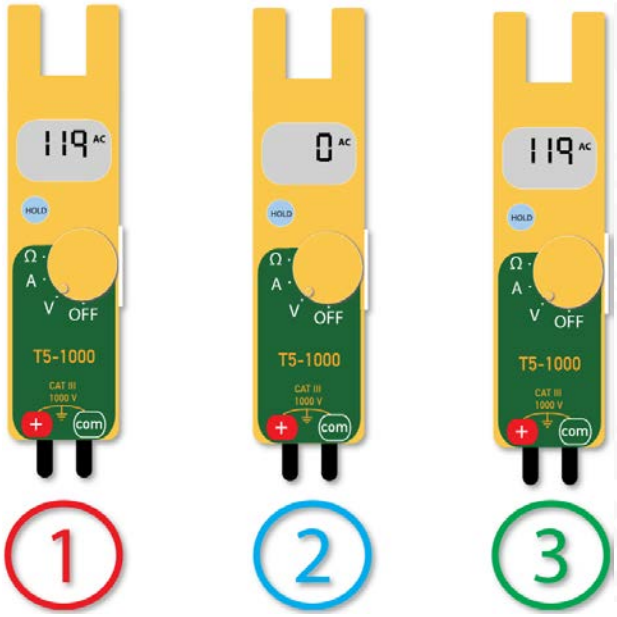
Electrically Safe Work Condition (ESWC)

Work shall be classified as de-energized if the following steps are taken to establish an ESWC (Electrically Safe Work Condition):

1. All potential sources of energy are determined from applicable one-line diagrams, panel schedules, and other equipment labeling schemes.
2. Load current must be interrupted. Motors that are running downstream of the disconnect must be shut down.
3. Disconnects or other switching means shall be opened.
4. Where possible, all disconnecting means shall be verified to be opened by a visual inspection or draw out type breakers shall be removed to the fully disconnected position. Each type of manual disconnecting means shall have a predetermined method of visual verification where possible.
5. Lockout/Tagout devices shall be installed in accordance with a documented and established policy.

6. Before enclosure containing electrical conductors or circuit parts is removed or opened to expose energized electrical conductors or circuit parts, PPE shall be worn in accordance with the PPE Policy as outlined in section. To verify the absence of voltage the Restricted Approach Boundary will be crossed as well as the Arc Flash Protection Boundary, therefore, Arc Flash and Shock PPE shall be worn.
7. A properly rated contact voltage (per ANSI S82.02) detector shall be used to verify the absence of voltage. A voltage meter shall be verified to be in working order before and after the following voltage measurement process by testing the meter on a known voltage source.
    1. First, test a known voltage source. The meter should read near the nominal source voltage level as indicated in the example below.
    2. Now take a voltage measurement on the circuit being tested for absence of voltage. You should read 0 volts.
    3. Now recheck the meter on the same known source to verify that the meter is still working properly.

Example: 120 V Known Source



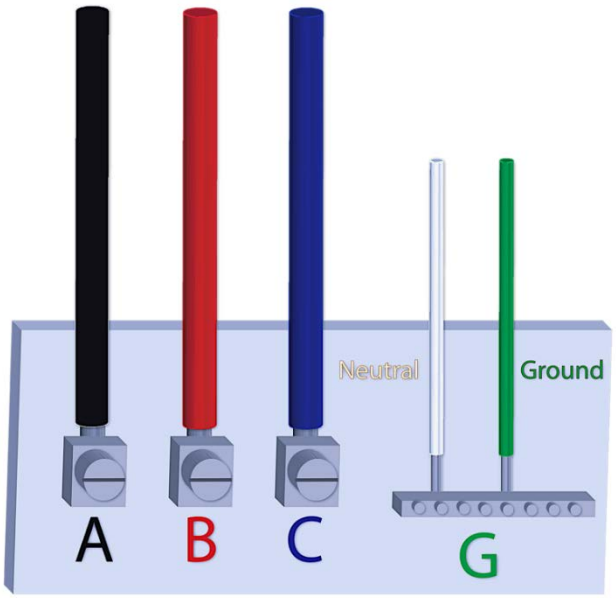
Once a meter has been verified to be working correctly, the qualified electrical worker may then verify the absence of voltage on the energized electrical conductors or circuit parts by checking each phase to phase and phase to ground.

