UNM ELECTRICAL SAFETY PROGRAM

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UNIVERSITY OF NEW MEXICO

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DOCUMENT REVISION LOG

Document: **Electrical Safety Program**

Rev. No.	Effective Date	Revision Description	Pages Replaced	Completed by:
1	09/14/2006	1. **Table of Contents:** (revised or added attachments): a. #1 Electrical Annual Training Matrix b. #2 Energized Work Permit c. #3 UNM/FM Job Briefing and Planning Checklist d. #4 Electrical Specifications for Contractors and UNM Personnel Doing Work at the University of New Mexico (as of 06/20/06) e. #5 UNM SOP "New Electrical Work Entering Energized Electrical Panels or Switchgear" f. #6 UNM SOP Testing and Working on Energized Circuits 2. Page 14, Conductive Apparel: metal eyeglasses without goggles or face shield. 3. Page 15, bullet #6: projections 4. Page 19, Employees must clean insulating; Employees must visually examine their gloves; the employee must ensure that…	N/A	Joel Straquadine
2	10/22/2007	Changed RSHEA to SRS throughout the document.	N/A	Joel Straquadine
3	11/26/2007	Added Attachment #7: "Entering Flooded Buildings Standard Operating Procedure".	N/A	Joel Straquadine
4	05/18/2011	Page 2, **Scope**; removed "and the Ground Fault Circuit Interrupter (GFCI)." Page 3, ***Unqualified persons***; removed "are those with little or no such training" and added "are persons who are not qualified". Page 10, **2nd bullet**; added "such as, portions of Photovoltaic systems". Expose the employee to……removed "an" to make the word "other" (instead of another). Page 11, **Re-energizing….(2nd bullet)**; added "Reinstall all covers, guard, doors and deadfronts", Page 14, **Extension cords**…added "Only one cord or multi outlet device may be installed between receptacle and device. Multi outlet devices must be power tap rated". Page 16, **device** may not…added "by certified testing company". **Test instruments**…..added "Test equipment must be maintained and certified at required intervals".	N/A	Billy Hromas

		Page 20, **4th bullet**; added "All testing and abatement must be performed by qualified personnel, contact SRS at 277-2753". Page 22, added "**Manager**" column to training matrix. Page 25, **NFPA 70E** table…added "9, 10," Page 31, **20)** removed the "2" to make it say 50 volts Removed "competent" and added "qualified" Page 40, Before Entering…2. added "should be available to turn off power to the space, as directed," & Updated various items in the Entering Flooded Space SOP, pages 39-40. Attachment #4, Pages 28-33, Replaced with an updated version: Electrical Specifications for Contractors and UNM Personnel Doing Work at the University of New Mexico. (As of 01/06/2011)		
5	**04/22/2013**	1. Updated the UNM Energized Electrical Work Permit 2. Updated the Electrical Specifications for Contractors and UNM Personnel Doing Work at the University of New Mexico (as of 03/13/12)	**N/A**	**David Hromas**
6	**07/15/2013**	Updated the Electrical Specifications for Contractors and UNM Personnel Doing Work at the University of New Mexico (as of 07/12/13) (Electrical Metering)	**N/A**	**David Penasa**
7	**10/31/2013**	UNM Energized Electrical Work Permit: updated wording for the Approach Boundaries. Attachment #2	**N/A**	**Billy Hromas & David Penasa**
8	**04/04/2014**	Added: Portable Generator Permitting Requirements at the University of New Mexico (page 9)	**N/A**	**Larry Crum**
9	**04/04/2014**	Working on Electrical Systems: added 3 bullets regarding **VFD's** (page 13).	**N/A**	**Billy Hromas**
10	**04/04/2014**	UNM Energized Electrical Work Permit: updated wording for the Approach Boundaries. Attachment #2, page 26.	**N/A**	**Billy Hromas & David Penasa**
11	**04/04/2014**	Added to Attachment #7 Entering Flooded Spaces: 1.) UNM Flooded Building Checklist; 2.) Building Specifics; 3.) Other Critical Building Systems, pages 45-47.	**N/A**	**Larry Crum**
12	**04/04/2014**	Added Attachment #8: Student Projects that contain electrical components that is accessible to the Public, pages 48-49.	**N/A**	**Larry Crum**
13	**04/04/2014**	General Wiring Design and Protection, page 7: added National Electrical Safety Code (NESC).	**N/A**	**David Penasa**

