Electrical Research Standard Operating Procedure Worksheet

Print the names of all researchers involved in this work:	**Building(s):**
Principal Investigator/Lab Manager:	**Lab Number(s):**
Date:	**Lab Phone #(s):**
Description of Experiment including purpose and general approach:	

SECTION 1. CHECK THE TRAINING TO BE COMPLETED PRIOR TO CONDUCTING THE PROCEDURE

TRAINING DOCUMENTATION	YES	NO
All researchers have attended appropriate safety trainings as assigned in HuskySMS including Electrical Safety for Qualified Persons or Electrical Safety in Research in the last 3 years? * **Researchers can check their training history at https://uconn.scishield.com/**	☐	☐

Failure to complete mandatory Electrical Safety Training through EHS within the last 3 years will prohibit electrical research in labs.

SECTION 2. PREREQUISITES

Complete the following prior to starting this research	YES	NO
Define controls to protect welfare of personnel (complete Workplace Hazard Assessment)	☐	☐
Acquired Safety Data Sheets (SDS) for all chemicals used in this research. Refer to UConn's Hazard Communication Program or Chemical Hygiene Plan as appropriate.	☐	☐
Developed experimental schematic including inputs/outputs, gauges, access ports, controls, fuses or other over-current protective devices?	☐	☐
Developed supporting information including calculations, graphs/plots of preliminary data that supports the general safety of this procedure?	☐	☐
Developed a list of equipment required for this research activity?	☐	☐
Determine the proper category digital multimeter necessary for your work. Refer to Fluke – ABC's of Digital Multimeters	☐	☐
Developed a list of Electrical PPE required for each separate step in the procedure? Refer to Selection of Electrical PPE Tables on the EHS website.	☐	☐
Determine the largest Restricted Approach Boundary and Arc Flash Protection Boundary necessary for the work associated with this procedure.	☐	☐

SECTION 3 PROCEDURE OR PROCESS (add more lines as necessary or attach pages)	
Procedure or Process Steps	**Safety Control(s)**
0. Identify each step of the procedure and indicate the safety controls used e.g., "open covers to expose energized conductors."	*8cal/cm² rated arc flash PPE including Coveralls, face shield, balaclava, insulated gloves with leather covers*
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17.	

SECTION 4. CHECK AND DESCRIBE ADDITIONAL HAZARDS INVOLVED IN PROCEDURE	
Hazard Type	**Description of Hazard(s) and Control(s)**
☐ **Impact**	
☐ **Cuts/Penetration**	
☐ **Pressure**	
☐ **Biological Agents**	
☐ **Thermal (Hot/Cold)**	
☐ **Electromagnetic Radiation (EMF)**	
☐ **Harmful Dust/Mists/Fumes/Vapors**	
☐ **Light (Optical) Radiation**	
☐ **Ionizing Radiation**	
☐ **Noise**	
☐ **Other**	

SECTION 5. SELECT THE ENGINEERING CONTROLS USED TO CONTROL THE HAZARDS

☐ Chemical Fume Hood	☐ Blast Shield
☐ Biological Safety Cabinet	☐ Ultraviolet Light Screens
☐ Glove Box	☐ Other _____
☐ Local exhaust (e.g., "snorkels" or "elephant trunks")	☐ None Required

SECTION 6. WORK PRACTICES USED TO CONTROL HAZARDS		
Work Practices: Complete the following to establish work practices that will be used	**Yes**	**No**
Principal Investigator and Lab Supervisor have determined that students are not exposed to any serious hazards while working alone during the procedure? *(Working with exposed energized conductors >50V prohibits working alone. See the Working Alone Policy).*	☐	☐
All work on research equipment will be performed only in an electrically de-energized state?	☐	☐
*Lockout/Tag-out will be used to ensure de-energized state is maintained? (*Training Requirement)	☐	☐
Will any work be performed on exposed energized conductors >50V? (If so, work must be performed in accordance with NFPA 70E work practices that pertain to this research activity. Contact EHS for guidance).	☐	☐
Read and understand the Safety Data Sheet (SDS) for each chemical being used?	☐	☐
Physically mark Flash Protection Boundaries out on lab bench and floor surfaces to indicate where arc flash protection PPE must be donned and used. (If tape is used, ensure worn tape does not create a trip hazard).	☐	☐
Other work practices:	☐	☐
PI acknowledges that researchers involved in this procedure are trained and knowledgeable in the construction and operation of the equipment or specific work methods used and are trained to identify and avoid the electrical hazards that might be present with respect to this equipment or work methods. (a "YES" response requires the PI's initials).	☐	**PI initials** _____

