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Electrical Safe Work Practices and Procedures

I. INTRODUCTION

It is the practice of the City of Boise to utilize lockout/tagout procedures in order to isolate hazardous energy to electrical equipment, however, if conditions arise that do not allow the lockout/tagout (de-energizing) of equipment, precautions shall be taken to prevent the risk of shock. The purpose of this regulation is to establish safe work practices that are intended to prevent electric shock, arc flash exposure, or other injuries which may result from direct or indirect contact with electrical equipment and circuits which may be energized or may become energized.

II. APPLICATION

This regulation applies to all city employees and contractors, whether Qualified or Unqualified while working at city Facilities, working on or near electrical equipment that might be energized or may become energized.

III. RESPONSIBILITIES

A. Management Shall:

1. Implement and enforce this program as applicable to their facility. Upon request, Risk and Safety Services is available to provide additional support.
2. Ensure employees have the appropriate Personal Protective Equipment (PPE) and tools to perform the work safely.
3. Ensure employees have the appropriate training to perform the work safely.
4. Report any electrical incident, near miss, shock, or injury to the Risk and Safety Services.
5. Lead incident investigations involving electrical work.
6. Review this program every three (3) years to ensure continued effectiveness.
7. Anticipate all work hazards and utilize all safeguards as required.
8. Identify employees as Qualified, Authorized, or Unqualified.
9. Review and approve energized electrical work permit.

B. Project Manager or Designated Staff Shall:

1. Report any electrical incident, near miss, shock, or injury to the Facility Manager and Risk and Safety Services.

C. Employees Shall:

1. Perform only work for which they are trained and experienced. All employees entering the Boundary areas shall wear level 1 PPE at a minimum. (Cotton clothing and safety glasses is a bare minimum around electrical gear).
2. Employees shall understand, follow, and perform duties in conformance with the requirements in this regulation.
3. Stop work and contact their supervisor if they are unclear on a procedure.
4. Stop work immediately if they identify an unsafe act or unsafe condition.
5. Report to their supervisor any electrical incident, near miss, shock, or injury.

a. Qualified Personnel (see Definitions of Qualified Person)

Review and sign the Energized Electrical Work Permit (EEWP) document when working on energized equipment.

Shall inspect test equipment, tools, and PPE prior to use.

Shall utilize the appropriate PPE.

Shall be permitted to maintain and repair equipment under 600VAC.

b. Unqualified Personnel

Operation of equipment when required for Normal Operation as described in Section "V", subsection D.

IV. DEFINITIONS

- A. *Affected Employee or Person* - Persons, who, in the course of performing their assigned tasks, are required to operate or use a machine or equipment on which electrical servicing or maintenance is being performed.
- B. *Authorized Lockout/Tagout (LOTO) Employee* - A person who has completed the required hazardous energy control training and is authorized to lockout or tagout a specific machine or equipment to perform service or maintenance that does not involve any exposed energized electrical work. See city regulation for specific LOTO requirements. For specific training requirements see Section VIII. Should LOTO require exposed energized electrical work, the Authorized Employee would also need to be a Qualified Employee or Person.
- C. *Electrically Safe Work Condition* – A state in which electrical circuit parts have been disconnected from energized parts, LOTO has been performed in accordance with standards, tested to ensure the absence of voltage, and grounded if necessary.

- D. *Energized Electrical Parts* - Electrical circuit parts that are connected to, or is a source of voltage.
- E. *Exposed Energized Electrical Parts* – Electrical circuit parts capable of being inadvertently touched or approached nearer than a safe distance by a person. This does not apply to electrical circuit parts that are suitably guarded, isolated, insulated or in an Electrically Safe Condition.
- F. *Limited Approach Boundary*- An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.
- G. *Lockout/Tagout (LOTO)* – A process to control the unexpected re-energization of equipment or release of stored energy which could cause injury. See city Hazardous Energy Control regulation for specific LOTO requirements.
- H. *Qualified Person* – A Qualified person is also an Authorized person (but not conversely). A person who has sufficient skills and knowledge regarding the construction and operation of the electrical equipment. Prior to an employee being considered a “Qualified Person”, the employee’s direct supervisor shall verify the employee has met all the training requirements in section VIII. Training subsection A of this document before the employee conducts any electrical work as a Qualified Person. All completed training as required in section VIII. Training of this document shall be documented and recorded in the city’s Learning Management System.
 - 1. Qualified Persons shall have additional training, able to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method. They shall pay attention to detail and take time to access risk in all activities. Qualified employees will only be permitted to work on equipment (600VAC or less). All energized work on 600VAC AND ABOVE will be performed by Qualified contractors.
 - 2. Qualified Persons shall be familiar with the proper use of the special precautionary techniques, personal protective equipment (PPE, including arc-flash, insulating and shielding materials), and insulated tools and test equipment (volt/ohm meter) required to safely perform the work.
 - 3. Only a Qualified Person is allowed to work on exposed energized circuits (600VAC or less) and any energized circuit that does not meet the criteria for Normal Operation defined in this section.