14	**04/04/2014**	Working Space and Electric Equipment, page 10: added "and not less than 30 inches width (or width of equipment, if wider than 30 inches)".	**N/A**	**David Penasa**
15	**04/04/2014**	De-energizing Equipment, page 13, last bullet: Removed wording and added "and instruments must also" be checked	**N/A**	**David Penasa**
16	**04/04/2014**	Hazardous Materials, page 22, changed MSDS to SDS (Safety Data Sheets).	**N/A**	**David Penasa**
17	**04/04/2014**	Updated the Job Briefing and Planning Checklist, page 29.	**N/A**	**David Penasa**
18	**04/04/2014**	Updated the UNM SOP Testing and Working on Energized Circuits, page 22.	**N/A**	**David Penasa**
19	**04/10/2014**	Updated the Electrical Specifications for Contractors and UNM Personnel Doing Work at the University of New Mexico (as of 04/10/14) (Electrical Metering) Attachment #4, pages 30-38.	**N/A**	**David Penasa**
20	**08/21/2014**	Updated the Energized Work Permit, page 26 with a diagram of the Approach Boundary.	**N/A**	**David Penasa & Larry Crum**
21	**03/22/2016**	Changed contact information: removed Larry Crum and added Will Monette.	**N/A**	**William Monette**
22	**03/22/2016**	Page 32, #6: Added "and LTMF".	**N/A**	**William Monette**
23	**04/05/2016**	Page 18, Test Equipment: added verbiage regarding Voltage Indicators	**N/A**	**Committee**
24	**04/05/2016**	Page 26, Updated UNM Energized Electrical Work Permit: Safety Backup must be a Qualified Person as defined by NFPA 70E	**N/A**	**Committee**
25	**04/25/2016**	Page 24, Updated Safety Training Matrix	**N/A**	**Billy Hromas**
26	**02/22/2022**	Complete rewrite of the Electrical Safety Program.	**All**	**EHS & FM**
27	**6/8/2022**	Combined *Attachment 5: Test Apparatus* & *Attachment 11: Custom Electrical Equipment Field Evaluation Form* into a singular document. Combined *Attachment 1: UNM Energized Electrical Work* & *Attachment 6: Testing and Working on Energized Circuits* into a singular document. Updated responsibilities for Supervisors and Lead Personnel to reflect responsibility to verify arc flash assessment not to perform the assessment directly.		
28	**4/24/2023**	Reviewed. No Changes	**N/A**	**ZP,LB,JG**
29	**6/28/23**	Removed the link for Risk Services notice of incident page as they use ours, updated header and footer, attached all attachments	**31, 33-135**	**Viktor Gough**

		to actual SOP instead of having them as individual items		
29.1	**7/25/23**	Added in Culture of Safety message and the Stop Work portion for employee responsibilities	**2, 6-9**	**Viktor Gough**
30	**5/10/24**	Reviewed. No Changes	**N/A**	**TD**

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1. SCOPE

This program applies to the University of New Mexico and its branch campuses, to all work performed on any UNM and UNM HSC Properties (excluding UNM Hospital properties), and to all work performed by UNM employees regardless of jobsite location. All employees who face a risk of electrical shock, burns or related injuries must be trained in electrical safety work practices. These work practices must always be followed. In addition, employees that work around, but not on, electrical systems must be trained in the inherent danger of electricity.

Due to the potential for serious injury and/or death, all faculty, staff, and contractors are required to comply with this program. Failure to comply with the provisions of this program could result in disciplinary action up to and including discharge.

This Electrical Safety Program describes work practices for qualified person, qualified electrical workers and unqualified persons. (As defined by the National Fire Protection Association (NFPA 70E), the National Electrical Code (NEC), Occupational Safety and Health Administration (OSHA).

The program addresses the three following areas:

1) General Requirements for Electrical Safety-Related Work Practices
2) Establishing an Electrically Safe Work Condition (Lockout/Tagout Program)
3) Electrical Work Hazard Protection

2. GOAL

The goal of the Electrical Safety Program is to assist UNM in:

1) Working toward providing a safe and healthful living, learning, and working environment for every member of the greater university community by assuring safe work practices through educating, training, and assisting individuals and departments;
2) Helping individuals and departments achieve compliance with all health and safety state and federal regulations and university policies as economically as possible; and
3) Acting as liaison with external regulatory agencies, and to monitor university compliance with mandatory health and safety standards where necessary.