Three-phase power shall be delineated in individual phases as Phase A, Phase B, and Phase C. The workers shall verify that each Phase is de-energized in order to achieve an ESWC.

1. Phase A to B shall be verified to be 0 volts
2. Phase B to C shall be verified to be 0 volts
3. Phase A to C shall be verified to be 0 volts
4. Phase A to Ground shall be verified to be 0 volts
5. Phase B to Ground shall be verified to be 0 volts
6. Phase C to Ground shall be verified to be 0 volts

7. Neutral to Ground shall be verified to be 0 volts

   Once all voltage measurements have been taken, the meter shall be checked again to ensure that overcurrent protection device within the meter was not damaged or opened. The meter shall once again be tested on the same known voltage source as previously tested.



8. If equipment contains capacitors or a source of induced voltage, these sources of energy may require various grounding techniques to establish and electrically safe work condition. If concerns arise that these types of energy are present, the manufacturer's manual shall be consulted.

   When the electrical component or circuit parts has a nominal voltage exceeding 1000 Volts, stored energy is more likely to present a life-threatening hazard. Grounding straps and shorting of capacitor plates may be utilized to discharge stored energy in capacitive elements. Turning of mechanical rotors may also back-feed life-threatening energy into the system so these rotors may need to be locked for certain types of loads. Interlock mechanisms may also provide secondary power from a different source so these interlocks may not be relied on as a disconnecting means unless properly locked out and tagged. Equipment manuals shall be consulted for deenergizing any loads or electrical equipment or circuit parts with a nominal voltage exceeding 1000 Volts.

Energized Work

Energized work is work that is performed on an energized circuit. This would include but is not limited to tasks such as tightening a lug, manipulating wire, cutting conductors, tapping a live bus, insertion or removal of a bucket into a MCC, terminating wire connections, inserting a fuse or circuit breaker into live bus, etc.

All work performed on electrical conductors or circuit parts that have not been put into an Electrically Safe Work Condition (ESWC) shall be classified as energized work and shall only be completed by qualified electrical workers. This energized work shall be permitted where the employer can demonstrate that de-energizing introduces additional hazards from increased risk, infeasibility, or work is being completed on equipment carrying less than 50 volts. Work performed within the Limited Approach Boundary or Arc Flash Boundary shall be considered energized even if the work does not require direct contact with energized electrical conductors or circuit parts. Appropriate PPE and tools shall be used. All energized work must be performed with an Energized Electrical Work Permit (EEWP) unless requirements are met for exceptions to the EEWP.

When management identifies a particularly hazardous, electrical work may require a buddy system on voltages less than 1000 Volts. Please note that the 2nd person utilized in the buddy system for establishing an ESWC on systems less than 1000V may be an unqualified worker who is trained on method of contact release and/or AED/CPR protocol.

Testing & Troubleshooting

Testing & troubleshooting work is work where the circuit is energized, but it is not possible to perform this work in a de-energized condition. This includes tasks such as voltage measurements, troubleshooting controls equipment, visual inspection, and thermal imaging.

For purposes of testing & troubleshooting, electrical conductors or circuit parts cannot be put into an Electrical Safe Working Condition (ESWC). This work may be performed by qualified electrical workers while the electrical conductors and circuit parts are energized without an Energized Electrical Work Permit (EEWP).

Testing and troubleshooting other than verifying absence of voltage shall not be performed on electrical components or circuit parts with a nominal voltage exceeding 1000 Volts except for verifying absence of voltage.

'Change of State Work'

All work involving switching or other steps that change the state of an electrical conductor or circuit part from a de-energized to energized state or an energized to a de-energized state shall be classified as 'Change of Electrical State' work.

While this type of work may not expose the worker to any exposed electrical conductors or circuit parts, the possibility may exist that energy may be 'blown out' or released due to equipment failures or system transients. All 'Change of Electrical State' work shall be performed in adherence with a pre-established policy specific to that equipment.

Equipment that is not properly maintained (per applicable industry codes and standards), not properly installed (per applicable industry codes and standards), and has evidence of impending failure (such as evidence of arcing, overheating, loose or bound equipment parts, visible damage, deteriorations, or other damage) shall require PPE for 'Change of Electrical State' work.