ALL ELECTRICAL WORK SHALL BE PERFORMED IN THE DE-ENERGIZED STATE WHEN EVER POSSIBLE.

NEVER WORK ON ENERGIZED CIRCUITS ALONE.

- I. *Unqualified Person* – Any person that is not a Qualified Person.
- J. *Working On or Near* - Working close enough to energized electrical circuit parts for a person to be exposed to an electrical hazard.

- K. *Journeyman Electrician*- is to be considered a qualified person who can perform the actual physical work of installing or altering electric wiring or equipment to convey electric current, or apparatus to be operated by electric current.
- L. *Risk Assessment*- An overall process that identifies hazards, estimates the likelihood of occurrence of injury or damage to health, estimates the potential severity of injury or damage to health, and determines if protective measures are required.

V. GENERAL REQUIREMENT

Electrical safe work practices shall be employed to prevent electric shock and/or electrical arc flash injuries resulting from either direct or indirect contact associated with working on or near electrical parts which may be energized, or may become energized. Specific work practices shall be consistent with the nature and extent of the associated hazard.

Electrical safe work practices include the safe installation and operation of electrical equipment, proper housekeeping around electrical equipment, and continued maintenance of electrical equipment to ensure safe operation.

A. Electrical Installation Requirements:

1. Equipment must be suitable for the installation and use, and must be installed and used according to applicable Codes and Standards such as NFPA 70 National Electric Code (NEC) and/or Occupational Health and Safety Administration (OSHA).
2. Equipment must be free from recognizable hazards that are likely to cause injury.
3. Equipment should be labeled in a specific manner to identify purpose, nominal voltage, and source of supply.
4. Accurate single-line diagrams should be available to identify facility electrical infrastructure.
5. Guarding of Live Parts – Live parts operating at 50V AC, 100V DC, or more should be guarded from accidental contact by use of an approved cabinet or enclosure, or qualified person only restricted access room or vault.
6. Warning Signage – Entrances to rooms, vaults, and other locations with unguarded live electrical parts shall be marked with conspicuous signage restricting entrance to qualified persons only. Rooms, vaults, and other locations containing guarded live electrical parts determined to contain exposure to increased electrical hazards during normal operation, shall also be marked with conspicuous signage restricting entrance to qualified persons only.

B. Working Clearance about Electrical Equipment: Sufficient working space and clearance must be provided and maintained around electrical equipment to permit safe operation and maintenance. Working clearance distances according to National Electric Code (NEC) and OSHA shall be maintained at all times.

- C. Entrance and Access to Work Space: Entrance to and exit from electrical rooms and other areas containing live electrical equipment must be maintained for emergency egress in accordance with NEC and OSHA at all times.
- D. Normal Operation: Electrical equipment should meet the following criteria for operation without exposure to increased hazards or risk:
 - 1. Installed Properly – Meets NEC and manufacturer requirements for installation location and use.
 - 2. Maintained Properly – Meets manufacturer maintenance requirements and/or industry recognized maintenance standards such as NFPA 70B, Recommended Practice for Electrical Equipment Maintenance.
 - 3. Equipment Doors are Closed and Secured – Doors are to be maintained and closed at all times, with all locking/latching devices in place and secure per manufacturer instructions.
 - 4. Equipment Covers are in Place and Secured – All covers should be on and secure including all latches, mounting hardware, screws, and bolts per manufacturer instructions.
 - 5. There is No Evidence of Impending Failure – No evidence of arcing, overheating, loose or bound equipment parts, equipment damage, or equipment deterioration.