3. PURPOSE

Employees who face a risk of electrical shock or related injuries must be trained in appropriate electrical safety work practices. In addition, employees that work around—but not on—electrical systems must be trained in the hazards associated with electricity. UNM has developed the Electrical Safety Program to:

1) Assure that departments understand and comply with the regulatory requirements related to electrical work;
2) Assure the safety of employees who may work in the vicinity of, or on, electrical systems; and
3) Assure that all departments that perform electrical work on campus follow uniform work practices.

4. Application

The electrical safety program will be evaluated annually. This evaluation shall consist of reviewing current electrical safety training, updates to associated codes and standards, and any incident or near miss reports from the previous year. If deficiencies are found within the program or employee training, the program and/or training will be modified to address those deficiencies and employees will be retrained to the modifications.

5. UNM's Commitment to Safety

Safety is a core value of the University of New Mexico. UNM is committed to creating and fostering a culture of safety within the community. To learn more visit https://ehs.unm.edu/culture-of-safety.html.

6. Acronyms & Definitions

Authorized Lockout/Tagout Employee - A person who has completed the required hazardous energy control training and is authorized to lock or tag out a specific machine or equipment to perform service or maintenance.

Arc Flash Hazard – A source of possible injury or damage to health associated with the release of energy caused by an electric arc.

Arc Flash Risk Assessment – An overall process that identifies hazards, estimates the likelihood of injury or damage to health, estimates the potential severity of injury or damage to health, and determines if protective measures are required.

Arc Rating – The value attributed to materials that describes their performance to exposure to an electrical arc discharge. The arc rating is expressed in Cal/cm^2 and is derived from the determined value of the arc thermal performance value (ATPV) or energy of breakopen threshold (E_{BT}) (should a material system exhibit a breakopen response below the ATPV value). Arc rating is reported as either ATPV or E_{BT}, whichever is the lower value.

Arc Thermal Performance Value (ATPV) - The highest incident energy which did not cause a fire-resistant fabric to break open and did not exceed the second degree burn criteria.

Boundary, Arc Flash – When an arc flash hazard exists, an approach limit from an arc source at which incident energy equals 1.2 Cal/cm^2 (5 J/cm^2).

Boundary, Electrical Safety – The minimum distance Qualified Persons shall keep unqualified persons away. This boundary encompasses the Arc Flash Boundary for arc flash protection and the Limited Approach Boundary for shock protection.

Boundary, Limited Approach – An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists. This is the closest distance an Unqualified Person can approach and can be crossed only by Qualified Persons. Crossing this boundary is considered "working near energized parts".

Boundary, Restricted Approach – An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased likelihood of electric shock, due to electrical arc-over combined with inadvertent movement.

Barricade - A physical obstruction such as tapes, cones or A-frame-type wood or metal structures intended to provide a warning and to limit access.

Barrier – A physical obstruction that is intended to prevent contact with equipment or energized electrical conductors and circuit parts or to prevent unauthorized access to a work area.

Competent Person – A person who meets all the requirements of Qualified Person and who in addition, is responsible for all work activities or safety procedures related to custom or special equipment and has detailed knowledge regarding the exposure to electrical hazards, the appropriate control methods to reduce the risk associated with those hazards, and the implementation of those methods.

De-energized – Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth.

Device – A unit of an electrical system, other than a conductor, that carries or controls electrical energy as its principal function.

Disconnecting Means - A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

Disconnection (or Isolating) Switch (Disconnector, Isolator) – A mechanical switching device used for isolating a circuit or equipment from a source of power.

EHS – Environmental Health & Safety Department

Electrical Hazard – A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or arc blast injury.

Electrical Safety – Identifying hazards associated with the use of electrical energy and taking precautions to reduce the risk associated with those hazards.

Electrical Safety Authority (ESA) – The authority having jurisdiction for custom built or modified electrical equipment used in teaching and research laboratories. EHS shall serve as the ESA at UNM and

assist the laboratories through the Field Evaluation process that is required to help insure that the equipment is safe for use.

Electrically Safe Work Condition – A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to verify the absence of voltage and, if necessary, temporarily grounded for personnel protection.

Enclosed – Surrounded by a case, housing, fence or wall(s) that prevents persons from unintentionally contacting energized parts.

Enclosure – The case or housing of apparatus - or fence or walls surrounding an installation to prevent personnel from unintentionally contacting energized electrical conductors or circuit parts or to protect the equipment from physical damage.

Energized – Electrically connected to, or is, a source of voltage.

Equipment – A general term, including fittings, devices, appliances, luminaires, apparatus, machinery, and the like, used as part of, or in connection with, an electrical installation.