Medium Voltage Work

When working on or near electrical components or circuit parts with a nominal voltage that exceeds 1000 Volts, additional electrical safe work practices shall be utilized by management and by the worker. Only Level 2 Qualified Electrical workers may work on or near electrical components or circuit parts with a nominal voltage that exceeds 1000 Volts.

Requirement for a Medium Voltage Electrical Work Permit

All work performed on or near energized electrical equipment or circuit parts with a nominal voltage exceeding 1000 Volts shall only be performed after completion of the Medium Voltage Electrical Work Permit form.

Additional Requirement for ESWC

Energized work will never be performed on electrical equipment or circuit parts with a nominal voltage exceeding 1000 Volts; however, establishing an Electrically Safe Work Condition (ESWC) on this equipment provides unique hazards. A special lockout/tagout procedure shall be written when performing work on medium voltage equipment (see FSU Hazardous Energy Control (Lockout-Tagout program)). Proper grounding jumpers shall be used when establishing a ESWC on medium voltage equipment.

Non-Contact Voltage Testers

Non-contact voltage testers rated for use on nominal voltages exceeding 1000 Volts shall be utilized for verifying absence of voltage. The voltage rating of these testers must exceed the nominal voltage of the circuit being tested. These voltage testers shall be mounted on a properly rated hot stick.

Hot Sticks

Hot sticks must be rated for use on nominal voltages exceeding 1000 Volts. The voltage rating of these hot sticks must exceed the nominal voltage of the circuit being tested. Hot sticks must be given a visual inspection prior to use to ensure that there are no moisture or contaminants on the surface of the hot stick that could be conductive. **These hot sticks shall be tested every 2 years for repair and/or cleaning.**

Buddy System

Work performed on electrical equipment or circuit parts with a nominal voltage exceeding 1000 Volts shall not be performed alone. Two Level 2 Qualified Electrical workers must service this equipment together and verify each other's electrical safety work practices.

Grounding Conductors

Grounding conductors installed to discharge stored energy shall be removed prior to reenergizing electrical equipment or circuit parts with a nominal voltage exceeding 1000 Volts. Two people shall verify that grounding conductors have been removed prior to reenergizing.

For installing the grounding conductors, the grounding conductors shall be connected first to an effective ground then to Phase A, B, and C.

For removing the grounding conductors, Phase A, B, and C shall be removed prior to removing the grounding conductor from an effective ground.

Grounding conductors shall be rated to conduct the available fault current.

The grounding conductors must have adequate clamping devices to ensure that the clamps are not accidentally removed from the phase conductors or an effective ground.

Grounding may not be sufficient for removal of stored energy from some capacitive elements. Often, the plates of a capacitor must be shorted with a rated conductor. Refer to manufacturer's manuals for this information.

Energized Electrical Work Permits

Energized Electrical Work Permits (EEWP) shall be used for all Energized Work except for "Testing and Troubleshooting". The purpose of this EEWP is the following:

1. To ensure accountability & responsibility for all workers & management involved
2. To mitigate the electrical hazard when possible
3. To determine proper PPE
4. To verify procedural requirements
5. To coordinate safety efforts

Justification for Energized Work

To engage in energized work on electrical conductors or circuit parts, justification must be included on the Energized Electrical Work Permit (EEWP) and signatures of authorized management must be included.

Energized work shall only be used as a last resort. Tasks where de-energizing is considered 'inconvenient' shall not be considered as justified for performing energized work.

One or more of the following conditions must be met for valid justification for energized work for the EEWP to be considered viable:

1. De-energizing may result in risk to the lives and/or safety of students in residence halls.
2. De-energizing may result in compromises to ongoing critical research.
3. De-energizing may result in increased risk to the lives and/or safety or faculty or students in any way.
4. De-energizing may result in emergency alert system being disabled.

Electrical Lockout/Tag-out (LOTO)

Consult Florida State University's Hazardous Energy Control (Lockout-Tagout) Program .

Methods of Contact Release

All qualified electrical workers shall be trained on methods of contact release if a worker is 'hung up' on a circuit.