VI. PROCEDURE

- A. Job Planning

Before starting any energized electrical work, job planning shall occur with all involved employees and/or contractors. The supervisor and/or the project manager shall verify the job planning is being completed. The job plan shall be documented by completing an Energized Electrical Work Permit (Appendix B) and the Pre-job Plan Checklist (Appendix G) which should cover the following topics:

 - 1. Specific step-by-step work procedures to employ.
 - 2. Identification of all possible hazards, including non-electrical (confined space, fall protection, mechanical, etc.).
 - 3. Energy source control, including LOTO procedures if required.
 - 4. PPE requirements.
 - 5. Energized work permit requirements if required.
- B. Work On or Near Exposed De-Energized Electrical Parts

Energized electrical parts operating at 50V AC or above, or 100V DC or above, to which a person might be exposed shall be put into an electrically safe work condition before any employee or persons crosses the Limited Approach Boundary. All exposed electrical parts are to be considered energized until an electrically safe work condition has been established. All work procedures and

PPE required based on the exposed energized electrical parts Risk Assessment are required until an electrically safe condition has been established. Risk assessment is a comprehensive review of hazards for specific tasks, and the means and methods required to minimize the risk.

1. Establishing an Electrically Safe Work Condition

An electrical safe work condition shall be achieved when all of the following have been established and verified:

- a. All possible sources of electrical supply to the equipment have been determined.
- b. After properly interrupting the load, open the disconnecting device for each source.
- c. Apply LOTO procedures per city Hazardous Energy Control regulation.
- d. Use an adequately rated test instrument to test each phase for voltage to verify it is de-energized. Test phase-to-phase and phase-to-ground. Test equipment should be tested against a known voltage source before and after each test to verify it is operating properly.

2. Qualifications

Only Qualified persons are responsible for establishing an electrically safe work condition. The exception to this would be when there are installed Permanent Electrical Safety Devices that allow personnel to safely verify presence or absence of voltage. This device provides the capability to measure voltage from outside the enclosure, minimizing risk of arc flash and shock hazard. Once an electrically safe work condition has been established, Authorized persons may perform work on or near the de-energized electrical circuit parts if they have been properly briefed on the work to be performed, and are aware of all LOTO procedures.

3. Example Tasks

See Appendix E for a general list of tasks.

- a. Maintenance and servicing of equipment, such as vacuuming switchboards, panelboards, and motor control centers.
- b. Tightening of lugs on cables at switchboards, panelboards, and motor control centers.
- c. Replacing fuses in fused disconnect switches.

C. Work On or Near Exposed Energized Electrical Parts

1. Justification for Exposed Energized Work

All electrical circuit parts should be placed in an electrically safe condition prior to anyone crossing the Limited Approach Boundary, with the following exceptions:

- a. Electrical circuit parts operating at a nominal voltage or less than 50V AC, or 100V DC, unless determined otherwise by a Risk Assessment.

- b. Where it is demonstrated that de-energizing introduces additional or increased hazards such as; deactivation of emergency alarm systems, shutdown of hazardous ventilation equipment, or runaway of a critical process.
 - c. Where it is infeasible due to equipment design or operational limitations such as; voltage measurements for LOTO, performing diagnostics, testing or troubleshooting.
2. Electrical Work Crossing the Shock Approach Boundaries
- In those conditions where an employee is required to cross any of the Shock Hazard Approach boundaries of exposed energized conductors or component, operating with a voltage between any two conductors or components equal to or greater than 50V AC, or 100V DC, all of the following shall apply:
- a. Shock approach boundary distance should be labeled on equipment where an Electric Hazard Assessment (EHA) has been performed. See Appendix F for shock approach boundaries for equipment that is not labeled.
 - b. Only Qualified Personnel are allowed to cross the Limited Approach Boundary. All other personnel must stay beyond that distance unless supervised by a Qualified Person, briefed on the hazards involved, and both persons are wearing PPE as required.
 - c. When crossing the Restricted Approach Boundary with any part of their body, the Qualified Person shall put on all of the PPE for protection against shock or electrocution. The PPE shall have an insulated voltage rating equal to or greater than the highest voltage available in the exposed area.
 - d. Additionally, any Qualified Person crossing the Restricted Approach Boundary for any purpose other than voltage measurement, shall complete an Energized Electrical Work Permit before initiating any work. See Appendix B.
3. Electrical Work Crossing the Arc Flash Boundary
- In those conditions where an employee is required to cross the Arc Flash Boundary of exposed energized conductors or component, determined by the Electrical Hazard Assessment (EHA, refer to Arc Flash and Shock Hazard Procedure) (typically 208V AC or greater, 3-phase), all of the following shall apply:
- a. The Arc Flash Boundary distance should be labeled on all equipment that present a risk of arc flash hazard based on the EHA. See the Arc Flash and Shock Hazard Procedure for EHA details.
 - b. Persons shall put on all of the PPE indicated on the Arc Flash / Shock Hazard label applied to the device or equipment. The PPE shall have an Arc Thermal Protective Value (ATPV) equal to or greater than the incident energy in calories per square centimeter as stated on the label for the appropriate working distance. Where the label states the incident energy is greater than 40 calories per square centimeter, the structural strength

