Environmental Health & Safety Policy Manual		
Issue Date: 7/27/2015		Policy # EHS-400.16
Electrical Safety Policy		

1.0 PURPOSE:

This policy is intended to protect individuals working at the LSU Health Sciences Center (LSUHSC) from electrical hazards that may result in electric shock, burns, arc flash/blast or other injuries due to direct or indirect contact with electrical equipment, tools or appliances.

2.0 SCOPE:

This policy applies to all LSUHSC employees and contractors working on or near premises wiring; installations of electric conductors and equipment and feeder circuit conductors in or on buildings, structures, and in other areas such as yards, parking and other lots, confined spaces and industrial substations. It also applies to the installation of optical fiber cable near or with electric wiring.

3.0 RESPONSIBILITIES:

3.1 Environmental Health and Safety (EHS) Department shall:

- Assist the Facility Services department with the development and provide review of electrical procedures
- Assist with review of contractor electrical safety programs and operations to assess compliance with this policy and OSHA regulations.

3.2 Facility Services Department (FS) Department shall:

- Implement this policy through the development of the necessary specific written procedures, training of staff, purchase of equipment and modification to equipment and systems as necessary.
- Enforce this policy and other specific written procedures and ensure that all necessary equipment is provided and used.
- Identify employees covered by this policy and ensure that training is provided in the identification of potential electrical hazards and the means to protect themselves from those hazards
- Perform inspections to certify that electrical safety equipment is available for use and is in good working condition.

- Maintain all records required as part of this policy current and available for review.

3.3 Employees shall:

- Comply with the safe operating procedures of this policy as well as with any written safety procedures covering specific tasks.
- Maintain an awareness of electrical safety issues and report safety concerns immediately.
- Attend safety training and wear the required personal protective equipment (PPE) when working with electrical equipment.

3.4 Contractors

Contractors performing electrical work at University facilities or on University property are required to comply with all applicable OSHA standards including 29 CFR 1910 Subpart S and 29 CFR 1910.147 and NFPA Standard 70E.

4.0 IMPLEMENTATION:

4.1 Training:

Training shall be provided to any employee at risk of being exposed to an electrical hazard as part of their typical job duties.

Training shall, at a minimum, cover the following topics:

- The safety related work practices that pertain to their job assignments as well as the ability to determine the PPE requirements necessary to perform their jobs safely.
- The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
- The skills and techniques necessary to determine the nominal voltage of exposed live parts.
- The allowable approach distances and corresponding voltages to which the qualified employee will be exposed.

Training must be performed before the employee is assigned tasks requiring work around or on electrical systems and may be classroom, on-the-job, or a combination of the two. FS shall document that this training has occurred. At least annually, FS must review records to ensure that all training is current.

4.2 Selection and Use of Work Practices

Work practices must establish an electrically safe work condition prior to maintenance or other activities involving electrical installations or equipment. Electrical safe conditions are achieved through approved lockout/tagout

procedures (see EHS-400.05, Hazardous Energy Control Policy) before work begins on or near the equipment.

The only exceptions to the de-energizing requirement are:

- The live parts operate at less than 50 volts to ground and there is no increased exposure to electrical burns or to explosion due to electric arcs.
- If de-energizing the equipment or installation will create an increased or additional hazard including interruption of life support equipment, deactivation of emergency alarms, shutdown of hazardous location ventilation systems or removal of illumination for an area.
- If turning power off is infeasible due to equipment design or operational limitations including testing of electrical circuits that can only be performed with the circuit energized and work on circuits that form an integral part of a continuous process that would otherwise need to be completely shut down in order to permit work on one piece of equipment.

If live parts are not placed in an electrically safe work condition, the work performed is considered energized electrical work and shall be performed by written permit only (see Appendix A). The completed permit must be posted in the area where the energized work is taking place for the duration of the task. The permit must be kept on file for at least 6 months following completion of the work. A permit is not required for work related to testing, troubleshooting and voltage measuring provided the appropriate PPE is used.

4.3 Approach Boundaries to Live Parts

Observing a safe approach distance from exposed energized parts is an effective means of maintaining electrical safety. As the distance between an individual and live parts increases, the potential for an electrical injury decreases.