Exposed (as applied to energized electrical conductors or circuit parts) – Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to electrical conductors or circuit parts that are not suitably guarded, isolated, or insulated.

FM – Facilities Management Department

Grounded (Grounding) – Connected (connecting) to ground or to a conductive body that extends the ground connection.

Ground Fault Circuit Interrupter (GFCI) - A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds the values established for a Class A device. *Note: Class A GFCI trip when the current to ground is 6 mA or higher and do not trip when the current to ground is less than 4mA.*

Grounding Conductor, Equipment (EGC) – The conductive path(s) that provides a ground-fault current path and connects normally non-current-carrying metal parts of equipment together and to the system grounded conductor or to the grounding electrode conductor, or both.

Grounding Electrode (Conductor) – A conductor used to connect the system grounded conductor or the equipment to a grounding electrode or to a point on the grounding electrode system.
Guarded – Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats or platforms to remove the likelihood of approach or contact by persons or objects to a point of danger.

Hazard – A source of possible injury or damage to health.

Hazardous – Involving exposure to at least one hazard.

Interlock – An electrical, mechanical, or key-locked device intended to prevent an undesired sequence of operations.

Incident Energy – The amount of thermal energy impressed on a surface, based on a certain distance from the source, generated during an electrical arc event. Incident energy is typically expressed in calories per square centimeter (Cal/cm^2).

Incident Energy Analysis – A component of an arc flash risk assessment used to predict the incident energy of an arc flash for a specified set of conditions.

Interrupting Rating – The highest current at rated voltage that a device is identified to interrupt under standard test conditions.

Insulated – Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.

Laboratory – A building, space, room, or group of rooms intended to serve activities involving procedures for investigation, diagnostic, product testing, or use of custom or special electrical components, systems, or equipment.

Labeled – Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by who's labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Listed – Equipment, materials or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

Maintenance, Condition of - The state of the electrical equipment considering the manufacturers' instructions, manufacturers' recommendations, and applicable industry codes, standards, and recommended practices.

Nationally Recognized Testing Laboratory (NRTL) - An OSHA designation given to third party testing facilities that provide product safety testing and certification services to manufacturers. Please review the OSHA NRTL web page for an inclusive list of NRTLs.

Qualified Person – One who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and avoid the associated risk.

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. As used in this program, the two types of electrical hazard risk assessments identified are arc flash risk assessment and shock risk assessment.

Shock Hazard – A source of possible injury or damage to health associated with current through the body caused by contact or approach to energized electrical conductors or circuit parts.

Shock Hazard Risk Assessment – An evaluation investigating a person's potential exposure to energized parts or circuits, conducted for the purpose of injury prevention and the determination of safe work practices and the appropriate levels of personal protective equipment.

Unqualified Person – A person who is not a Qualified Person.

Working Distance – The distance between a person's face and chest area and a prospective arc source.

Working On (energized electrical conductors or circuit parts) – Intentionally coming in contact with energized electrical conductors or circuit parts with the hands, feet or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment (PPE) a person is wearing. There are two categories of "working on": *Diagnostic* (testing) is taking readings or measurements of electrical equipment with approved test equipment; *repair* is any physical alteration of electrical equipment (such as making or tightening connections, removing or replacing components, etc.)

7. Roles & Responsibilities

7.1. Facilities Management (Main Campus)

FM is responsible for developing, implementing, and administering the Electrical Safety Program. This involves:

1) Implementing the Electrical Safety Program procedures
2) Ensuring employees are trained in accordance with this program.
3) Designating Supervisors and Lead Personnel
4) Enforcing program compliance
5) Notifying EHS of any discovered program violations or safety incidents
6) Ensure all new electrical installed by UNM employees meet applicable codes and standards and are inspected by the UNM Trade Inspector.

7.2. Branch Campus Facility Managers

Managers overseeing branch campus maintenance staff are responsible for implementing and administering the Electrical Safety Program on their respective campuses. This involves:

1) Implementing the Electrical Safety Program procedures

2) Ensuring employees are trained in accordance with this program.
3) Designating Supervisors and Lead Personnel
4) Enforcing program compliance
5) Notifying EHS of any discovered program violations or safety incidents
6) Ensure all new electrical installed by UNM employees meet applicable codes and standards and are inspected by the UNM Trade Inspector.