of the equipment enclosure may not be able to contain the pressure wave from an arc flash incident, therefore the equipment should not be interacted with while energized.

4. Alerting

Alerting techniques shall be used to warn and protect persons from hazards which could cause injury due to electric shock, burns, or failure of electric equipment parts. Examples of alerting techniques:

- a. Safety signs, safety symbols, or accident prevention tags shall be used where necessary to warn employees about electrical hazards.
- b. Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas exposing employees to energized conductors or circuit parts.
- c. If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees.

5. Qualifications.

Only Qualified Persons may cross the Limited Approach Boundary of equipment with exposed energized circuit parts.

6. Example Tasks

See **Appendix E** for a general list of tasks.

- a. Removal of equipment covers to expose energized electrical circuit parts.
- b. All work on or near energized electrical equipment that does not meet the requirements of Normal Operation.
- c. Troubleshooting and diagnostics.
- d. Voltage measurement for electrical LOTO.

D. Work On or Near Non-Exposed Energized Electrical Parts:

1. Qualifications

Qualified or Authorized Persons only. All electrical equipment that meets the following criteria, should be treated as exposed energized parts for all interaction:

- a. Equipment that fails to meet all of the requirements of Normal Operation.
- b. Equipment that presents an increased hazard during Normal Operation such as:
 - i. Medium-voltage switch operation.
 - ii. Operation of switches or circuit breakers with an arc flash incident energy in excess of 40 calories per centimeter squared.
 - iii. Other tasks as determined by a Risk Assessment.

2. Example Tasks

See **Appendix E** for a general list of tasks.

- a. Operation of circuit breaker or disconnect switch.
- b. Reset of a motor overload at a MCC or stand-alone motor starter.
- c. Maintenance or servicing of equipment limited to the outside of closed equipment.
- d. Reading meters or toggling through equipment metering menus.

E. Field Audits

Field work as outlined in this procedure shall be audited by supervisors to verify the requirements contained in this electrical safe work program are being followed. Audits should be performed in intervals not to exceed 1 year. See **Appendix D** for the Energized Electrical Work Field Audit form.

VII. PERSONAL PROTECTIVE EQUIPMENT

- A. All PPE for arc flash and shock hazard protection should meet applicable standards. See NFPA 70E Table 130.7(C)(14) for applicable PPE standards.
- B. All PPE should be inspected prior to each use. Protective items that are damaged or contaminated should not be used.
- C. All PPE should be cared for according to manufacturer's instructions.
- D. Rubber insulated gloves should be tested before first issue and every six months thereafter to comply with OSHA 1910.137

VIII. TRAINING

Upon request, Risk and Safety Services will coordinate and arrange training. All employees working on or around energized electrical equipment should be identified as Qualified, Authorized, or Affected. Based on this classification the following additional training should be completed and documented:

- A. Qualified Person: All qualified persons should have additional training specific to arc flash and shock hazard. This training shall include:
 1. Identification of electrical hazards.
 2. Trained to select an appropriate test instrument and shall demonstrate how to use a device to verify the absence of voltage, including interpreting indications provided by the device. The training shall include information that enables the employee to understand all limitations of each test instrument that might be used.
 3. Understanding of Electrical Hazard Assessment (EHA).
 4. Understanding of equipment labeling.