As duration of a shock event can determine severity of injury and whether a worker lives or dies, workers shall be trained to instantaneously identify the following steps (please note that this is a hierarchy of steps so workers should start with step 1 if possible, and then move on down the list if not possible):

1. Open the upstream disconnecting means (shut off the power feeding the circuit).
2. Find something non-conductive to pry the worker off the circuit such as a nonconductive shepherd's hook, hot stick, or other nonconductive apparatus.
3. Use insulated gloves on hands to pull the worker off the circuit.
4. Use a wooden (not damp), rubber, or plastic apparatus to pry the worker off the circuit.

Care shall be taken that the worker does not attempt to pull the worker off the circuit using bare hands or bare arms. This could result in multiple fatalities.

Arc Flash Risk Assessment

As Florida State University is a large campus, incident energy analysis has not yet been performed on all electrical equipment. If the incident energy analysis has been performed, this equipment will have a label on it. For equipment that has not been labeled, the AF PPE Categories method will be used. Both methods are described below.

Please note the term PPE Level is used to determine the PPE to be worn per the incident energy analysis method only and corresponding labels. The term PPE Category is used to determine the PPE to be worn per the tables method only which is described below.

Incident Energy Analysis

If the incident energy analysis has been performed, a 'Warning' label will be applied. This label indicates that an electrical hazard exists and could result in death or serious injury. All electrical enclosures included in the incident energy analysis (208 volts and above) will be labeled with a 'Warning' label if the available incident energy is below 40 cal/cm^2 (PPE 4).

1. Incident Energy Analysis – This indicates that an engineering analysis has determined that at the working distance, the available incident energy has been calculated and indicated on the labels.
2. Arc Flash Boundary – This is the distance from a prospective arc flash source within which a person could receive a second-degree burn. Once within this boundary, all PPE as determined by the AF PPE Category shall be worn.
3. PPE Requirements – Each label should identify the correct PPE to wear based on the incident energy analysis.
4. AF PPE Level – There are 4 different levels of PPE worn for the arc flash hazard. Refer to the 'PPE Example' section for selecting PPE based on these levels.
5. Nominal Voltage – Each label shall identify the nominal voltage of the circuit.
6. Shock Boundaries – Within the Limited Approach Boundary, no additional PPE is needed, but unqualified workers shall never be within this boundary. The Restricted Approach Boundary indicates the boundary for which insulated gloves shall be worn.
7. Label Location – This name designates the name of the equipment. This should correspond with one-line diagrams.AF PPE Level – There are 5 different levels of PPE worn for the arc flash hazard.

Danger Labels

A 'Danger' label indicates an imminently hazardous situation, which will result in death or serious injury. This signal word is to be limited to the extreme situations. All electrical enclosures will be labeled with a 'Danger' label if the available incident energy exceeds 40 cal/cm^2. Extreme care should be utilized when operating or working on equipment with these labels. Energized work shall be prohibited.

PPE Selection for Incident Energy Method

In addition to selecting PPE based off the Site Specific PPE Level listed on a warning label, risk assessments shall be performed to ensure selection of PPE takes into consideration the condition of equipment.

PPE Level -

When the incident energy method has been performed and warning labels indicate that the electrical enclosure is PPE Level -, the following articles of PPE will be worn for energized work, testing & troubleshooting:

1. Safety glasses
2. Hearing protection
3. Leather protectors
4. Insulated gloves (if entering into restricted approach boundary)
5. Leather shoes with rubber soles
6. Untreated natural fiber pants (or arc rated)
7. Untreated natural fiber shirt (or arc rated)
8. Hardhat