7.3. Environmental Health & Safety

EHS is responsible for:

1) Developing and maintaining the written training programs, and other training resources that can be used by University employees.
2) Maintaining centralized records of training, work procedures, inspection data and reports
3) Providing technical assistance to University employees
4) Evaluating the overall effectiveness of the Program
5) Performing annual program audits in accordance with this program

7.4. Supervisors and Lead Personnel:

1) Ensure only Qualified Persons work on exposed energized electrical parts and/or equipment.
2) Create standard operating procedures for electrical tasks.
3) Verify arc flash and shock hazard risk assessments are being performed.
4) Conduct Job Briefings prior to hazardous tasks.
5) Ensure employees have and use the proper safety equipment for the job (personal protective equipment, barriers, barricades, tapes, cones, etc.).
6) Ensure all new electrical installations installed by UNM employees have been reviewed and approved by the trade's inspector.

7.5. Qualified Persons:

1) Understand the hazards and operation of the equipment being interacted with.
2) Be familiar with procedures for evaluating how the task will be performed, including the use of standard operating procedures, and all options for performing the task using the preferred method while circuits are de-energized.
3) Trained on and understand the proper use of test instruments.
4) Have the skills and techniques necessary to determine nominal voltages of exposed energized parts.

5) Understand the procedures for establishing an electrically safe work condition.

6) Have the skills and techniques necessary to distinguish energized parts from other electrical parts.

7) Maintain safe clearance distances from exposed live electrical parts.

8) Use and properly maintain the required personal protective equipment for the task.

9) Report unsafe conditions or electrical deficiencies immediately to appropriate faculty or supervisors.

Unqualified Persons must always remain outside the electrical safety boundary when working in the vicinity of exposed energized electrical equipment.

7.6. UNM and Contract Employers' Responsibilities

7.6.1. UNM Responsibilities.

1) UNM shall inform contract employers of the following:

    a. Known hazards that are covered by this program, that are related to the contract employer's work, and that might not be recognized by the contract employer or its employees

    b. Information about the employer's installation that the contract employer needs to make the risk assessments required by this program.

2) UNM shall report observed contract employer–related violations of this standard to the contract employer.

7.6.2. Contract Employer Responsibilities.

1) Contractors shall perform all work in accordance with the following documents:

    a. *Attachment 4: Electrical Specifications for Contractors and UNM Personnel doing Electrical Work at UNM*

    b. *Attachment 10: Contractor Guidelines for doing Mechanical & Electrical Work at UNM*

2) Contractors must notify and obtain approval in advance by UNM Area Electrical Staff / Supervision/Management prior to exercising any Electrical Equipment (i.e. shut down or startup of electrical equipment) via the UNM Utility Outage Request form (Attachment 9).

3) Contractors are not permitted to de-energize systems. UNM Staff must perform de-energization.

4) The contract employer shall ensure that each of his or her employees is instructed in the hazards communicated to the contract employer by the host employer. This instruction shall be in addition to the basic training required by this standard.

5) The contract employer shall ensure that each of his or her employees follows the work practices required by this standard and safety-related work rules required by the host employer.

6) The contract employer shall advise the host employer of the following:

a. Any unique hazards presented by the contract employer's work

b. Hazards identified during the course of work by the contract employer that were not communicated by the host employer

c. The measures the contractor took to correct any violations reported by the host employer under 7(A)(2) and to prevent such violation from recurring in the future

7.6.3. Documentation**.**

Where UNM has knowledge of hazards covered by this standard that are related to the contract employer's work, there shall be a documented meeting between the host employer and the contract employer.

7.7. Laboratory Faculty and Students

1) Understand the hazards and operation of the equipment being interacted with.
2) Be familiar with procedures for evaluating how the task will be performed, including the use of standard operating procedures, and all options for performing the task using the preferred method while circuits are de-energized.
3) Trained on and understand the proper use of test instruments.
4) Understand the procedures for establishing an electrically safe work condition.
5) Have the skills and techniques necessary to distinguish energized parts from other electrical parts.
6) Maintain safe clearance distances from exposed live electrical parts.
7) Use and properly maintain the required personal protective equipment for the task.
8) Report unsafe conditions or electrical deficiencies immediately to appropriate faculty or supervisors.
9) All stakeholders have the right to stop work if an unsafe condition arises within the work environment.

8. TRAINING REQUIREMENTS

8.1. Electrical Hazard Awareness Training.

UNM Employees that work on or around electrical systems shall:

1) Be trained to understand the specific hazards associated with electrical energy.
2) Be trained in safety-related work practices and procedural requirements, as necessary, to provide protection from the electrical hazards associated with their respective job or task assignments.
3) Be trained to identify and understand the relationship between electrical hazards and possible injury.