Safe approach distances to fixed live parts can be determined by referring to Appendix B, which contains a table listing the Limited and Restricted approach distances to live parts.

Persons shall not cross or take any conductive object closer to live parts operating at 50 volts unless one of the following conditions applies:

- The person is insulated or guarded from the live parts and no uninsulated part of the person's body crosses the Restricted Approach Boundary.
- The live parts are insulated from the person and from any other conductive object at a different potential.

Crossing the Restricted Approach Boundary is considered the same as making contact with energized parts. Persons shall only cross this boundary when all of the following precautions have been taken:

- The person has specific training to work on energized parts.
- The person has obtained an approved Energized Electrical Work Permit and uses PPE appropriate for working on energized parts which are rated for the voltage and energy level involved.

4.4 Other Precautions for Personnel Activities

Personnel shall adhere to the following practices during all work:

- Do not reach blindly into areas that might contain exposed live parts.
- Do not enter spaces containing live parts unless illumination is provided that allows the work to be performed safely.
- Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear or metal frame glasses) shall not be worn where they present an electrical contact hazard with exposed live parts.
- Conductive materials, tools and equipment that are in contact with any part of an employee's body shall be handled in a manner that prevents accidental contact with live parts. Such materials and equipment include, but are not limited to, long conductive objects such as ducts, pipes, tubes, conductive hose and rope, metal lined rulers and scales, steel tapes, pulling lines, metal scaffold parts, structural members and chains.
- When an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed live parts, protective shields, barriers or insulating materials shall be used as necessary to avoid contact with these parts. Doors, hinged panels and the like shall be secured to prevent them from swinging into employees.

4.5 Personal Protective Equipment

- Employees working in areas where electrical hazards are present shall be provided and use protective equipment (Arc Flash Gear) that is designed and constructed for the specific body part to be protected and for the work performed.
- Protective equipment shall be maintained in a safe, reliable condition and shall be visually inspected before use.
- Employees shall wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with live parts or from flying objects resulting from electrical explosion.
- Face, neck and chin protection shall be provided wherever there is a danger of injury from exposure to electric arcs or flashes or from flying objects resulting from electrical explosions.

- Employees shall wear eye protection whenever there is a danger of injury from electric arcs, flashes or from flying objects resulting from electrical explosions. Face shields without an arc rating shall not be used for electrical work. Safety glasses or goggles must always be worn underneath face shields.
- Employees shall wear rubber insulated gloves where there is a danger of hand and arm injury from electric shock due to contact with live parts or where there is a possible exposure to arc flash burn. Leather or Flame Resistant (FR) gloves shall be worn where required for arc flash protection. Where insulating rubber gloves are used for shock protection, leather protectors shall be worn over the rubber gloves.
- Where insulated footwear is used as protection against step and touch potential, dielectric overshoes shall be required. Insulated soles shall not be used as primary electrical protection.

4.5.1 Selection of Personal Protective Equipment

Personal protective equipment shall be provided to and used by all employees working within the Flash Protection Boundary. For systems that are 600 volts or less, the Flash Protection Boundary shall be a minimum of four feet. For systems above 600 volts, the Flash Protection Boundary shall be determined through engineering analysis.

The specific PPE to be worn within the Flash Protection Boundary can be determined by either of two methods:

- Complete a detailed flash hazard analysis under engineering supervision that determines the incident exposure energy of each employee. Appropriate protective clothing can then be selected based on the calculated exposure level.
- Determine the hazard level of the task by referring to NFPA 70E Table 130.7 (C) (9) (a), “Hazard/Risk Category Classifications” (Appendix C). This table also indicates whether voltage-rated gloves and/or voltage-rated tools need to be used. Once the hazard level of the task has been determined, the required PPE can be ascertained form the NFPA 70E Table 130.7 (C) (10), “Protective Clothing and PPE Matrix” (Appendix D).