5. Selection of PPE based on equipment labeling.
 6. Understanding of NFPA 70E 2021 Table 130.7(C)(15)(a) and Table 130.7(C)(15)(b) for determination of when arc flash PPE is required.
 7. Use and testing of arc flash and shock hazard PPE.
 8. Understanding of shock approach boundaries and specific criteria required to cross each boundary.
 9. Understanding of the most current NFPA 70E Standard for Electrical Safety in the Workplace.
 10. Successful completion of the city's LOTO Authorized Employee training. Understanding of city LOTO requirements including the Hazardous Energy Control regulation.
 11. Safety retraining should occur at intervals not to exceed three years or when new technology, new types of equipment or changes in procedures require the use of safety related work practices that are different from those that the employee would normally use.
- B. Authorized Person: Should have awareness training specific to arc flash and shock hazard. This training should include:
1. Identification of electrical hazards.
 2. Understanding of Electrical Hazard Assessment (EHA).
 3. Understanding of equipment labeling.
 4. Understanding of shock approach boundaries and specific criteria required to cross each boundary.
 5. Understanding of city LOTO requirements including Regulation.
 6. Safety retraining should occur at intervals not to exceed three years or when new technology, new types of equipment or changes in procedures require the use of safety related work practices that are different from those that the employee would normally use.
- C. Affected Person: Should have awareness training specific to arc flash and shock hazard. This training should include:
1. Identification of electrical hazards.
 2. Understanding of Electrical Hazard Assessment (EHA).
 3. Understanding of equipment labeling.
 4. Understanding of shock approach boundaries and specific criteria required to cross each boundary.

IX. RECORDS RETENTION

Electrical safety training and procedure documentation shall be retained as follows:

- A. Training records shall include the employee name, date of training, training description, length in hours, and credentials of trainer, and shall be kept for a minimum of three years. These training records should be stored in the city's Learning Management System.
- B. Job plans should be documented and retained for a minimum of 3 years. Each department is responsible for their own job plan document retention.
- C. Completed energized work permits should be retained for a minimum of 3 years. Each department is responsible for their own energized work permit document retention.
- D. Energized electrical work field audit forms should be retained for a minimum of 3 years. Each department is responsible for their own electrical work field audit form document retention.

X. WORK PERFORMED BY CONTRACTORS

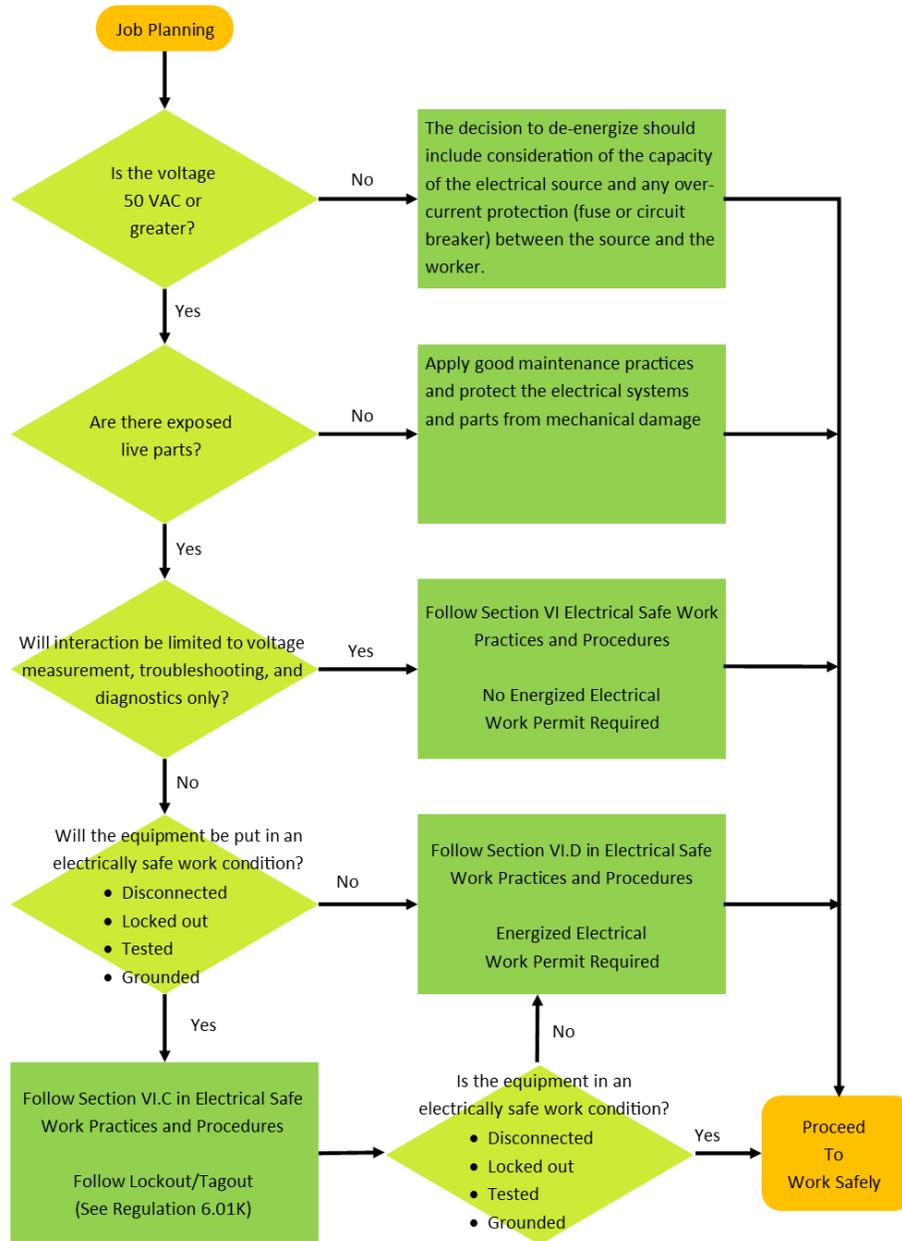
Contractors performing work on or near energized electrical circuit parts are required to follow all applicable procedures and regulations regarding electrical safety. In addition to involvement in job planning with the city employee responsible for the project, the Contractor should also complete the following prior to beginning work:

- 1. Provide certification of electrical safety training and documentation upon request.
- 2. Acknowledge understanding of the city LOTO site specific procedures.
- 3. The Contractor should certify in writing, their job plan meets or exceeds the requirements of Section VI (A) of this regulation.

XI. APPENDICES

- Appendix A: Energized Electrical Flow Chart
- Appendix B: Energized Electrical Work Permit
- Appendix C: Arc Flash PPE When Incident Energy is Determined
- Appendix D: Energized Electrical Work Field Audit
- Appendix E: Arc Flash Hazard Identification by Task and Personnel
- Appendix F: Shock Approach Boundaries
- Appendix G: Pre-Job Plan Checklist

APPENDIX A: ENERGIZED ELECTRICAL WORK FLOW CHART



APPENDIX B: ENERGIZED ELECTRICAL WORK PERMIT

Section I: To be completed by the requestor or supervisor of the job				
1. Requestor Name:	2. Job Location:	3. Job/Work Order #:		
4. Description of work to be performed:				
5. Justification of why the circuit/equipment cannot be de-energized or the work delayed until the next scheduled outage:				
<input type="checkbox"/> Shut down/Lock-Out Tag-Out creates an additional or increased hazard (specify):	<input type="checkbox"/> Shut down/Lock-Out Tag-Out is infeasible due to equipment design or operational limitations (specify):			
6. Signature of Requestor:	Title:	Date:		
7. NAME OF SUPERVISOR IN CHARGE OF WORK:		Telephone #:		
Section II: To be completed by the Electrically Qualified Person(s) doing the work				
8. Equipment Identification Model #: _____ Serial or ID#: _____ Other: _____	9. Detailed job description procedure to be used in performing the above detailed work: a. _____ e. _____ b. _____ f. _____ c. _____ g. _____ d. _____ h. _____			
10. Shock Risk Assessment. Refer to Arc Flash Label if present, if not, see Table 130.4(E)(a). Voltage to which personnel will be exposed: _____ Limited Approach Boundary: _____ft _____in Restricted Approach Boundary: _____ft _____in	12. PPE Category for the task (circle one) from Table 130.7(C)(15)(a): On Label 1 2 3 4 <table style="width: 100%; border: none;"> <tr> <td style="width: 33%; border: none; vertical-align: top;"> <input type="checkbox"/> Arc-Rated Long-Sleeve Shirt <input type="checkbox"/> Arc-Rated Pants <input type="checkbox"/> Arc-Rated Coveralls <input type="checkbox"/> Arc-Rated Jacket, Parka <input type="checkbox"/> Arc-Rated Arc Flash Suit Jacket <input type="checkbox"/> Arc-Rated Arc Flash Suit Pants <input type="checkbox"/> Arc-Rated Arc Flash Suit Hood <input type="checkbox"/> Arc-Rated Gloves <input type="checkbox"/> Arc-Rated Hard Hat Liner <input type="checkbox"/> Other: _____ _____ _____ </td> <td style="width: 33%; border: none; vertical-align: top;"> <input type="checkbox"/> Safety Glasses <input type="checkbox"/> Safety Goggles <input type="checkbox"/> Ear Plugs <input type="checkbox"/> Leather Footwear <input type="checkbox"/> Voltage Rated Tools <input type="checkbox"/> Test Instruments <input type="checkbox"/> Other: _____ _____ _____ </td> </tr> </table>		<input type="checkbox"/> Arc-Rated Long-Sleeve Shirt <input type="checkbox"/> Arc-Rated Pants <input type="checkbox"/> Arc-Rated Coveralls <input type="checkbox"/> Arc-Rated Jacket, Parka <input type="checkbox"/> Arc-Rated Arc Flash Suit Jacket <input type="checkbox"/> Arc-Rated Arc Flash Suit Pants <input type="checkbox"/> Arc-Rated Arc Flash Suit Hood <input type="checkbox"/> Arc-Rated Gloves <input type="checkbox"/> Arc-Rated Hard Hat Liner <input type="checkbox"/> Other: _____ _____ _____	<input type="checkbox"/> Safety Glasses <input type="checkbox"/> Safety Goggles <input type="checkbox"/> Ear Plugs <input type="checkbox"/> Leather Footwear <input type="checkbox"/> Voltage Rated Tools <input type="checkbox"/> Test Instruments <input type="checkbox"/> Other: _____ _____ _____
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11. Arc Flash Risk Assessment. Refer to Arc Flash Label if present, if not, see Table 130.7(C)(15)(a). Incident Energy (cal/cm ²): _____ Arc Flash Boundary: _____ft _____in				