UNM Students and Staff that work on or around electrical system within a lab setting shall:

1) Complete a hazard assessment form specific to their electrical experiment
2) Include hazard identification and safety controls in their lab safety manual
3) Train those working within the lab on specific processes and procedures related to the experiment

8.2. Qualified Person Training

A qualified person, as defined by NFPA 70E, shall be trained and knowledgeable in the construction and operation of equipment or a specific work method and be trained to identify and avoid the electrical hazards that might be present with respect to that equipment or work method. The qualified person shall be identified through verification of training records and supervisor review.

1) Such persons shall also be familiar with the proper use of the special precautionary techniques, applicable electrical policies and procedures, PPE, insulating and shielding materials, and insulated tools and test equipment.
2) A person can be considered qualified with respect to certain equipment and tasks but still be unqualified for others.
3) Such persons permitted to work within the limited approach boundary shall, at a minimum, be additionally trained in all of the following:
    a. Skills and techniques necessary to distinguish exposed energized electrical conductors and circuit parts from other parts of electrical equipment
    b. Skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors and circuit parts
    c. Approach distances specified in NFPA 70E Table 130.4(E)(a) and NFPA 70E Table 130.4(E)(b) and the corresponding voltages to which the qualified person will be exposed
    d. Decision-making process necessary to be able to do the following:
        i. Perform the job safety planning
        ii. Identify electrical hazards
        iii. Assess the associated risk
        iv. Select the appropriate risk control methods from the hierarchy of controls methods, including PPE
4) An employee who is undergoing on-the-job training for the purpose of obtaining the skills and knowledge necessary to be considered a qualified person, and who in the course of such training demonstrates an ability to perform specific duties safely at his or her level of training, and who is under the direct supervision of a qualified person shall be considered to be a qualified person for the performance of those specific duties.
5) Employees shall be 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.

6) UNM shall determine through regular supervision or through audits conducted on at least an annual basis that each employee is complying with the safety-related work practices required by this standard.

8.3. Unqualified Persons Training

1) Anyone not qualified to perform a task. Unqualified personnel shall be instructed in the following: Risk and hazards associated with contact with energized electrical equipment, and

2) Tasks that can only be performed by a Qualified Person, and

3) Importance of electrical hazard signs, labels and tags.

8.3.1. Additional Training and Retraining

Additional training and retraining in safety-related work practices and applicable changes in this standard shall be performed at intervals not to exceed 3 years. An employee shall receive additional training or retraining if any of the following conditions exists:

1) The supervision or annual inspections indicate the employee is not complying with the safety-related work practices.

2) New technology, new types of equipment, or changes in procedures necessitate the use of safety-related work practices different from those that the employee would normally use.

3) The employee needs to review tasks that are performed less often than once per year.

4) The employee needs to review safety-related work practices not normally used by the employee during regular job duties.

5) The employee's job duties change.

8.3.2. Type of Training

The training required shall be classroom, on-the-job, or a combination of the two. The type and extent of the training provided shall be determined by the risk to the employee.

8.3.3. Electrical Safety Training Documentation

The employer shall document that each employee has received the training required by this program. This documentation shall be in accordance with the following:

1) Be made when the employee demonstrates proficiency in the work practices involved

2) Be retained for the duration of the employee's employment

3) Contain the content of the training, each employee's name, and dates of training

8.4. Lockout/Tagout Procedure Training.

8.4.1. Initial Training

Employees involved in the lockout/tagout procedures shall be trained in the following:

1) The lockout/tagout procedures
2) Their responsibility in the execution of the procedures

8.4.2. Retraining

Retraining in the lockout/tagout procedures shall be performed as follows:

1) When the procedures are revised
2) At intervals not to exceed 3 years
3) When supervision, annual inspections, or audits indicate that the employee is not complying with the lockout/tagout procedures

8.4.3. Lockout/Tagout Training Documentation

1) The employer shall document that each employee has received the training required by this program
2) The documentation shall contain the content of the training, each employee's name, and the dates of the training.

8.5. Emergency Response Training

8.5.1. Contact Release

Employees exposed to shock hazards and those responsible for the safe release of victims from contact with energized electrical conductors or circuit parts shall be trained in methods of safe release. Refresher training shall occur annually.