PPE Level 1 & 2

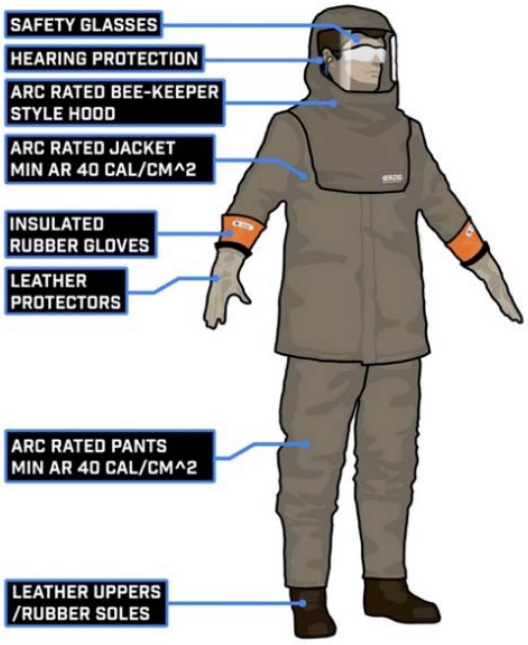
When the incident energy method has been performed and warning labels indicate that the electrical enclosure is PPE Level 1 or 2, the following articles of PPE will be worn for energized work, testing & troubleshooting.

1. Arc rated face shield with hard hat
2. Arc rated balaclava
3. Safety glasses
4. Hearing protection
5. Leather protectors
6. Insulated gloves (if entering into restricted approach boundary)
7. Leather shoes with rubber soles
8. Arc rated pants (minimum rating of 8 cal/cm^2)
9. Arc rated shirt (minimum rating of 8 cal/cm^2)

PPE Level 3 & 4

When the incident energy method has been performed and warning labels indicate that the electrical enclosure is PPE Level 3 or 4, the following articles of PPE will be worn for energized work, testing & troubleshooting:

1. Arc rated bee-keeper style hood (minimum rating of 40 cal/cm^2)
2. Safety glasses
3. Hearing protection
4. Leather protectors
5. Insulated gloves (if entering into restricted approach boundary)
6. Leather shoes with rubber soles
7. Arc rated pants (minimum rating of 40 cal/cm^2)
8. Arc rated jacket (minimum rating of 40 cal/cm^2)



PPE Selection for Categories Method (No Label)

The following method may be utilized by qualified electrical workers in the time prior to completion of the arc flash analysis and corresponding labeling for selecting PPE. (Please note that this PPE selection methodology does not meet all requirements of the 2018 NFPA 70E. This methodology is intended to ensure that workers risk is limited for the potential of receiving catastrophic burn injuries or death resulting from arc flashes in the interim period prior to completion of the incident energy analysis.)

Please note the term PPE Category is used to determine the PPE to be worn per the tables method only. The term PPE Level is used to determine the PPE to be worn per the incident energy analysis method only and corresponding labels.

In addition to utilizing the PPE Category method (when there is no warning label to indicate PPE Level), risk assessments shall be performed to ensure selection of PPE takes into consideration the condition of equipment.

PPE Category 2

For accessing electrical equipment such as panelboards and disconnects (like those pictured below) rated from 150 Volts-750 Volts and not exceeding 400 amp ratings, AF PPE Category 2 shall be worn.

When the AF PPE Category Method indicate that the electrical enclosure is PPE Category 2, the following articles of PPE will be worn for energized work, testing & troubleshooting:

1. Arc rated face shield with hard hat
2. Arc rated balaclava
3. Safety glasses
4. Hearing protection
5. Leather protectors
6. Insulated gloves (if entering into restricted approach boundary)
7. Leather shoes with rubber soles
8. Arc rated pants (minimum rating of 8 cal/cm^2)
9. Arc rated shirt (minimum rating of 8 cal/cm^2)

PPE Category 4

For accessing equipment such as Motor Control Centers (MCC), Switchboards or Switchgear (like those pictured below) AF PPE Category 4 shall be worn.

When the AF PPE Category Method indicates that the electrical enclosure is PPE Category 4, the following articles of PPE will be worn. This PPE may also be needed for 'change of state' electrical work:

1. Arc rated bee-keeper style hood (minimum rating of 40 cal/cm^2)
2. Safety glasses
3. Hearing protection
4. Leather protectors
5. Insulated gloves (if entering into restricted approach boundary)
6. Leather shoes with rubber soles
7. Arc rated pants (minimum rating of 40 cal/cm^2)
8. Arc rated jacket (minimum rating of 40 cal/cm^2)

PPE Category for Medium Voltage Equipment

For accessing any equipment with a nominal voltage of greater than or equal to 1000V, the NFPA 70E Table 130.7(C)(15)(a) indicates that AF PPE Category 4 shall be worn.