13. Means employed to restrict the access of unqualified persons from the work area:

- Signs/Tags
- Barricades
- Attendants

14. Has the Pre-Job Plan Checklist (Appendix H), including discussion of any job-related hazards been completed?

- Yes, see attached
- If no, why not?

15. Do you agree the above-described work can be done safely:

- Yes
- No, (If no, return to Requester and/or Supervisor)

Electrically Qualified Person(s)

Date

Electrically Qualified Person(s)

Date

Section III: Approval(s) to perform the work while electrically energized

Proposed Energized Electrical Work has been reviewed and approved or denied by:

Supervisor

Date

Permit Expiration Date: _____

- Permit Approved**
- Permit Denied**

Section IV: Emergency Action

In the event of an electrical emergency call 911. Provide detailed information to the emergency operator.

Notes:

Once the work is complete, return this form with the work order to be retained in the Computerized Maintenance Management System/Hansen for retention.

APPENDIX C: ARC FLASH PPE WHEN INCIDENT ENERGY IS DETERMINED

Arc-rated clothing and PPE selection matrix for determined incident energy level. Based on NFPA 70E 2021, Table H.3

Protective Clothing and PPE		Incident Energy Exposure (cal/cm ²)		
		≤ 1.2	1.2 ≤ 12	≥ 12
	Long sleeve shirt and pants or coverall, per ASTM F 1506 or untreated natural fiber	✓		
	Arc-rated long-sleeve shirt and arc-rated pants		●	●
	Arc-rated coverall		●	●
	Arc-flash suit			
	Arc-rated jacket, parka, or rainwear	○	○	○
	Face shield for projectile protection	○		
	Arc-rated face-shield and arc-rated balaclava		●	
	Arc-rated arc flash suit hood			✓
	Hard hat		✓	✓
	Arc-rated hard hat liner		○	○
	Safety glasses	●	●	●
	Safety goggles	●	●	●
Hearing protection	✓	✓	✓	
	Heavy-duty leather gloves			
	Rubber insulating gloves with leather protectors	●	●	
	Arc-rated gloves			✓
	Leather footwear		✓	✓

Notes:

- ✓ Recommended PPE.
 - Select one piece of equipment from these options.
 - Optional equipment, use as environment and comfort requires.
1. All arc-rated clothing and equipment should have an arc-rating greater to or equal than the determined incident energy level.