8.5.2. First Aid, Emergency Response, and Resuscitation

1) Employees responsible for responding to medical emergencies, and employees performing work on, or associated with, exposed lines or equipment energized at 50 volts or more must be trained in must be trained in:
    a. First aid and emergency procedures.
    b. Cardiopulmonary resuscitation (CPR).
    c. Automated external defibrillator (AED) if an employer's emergency response plan includes the use of this device.

8.5.3. Training Verification

UNM shall verify at least annually that employee emergency response training is current.

8.5.4. Documentation

The employer shall document that the training required has occurred.

9. PRIORITY

9.1. Hazard Elimination

1) Hazard elimination shall be the first priority in the implementation of safety-related work practices. Once a hazard has been identified, it should be determined if the hazard can be eliminated. During the electrical system design stage, methods should be employed to eliminate hazards in their entirety.

9.2. Engineering Controls

1) All electrical distribution panels, breakers, disconnects, switches, junction boxes, etc. shall be completely enclosed.

2) A watertight enclosure shall be used where there is the possibility of moisture entry either from operations or weather exposure.

3) Electrical distribution areas will be guarded against accidental damage by locating in specifically designed rooms, use of substantial guard posts and rails and other structural means.

4) Electrical distribution rooms, vaults and spaces shall be so enclosed within fences, screens, partitions, or walls as to minimize the possibility that Unqualified Persons will enter.

5) Entrances to electrical distribution rooms, vaults and spaces that are not under the observation of an attendant shall be kept locked.

6) Sufficient access and working space shall be provided and maintained around electrical equipment to permit ready and safe operation and maintenance of such equipment. A clear approach and 3-feet of side clearance shall be maintained for all distribution panels.

7) All conduit shall be fully supported throughout its length. Non-electrical attachments to conduit are prohibited.

8) All non-rigid cords shall be provided strain relief where necessary.

9.3. Administrative Controls

1) Signs warning Unqualified Persons to keep out of electrical distribution rooms, vaults and spaces shall be displayed at entrances.

2) Unqualified Persons may not enter electrical distribution rooms, vaults and spaces where there are energized, exposed electrical conductors or circuit parts.

3) Access to electrical distribution rooms, vaults and spaces is limited to those employees who have a need to enter.

4) Only Qualified Persons shall conduct diagnostics and repairs to electrical equipment.

5) Contractors performing electrical work must hold a license for the work.

6) Areas under new installation or repair will be sufficiently guarded with physical barriers and warning signs to prevent unauthorized entry.

7) All electrical control devices shall be properly labeled.

8) All Qualified Persons shall follow established electrical safety and standard operating procedures.

9) Conductive articles of jewelry and clothing (such a watch bands, bracelets, rings, key rings, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) may not be worn if they might contact exposed energized parts. Articles may be worn if they are rendered nonconductive by covering, wrapping, or other insulating means.

10. General Requirements

Electrical conductors and circuit parts shall not be considered to be in an electrically safe work condition until all of the requirements of *Attachment 2: Control of Hazardous Energy (Lockout/Tagout) Program* have been met.

Safe work practices applicable to the circuit voltage and energy level shall be used in accordance with *Attachment 1: Energized Work SOP* until such time that electrical conductors and circuit parts are in an electrically safe work condition.

11. Research Laboratories and Support Shops

This section defines practices and procedures to be implemented for electrical equipment that is not listed or labeled by a nationally-recognized testing laboratory (NRTL). Typically, this will include research related equipment that is custom built in-house or NRTL listed or labeled equipment that has been modified which invalidates the listing or labeling.

An important concept to understand is that NRTL listed/labeled electrical equipment has undergone rigorous testing to help insure that it is safe for use. If electrical equipment is modified or custom built in-house, the laboratory/group responsible for modifying or building the equipment is responsible to complete a field evaluation of the equipment to ensure that it is safe for use. EHS is available to provide guidance and identify resources to aid in completion of the field evaluation, however, EHS cannot perform the field evaluation.

11.1. General Laboratory Requirements

1) Equipment and installations that bear the seal of a NRTL are considered approved as long as they are installed and used in accordance with any instructions included in the listing or labeling.

2) NRTL listed or labeled equipment must be acquired/used whenever it is available, even if similar unlisted or labeled equipment can be used. OSHA allows for approval of custom-made equipment or related installations if the equipment is determined to be safe for its intended use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection.