SECTION 7. SELECT PERSONAL PROTECTIVE EQUIPMENT TO BE WORN DURING THE PROCEDURE	
Electrical Shock and Arc-Flash Personal Protective Equipment	
Body Part	**Arc-rated Personal Protective Equipment**
☐ **Eye and Face Protection (electrical arc flash)**	☐ Arc-rated Face Shield _____Cal/cm^2 *(must be used with safety glasses or goggles)* ☐ Balaclava _____Cal/cm^2 *(used with arc-rated face shield in situations ≥8 Cal/cm2)* ☐ Arc-rated Flash Suit Hood _____Cal/cm^2 ☐ Other _____Cal/cm^2
☐ **Body Protection (electrical arc flash)**	☐ Arc-rated Long-Sleeved Shirt and Pants _____Cal/cm^2 ☐ Arc-rated Coverall _____Cal/cm^2 ☐ Arc-rated Flash Suit Jacket, Pants, and hood _____Cal/cm^2 ☐ Arc-rated Jacket _____Cal/cm^2 ☐ Arc-rated Parka _____Cal/cm^2 ☐ Arc-rated Rainwear _____Cal/cm^2 ☐ Arc-rated Hard hat liner _____Cal/cm^2 ☐ Other _____Cal/cm^2

Hand Protection (electrical shock and arc flash)	☐ Electrically Insulated Gloves with Leather Protectors ☐ Arc-rated Gloves *(If rubber insulated gloves with leather protectors are used, arc-rated gloves are not required)* ☐ Other _____

Other Hazard Personal Protective Equipment	
Body Part	**Personal Protective Equipment**
☐ **Eye and Face Protection (non-electrical)**	☐ Safety Glasses *(are required if potential for arc-flash exists)* ☐ Impact or Splash Protection Face Shield ☐ Safety Goggles ☐ Other_____
☐ **Head Protection**	☐ Hard Hat *(is required if potential for arc-flash exists)* ☐ Other_____
☐ **Hand Protection (non-electrical)**	☐Butyl Rubber ☐Polyvinyl chloride (PVC) ☐Natural Rubber ☐Fluoroelastomer (Viton) ☐Neoprene ☐Norfoil ☐Nitrile ☐Thermally insulated gloves ☐Polyvinyl alcohol (PVA) ☐Other _____
☐ **Body Protection (non-electrical)**	☐ Lab coat ☐Plastic or rubber apron ☐ Flame-resistant lab coat ☐Other _____ ☐ Long pants
☐ **Foot Protection**	☐ Leather shoes *(required if potential for arc-flash exists)* ☐ Closed-toed footwear ☐ Steel-toed shoes ☐ Other_____
☐ **Respiratory Protection**	☐ Powered Air-Purifying Respirator ☐ Dust Mask ☐ Full Face-piece Negative Pressure ☐ Not Applicable ☐ Half-mask negative pressure ☐ Other _____
☐ **Hearing Protection**	☐ Ear plugs *(required if potential for arc-flash exists)* ☐ Other_____
☐ **Other**	

SECTION 8. FOLLOW PROCEDURE FOR EMERGENCIES AS LISTED BELOW:

1. **Relocate to a safe location. Close door(s) to lab if feasible.**
2. **Call 911.**
3. **If safe, post a "NO ENTRY" sign(s) or other warning information on the door(s)**
4. **Evacuate the building through the nearest exit. Do not run. Do not use elevators.**
5. **Do not re-enter area until instructed to do so by UConn Fire Department or other emergency personnel**
6. **Report accident to Principal Investigator/Supervisor**

SECTION 9. REVIEW AND UNDERSTAND FIRST AID PROCEDURES LISTED BELOW:

First Aid- Eyes	**1. Move to the eyewash, forcibly hold eyelids open and begin flushing both eyes.** **2. Remove contact lenses and eyewear while flushing (if applicable).** **3. Dial 911 or have someone else dial 911.** **4. Keep flushing eyes under the eyewash until emergency personnel arrives.** **5. Report incident to supervisor and EHS.**
First Aid- Skin Contamination	**1. Move to safety shower, pull shower handle, and flush affected area with water.** **2. Remove contaminated clothing while flushing (if applicable).** **3. Dial 911 or have someone else dial 911.** **4. Keep rinsing affected area until emergency personnel arrive.** **5. Report incident to supervisor and EHS.**
First Aid- Electric Shock or Burns	**1. Turn off electric power at the main disconnect.** **2. Extinguish any burning clothing on the victim.** **3. Remove any smoldering or hot clothing that's not sticking to the skin of the victim.** **4. Dial 911 or have someone else dial 911.** **5. Consider CPR and or AED as necessary for electric shock.** **6. Report incident to supervisor and EHS.**
First Aid- Inhalation	**1. Move to fresh air.** **2. Dial 911 or have someone else dial 911.** **3. Report incident to supervisor and EHS.**
First Aid- Other	*Describe additional first aid procedures based on hazards (e.g. use of Water-Jel wraps or blankets to reduce burn severities).*

SECTION 10. SELECT WASTES GENERATED AND DESCRIBE MANAGEMENT PROCEDURES

Type of Waste	Waste Characteristics	Waste Management
☐ **Chemical**	☐ **Corrosive** ☐ **Ignitable** ☐ **Reactive** ☐ **Toxic**	*Describe how hazardous chemical wastes will be managed (e.g. Label with words "Hazardous Waste", Use full chemical names on labels, Keep waste containers closed, Storage with compatible wastes, etc.)*
☐ **Biological**	☐ **Solid** ☐ **Liquid** ☐ **Sharps** ☐ **Animal Research**	*Describe how biological wastes will be managed (e.g. sharps disposed of in approved sharps containers, solid wastes collected in biohazard box-bag units, etc.).*
☐ **Radioactive**	☐ **Short half-life** ☐ **Long half-life**	*Describe how radiological wastes will be managed (e.g. short half-life waste segregated by radionuclide, radioactive waste stored in containers provided by the Radiation Safety Office, etc.).*
☐ **Other**		

SECTION 11. DECONTAMINATION PROCEDURES

☐ **Equipment**	*Describe how equipment will be decontaminated after use (e.g. use manufacturer instructions, specifications, etc.).*
☐ **Glassware**	*Describe how glassware (i.e. beakers/flasks/test tubes, etc.) will be decontaminated after use.*
☐ **Work Area**	*Describe how the work area (e.g. lab benches, fume hoods, etc.) will be decontaminated after use.*
☐ **Personal Hygiene**	*Describe how the researchers will decontaminate after procedure.*

SECTION 12A. RESEARCHER APPROVAL

I have reviewed and will follow the standard operating procedure (SOP) for the procedure/process listed above. I understand that further approval from the PI/Lab Manager is required if any of the following events occur:

- **A change in operational voltages or available short circuit current that would require a change in the arc rated protective clothing or shock hazard protection.**
- **Any change in over-current protective devices or their settings that could potentially change the clearing times of fuses or circuit breakers.**
- **Any change in the selective coordination of circuit breakers or fuses in the system.**
- **A change in amount (*Add quantity and/or volume*) or substitution of the chemicals in the procedure is planned.**
- **A change in the agreed-upon experimental set-up as planned.**
- **Signs of a failure in safety design or equipment are observed.**
- **Signs or symptoms of a chemical exposure are observed.**
- **Unexpected and/or potentially dangerous experimental results occur (e.g., electric shock, arc flash, fire, uncontrolled buildup of heat and/or pressure, etc.)**

Significant Changes with new safety implications many require a revised procedure.

Print Name	Signature	Date

Section 12B. PRINCIPAL INVESTIGATOR APPROVAL

I approve the contents of the lab-specific standard operating procedure listed above:

SIGNATURE:	DATE:	PHONE:
A HARD COPY OF EACH PROCEDURE MUST BE STORED IN THE LAB.		