APPENDIX D: ENERGIZED ELECTRICAL WORK FIELD AUDIT

Auditors Name: _____ Date: _____			
Employee Name(s): _____ Job Title: _____			
Location: _____ Work Being Performed: _____ _____			
	Yes	No	N/A
1. Is the work being performed energized?			
2. Can the work be performed in the de-energized state?			
3. Does the work require an Energized Electrical Work Permit?			
4. Is there an approved written Energized Electrical Work Permit?			
5. Was a pre-job meeting conducted prior to work commencing?			
6. Is the proper PPE worn for Arc Flash and Shock Protection?			
7. Does the PPE appear to be in good condition?			
8. Are insulated hand tools/equipment being used?			
9. Are test instruments and equipment designed and properly rated for the circuits, equipment and environment they are being used?			
10. Is access restricted? Are the proper measures in place (signs, barricades, attendants) to protect other personnel from coming in contact with energized parts?			
11. Are safe work practices being followed?			
Comments: _____ _____			

APPENDIX E: ARC FLASH HAZARD IDENTIFICATION BY TASK AND PERSONNEL

Task	Meets Normal Operation	Arc Flash PPE Required	Authorized Person	Qualified Person**
Reading a panel meter while operating a meter switch.	Yes	No	Yes	No
Operation of circuit breaker, switch, contactor, or starter.	Yes	No	Yes	No
	No	Yes	No	Yes
Work or testing on energized electrical parts or conductors.	Any	No	No	Yes
Battery voltage testing.	Yes	No	No	Yes
	No	No	Yes	No
Work on circuit breakers or switches.	Any	Yes	No	Yes
Removal or installation of covers that does not expose bare, energize, electrical parts or conductors.	Yes	No	Yes	No
	No	Yes	No	Yes
Opening doors or removing covers which exposes bare, energized electrical parts or conductors.	Any	Yes	No	Yes
Removal of battery inter-cell connector covers.	Yes	No	No	Yes
	No	Yes	No	Yes
Performing non-contact inspections outside of the restricted approach boundary.	Any	No	Yes	No
Applying temporary protective grounding equipment following a voltage test.	Any	Yes	No	Yes
Working on energized control circuits under 120 V without exposing 120 V energized parts or conductors.	Any	No	No	Yes
Insertion or removal of starter buckets from a motor control center.	Any	Yes	No	Yes
Insertion or removal of circuit breakers or starters from switchgear.	Any	Yes	No	Yes
Connecting or disconnecting plug-in equipment from busways.	Any	Yes	No	Yes
Insulated cable inspection without manipulating cable.	Any	No	No	Yes
Insulated cable inspection that includes cable manipulation.	Any	Yes	No	Yes

**A Qualified person is able to perform any action an authorized person is allowed to perform.

Table Based NFPA 70E 2021 Table 130.5(C)

APPENDIX F: SHOCK APPROACH BOUNDARIES

< 50 V		
Not Specified	Not Specified	Not Specified
50 V - 150 V		
10'-0"	3'-6"	Avoid Contact
151 V - 750 V		
10'-0"	3'-6"	1'-0"
751V - 15kV		
10'-0"	5'-0"	2'-2"
15.1V - 36kV		
10'-0"	6'-0"	2'-9"
Exposed Movable Conductor	Exposed Fixed Circuit Part	
Limited Approach Boundary	Limited Approach Boundary	Restricted Approach Boundary

APPENDIX G: Pre-Job Plan Checklist

Department:	Supervisor:
Date:	Employees on Job: _____ _____

Job Elements	Required	Completed	NA	Notes
LOTO/Arc Flash Trained				
Energized Electrical Work Permit				
LOTO Completed (Live-Dead-Live)				
Signs and Barricades Installed				
Buddy System (co-worker present)				
Confined Space Permit				
Personal Fall Protection				
PPE/Tools/Equipment Inspected				
Excavation/Trenching Checklist				
Safety Data Sheet Review				
Hoisting and Rigging Review				
Appropriate Personnel Notified				

PPE Required	Yes	No	Type
Arc Flash Gear			
Fall Protection			
Respirator			
Hearing Protection			
Other: _____			

Emergency Preparation
1. Standby person CPR/AED trained? 2. Emergency Equipment/1 st Aid Kit in immediate vicinity? 3. Where is the fire alarm? 4. Where is the fire extinguisher? 5. Where is the equipment emergency shut off? 6. Where is the nearest telephone?

TASKS List the tasks/steps required to perform work.	Hazards List the hazards that could cause injury when each task is performed.	Risk Control Measures List the specific control measures for each hazard.