When the AF PPE Category Method indicates that the electrical enclosure is PPE Category 4, the following articles of PPE will be worn. This PPE may also be needed for 'change of state' electrical work:

1. Arc rated bee-keeper style hood (minimum rating of 40 cal/cm^2)
2. Safety glasses
3. Hearing protection
4. Leather protectors
5. Insulated gloves (if entering into restricted approach boundary)
6. Leather shoes with rubber soles
7. Arc rated pants (minimum rating of 40 cal/cm^2)
8. Arc rated jacket (minimum rating of 40 cal/cm^2)

Relationship with Contractors

Contractor's Responsibility

The contractor shall provide a copy of their written Electrical Safety Program upon request.

Host Responsibility

Contractors are expected to meet or exceed the safety requirements of OSHA and NFPA70E.

If contractors violate procedures while onsite, authorized personnel and/or management must either notify contractors of violations and remedy the violations or remove contractor personnel from the facility.

The host employer is responsible to provide a workplace free of known hazards to protect the contractor from known hazards that exist after other controls have been implemented in a workplace.

Documented Meeting

Host employer must ensure that a job briefing shall be held between authorized Host Personnel responsible for the work and the contractor designated personnel before work starts.

Work Inspection

Upon completion of work, the Host's designated personnel shall inspect contractor's work to ensure that this work meets the requirements of the contract.

General Electrical Safety Requirements

The following are general electrical safety requirements that shall be followed at all times.

Overhead Powerlines

The workplace shall be evaluated for safety before work begins when the work is near electric lines or other energized electrical conductors or circuit parts. If the possibility exists of contact with electrical conductors or circuit parts, workers must be trained to avoid the electrical hazard.

Blind Areas

Employees shall not reach blindly into areas that might contain exposed energized electrical conductors or circuit parts.

Non-Illuminated Areas

Employees shall not enter spaces containing energized electrical conductors or circuit parts unless illumination is provided that allows the work to be performed safely.

Conductive Apparel

Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn within the restricted approach boundary or where they present an electrical contact hazard with exposed live parts.

Conductive Materials

Conductive materials, tools, and equipment that are in contact with any part of an employee's body shall be handled in a manner that prevents accidental contact with live parts. Such materials and equipment include, but are not limited to, long conductive objects such as ducts, pipes, tubes, conductive hose and rope, metal-lined rules and scales, steel tapes, pulling lines, metal scaffold parts, structural members, and chains.

Confined Spaces

When an employee works in a confined space or enclosed spaces (such as a manhole or vault) that contains exposed live parts, the employee shall use protective shields, barriers, or insulating materials as

necessary to avoid contact with these parts. Doors, hinged panels, and the like shall be secured to prevent them from swinging into employees. All other requirements of the facility confined space entry program must be followed.

Refer to Florida State University's Confined Space Program for more information.

Wet or Damp Locations

Wet or damp locations shall be avoided when performing electrical work. If the location is wet or damp, it should be cleaned or allowed to dry if possible. Work should not be performed unless it is critical. Only use electrical equipment with GFCI's when work must be performed in wet or damp locations.

Alertness

Workers performing any electrical tasks shall be alert and cognizant of their surroundings at all times. Workers shall not be allowed to work within the Limited Approach Boundary or the Arc Flash Boundary when they are impaired due to illness, fatigue, medications, or for any other reasons.

Extension Cord Requirements

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

- Extension cords may only be used to provide temporary power, less than 90 days.
- Portable cord-and-plug connected equipment and extension cords must be visually inspected before use for external defects such as loose parts, bent or missing pins, or damaged insulation. Any defective cord must be immediately removed from service.
- Extension cords shall be rated for the application on which they are used.
- Only extension cords meeting manufacturer's specifications may be used.
- Workers performing work which requires extension cords near damp or wet locations must use a GFCI.
- GFCIs must be tested before use and removed from service if found to be defective.
- Extension cords should be covered by cord protector or tape when they cross a walkway or other path of travel.
- Extension cords using grounding-type equipment must contain an equipment-grounding conductor (3 pronged). Removal of the grounding plug or prong is prohibited.
- Extension cords may not be used as a permanent source of electricity.
- Extension cords shall not be attached to the building structure or fire protection systems.