4.5.2 Flame-Resistant Apparel and Underlayers

Flame-resistant apparel shall be visually inspected before each use. FR apparel that is contaminated or damaged shall not be used. Protective items that become contaminated with grease, oil, flammable liquids or combustible liquids shall not be used. The garment manufacturer’s instructions for care and maintenance of FR apparel shall be followed.

FR clothing made from flammable synthetic materials that melt at temperatures below 315 degrees Celsius, such as acetate, nylon, polyester, polypropylene and spandex, either alone or in blends, shall not be used. Clothing made from non-melting flammable natural materials, such as cotton, wool, rayon or silk may be used as underlayers beneath FR apparel. Garments worn as outer layers over FR apparel (i.e. jackets or rainwear) must also be made from FR material.

Flash suits must permit easy and rapid removal by the user.

4.5.3 Insulated Tools and Equipment

Only insulated tools and equipment shall be used within the Limited Approach Boundary of exposed energized parts. Insulated tools shall be rated for the voltages on which they are used and shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.

Fuse and fuse holder handling equipment, insulated for the circuit voltage, shall be used to remove or install a fuse if the fuse terminals are energized.

Ropes and hand lines used near exposed live parts operating at 50 volts or more or where an electrical hazard exists, shall be nonconductive.

Portable ladders shall have nonconductive side rails and shall meet the requirements of ANSI standards for ladders.

4.5.4 Rubber Insulating Equipment

Rubber insulating equipment includes protective devices such as gloves, sleeves, blankets and matting. All rubber insulating equipment shall comply with applicable American Society for Testing and Materials (ASTM) standards.

Insulating equipment must be inspected for damage before each day's use and immediately following any incident that could have caused damaged.

Rubber insulating equipment must be stored in an area protected from light, temperature extremes, excessive humidity, ozone and other substances and conditions that may cause damage.

4.6 Alerting Techniques

Barricades shall be used in conjunction with safety signs to prevent or limit access to work areas containing live parts. Conductive barricades shall not be used where they might cause an electrical hazard. Barricades shall be placed no closer than the Limited Approach Boundary.

If barricades and signs do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees. The primary duty of the attendant shall be to keep unqualified persons out of the work area where an electrical hazard exists. The attendant shall remain in the area for as long as there is a potential exposure to electrical hazards.

5.0 RECORDKEEPING

Facility Services shall be provided and maintain for a minimum years a copy of all required records.

6.0 INSPECTIONS AND PROGRAM REVIEW:

EHS shall routinely inspect energized (permitted) operations to evaluate compliance with this policy. Inspections shall occur on a basis no less frequent than once every six months, as possible, based on the frequency of performance of permitted operations.

7.0 REFERENCES:

OSHA 29 CFR 1910.331 through 1910.335, “Electrical Safety Related Work Practices”

National Fire Protection Association (NFPA) 70E, “Standard for Electrical Safety in the Workplace” 2015 edition

8.0 APPENDICES:

Appendix A, Energized Work Permit
Appendix B, Approach Boundary for Live Parts Shock Protection
Appendix C, Hazard/ Risk Category Classifications

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Appendix A: Energized Work Permit

Part I: To be completed by the Supervisor	
Description of Circuit & Equipment:	Job Location:
Description of Work to Be Done:	
Justification of why the circuit cannot be de-energized or the work delayed until the next scheduled outage:	

Name	*Title*	*Signature*	*Date*

Part II: To be completed by the qualified person(s) completing the work	Check when Complete
(1) Detailed description of procedure to be used in performing the above work:	
(2) Description of safe work practices to be employed:	
(3) Voltage exposure (shock hazard analysis):	
(4) Determination of shock protection boundaries:	
(5) Results of flash hazard analysis:	
(6) Determination of flash protection boundaries:	
(7) PPE required to safely perform the task:	
(8) Method used to restrict access to the work area:	

(9) Do you agree the above work can be done safely? YES (proceed to Part III) NO (return to requestor)

Qualified Person(s): _____ Date: _____

Qualified Person(s): _____ Date: _____

Qualified Person(s): _____ Date: _____

Part III: To be completed by members of Electrical Safety Committee

Approvals To Perform The Work While Electrically Energized:

Name	Job Title	Date

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Appendix B: Approach Boundaries for Live Parts Shock Protection

Nominal System Voltage (Phase to Phase)	**Limited Approach Boundary** *Exposed Movable Conductor*	**Limited Approach Boundary** *Exposed Fixed Circuit Part*	**Restricted Approach**
Less than 50 Volts	Not Specified	Not Specified	Not Specified
50 Volts to 300 Volts	10 feet	3 feet 6 inches	Avoid Contact
301 Volts to 750 Volts	10 feet	3 feet 6 inches	1 foot
751 Volts to 15 kilovolts	10 feet	5 feet	2 feet 2 inches

- **Limited Approach Boundary:** Distance from an exposed live part within which a shock hazard exists. An unqualified employee may not cross this boundary unless they are continuously escorted by a qualified employee.
- **Restricted Approach Boundary:** Distance from an exposed live part within which there is an increased risk of shock (due to electrical arc-over combined with inadvertent movement) for personnel working in close proximity to the live part. This boundary may only be crossed by a qualified person who is safely insulated or guarded from the live parts.

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Appendix C
Hazard/Risk Category Classifications
taken from NFPA Table 130.7(C)(9)(a)

Task (Assumes equipment is energized, and work is done within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Panelboards Rated 240 V and Below – Notes 1 and 3			
Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	0	N	N
Work on energized parts, including voltage testing	1	Y	Y
Remove/install CBs or fused switches	1	Y	Y
Removal of bolted covers (to expose bare, energized parts)	1	N	N
Opening hinged covers (to expose bare, energized parts)	0	N	N
Panelboards or Switchboards Rated > 240 V and up to 600 V (with molded case or insulated case circuit breakers) – Notes 1 and 3			
CB or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	1	N	N
Work on energized parts, including voltage testing	2 (*)	Y	Y
600 V Class Motor Control Centers (MCCs) – Notes 2 (except as indicated) and 3			
CB or fused switch or starter operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch or starter operation with enclosure doors open	1	N	N
Work on energized, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts >120 V, exposed	2*	Y	Y

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Appendix C
Hazard/Risk Category Classifications
taken from NFPA Table 130.7(C)(9)(a)

600 V Class Motor Control Centers (MCCs) (continued)			
Insertion or removal of individual starter "buckets" from MCC	3	Y	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare, energized parts)	1	N	N
600 V Class Switchgear (with power circuit breakers or fused switches) – Notes 5 and 6			
CB or fused switch operation with enclosure door closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure doors open	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts >120 V, exposed	2*	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	3	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to exposed bare, energized parts)	3	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N
Other 600 V Class (277 V through 600 V, nominal) Equipment – Note 3			
Lighting or small power transformers (600 V, maximum)	–	–	–
Removal of bolted covers (to expose bare, energized parts)	2*	N	N

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Appendix C
Hazard/Risk Category Classifications
taken from NFPA Table 130.7(C)(9)(a)

Opening hinged covers (to expose bare, energized parts)	1	N	N
Other 600 V Class (277 V through 600 V, nominal) Equipment (continued)			
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage testing	2*	Y	N
Revenue meters (kW-hour, at primary voltage and current)	–	–	–
Insertion or removal	2*	Y	N
Cable trough or tray cover removal or installation	1	N	N
Miscellaneous equipment cover removal or installation	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N

PPE Requirements can be found in Appendix E

Additional Information:

- V-rated Gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done.
- V-rated Tools are tools that are rated and tested for the maximum line-to-line voltage upon which work will be done.
- 2(*) means that a double-layer switching hood and hearing protection are required for this task in addition to the other Hazard/Risk Category requirements of ***Appendix E.***
- Y = Yes (required)
- N = No (not required)

Notes:

(1) 25kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
(2) For < 10kA short circuit current available, the hazard/risk category required may be reduced by one number.
(3) For <10 kA short circuit current available, the hazard/risk category required may be reduced by one number.
(5) 65 kA short circuit current available, up to 1.0 second (60 cycle) fault clearing time.
(6) For <25 kA short circuit current available, the hazard/risk category required may be reduced by one number.