3) EHS shall act as the Electrical Safety Authority (ESA) for UNM. In this role, EHS shall help guide the laboratory through the requirements of this section and if needed, assist with identifying the appropriate subject matter experts that may be needed to help the lab/group complete the field evaluation. EHS shall not be responsible for field evaluation of equipment. The field evaluation must be completed by the Competent Person designated by the laboratory that modifies or builds the equipment. In some cases, the Competent Person may need to collaborate with the appropriate subject matter experts to assist with the field evaluation, but ultimately, the Competent Person must take responsibility for the equipment and insure that it is safe for use.

4) Electrical equipment fabrication, modification or installation shall be completed by or under the direct supervision of a Competent Person.

5) A Competent Person is a person who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify and avoid the hazards involved. The Competent Person is responsible for all work activities or safety procedures related to custom or special equipment and has detailed knowledge regarding the exposure to electrical hazards, the appropriate control methods to reduce the risk associated with those hazards, and the implementation of those methods.

    a. The Competent Person shall understand the following concepts:

        i. Skills and techniques necessary to distinguish exposed energized electrical conductors and circuit parts from other parts of electrical equipment.

        ii. Skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors and circuit parts.

        iii. Approach distances specified in NFPA 70E 130.4(D)(a) and the corresponding voltages to which the individual will be exposed.

        iv. Decision-making process necessary to be able to do the following:

            1. Perform the job safety planning.

            2. Identify electrical hazards.

            3. Assess the associated risk.

4. Select the appropriate risk control methods from the hierarchy of controls including selection of appropriate personal protective equipment.

6) Where electrical equipment must be custom fabricated because NRTL listed or labeled equipment is not available or there is a case where foreign equipment is acquired to perform a unique experimental function in support of the laboratory's scientific mission or there is a need for continued use of legacy equipment, the equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees. The equipment must be field evaluated and approved by a Competent Person and documented on the Custom Electrical Equipment Field Evaluation Form (Attachment 5).

11.2. Laboratory Energy Thresholds

These thresholds are not intended to provide approval of a "safe" working condition. Environmental conditions, like wet hands or humid environment, could create hazardous conditions even if energy levels are within the identified thresholds. UNM strives to remove all electrical hazards from a process, and only allows energy exposure when it is absolutely necessary. In these instances, energy exposure levels shall not exceed those identified in the following list unless appropriate controls are implemented as approved by the Competent Person:

1) AC/DC: 50-volts and 5 milliamperes.

2) Capacitive Systems: No exposure levels shall be allowed for Capacitive Systems. Capacitors should be discharged and shorted prior to exposure.

11.3. Critical Low Voltage Shock Levels

Conditions for a serious (potentially lethal) shock across a critical path, such as the heart, are:

1) More than 30-V AC root mean square (rms), 42.4-V peak, or 60 V dc at a total impedance of less than 5000 ohms.

2) 10 to 75 milliamperes

3) More than 10 Joules

Conditions for a potentially lethal shock across the heart are:

1) More than 375 V at a total body impedance of less than 5000 ohms.

2) More than 75 mill amperes.

3) Moure than 50 Joules

11.4. Laboratory Equipment Examination

In judging equipment, considerations such as the following shall be evaluated:

1) Suitability of equipment for an identified purpose may be evidenced by NRTL listing or labeling for that identified purpose.

2) Electrical equipment must be enclosed to protect personnel from the hazards of electrical shock and arc flash and to contain fire or pieces that could be violently expelled.

3) Exposed metal parts of the enclosure are bonded and grounded.

4) Appropriate overcurrent protection is installed.

5) Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided.

6) Wire-bending and connection space.

7) Electrical insulation.

8) Heating effects under normal conditions of use and also under abnormal conditions likely to arise in service.

9) Arcing effects.

10) Classification by type, size, voltage, current capacity, and specific use.

11) Openings through which conductors enter shall be adequately closed and strain relief provided.

12) Other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment.

11.5. Laboratory Equipment Marking and Documentation

1) **Marking** – Marking of equipment shall be required for, but not limited to, equipment fabricated, designed, or developed for research testing and evaluation of electrical systems. Marking shall sufficiently list all voltage entering or leaving control cabinets, enclosures and equipment. Caution, Warning, or Danger labels shall be affixed to the exterior describing specific hazards and safety concerns. Refer to ANSI Z535, the series of Standards for Safety Signs and Colors for more information.

2) **Documentation** – Sufficient documentation shall be provided and readily available to personnel that install, operate and maintain equipment that describes operation, shutdown, safety concerns and nonstandard installations. Schematics, drawings and bill of materials describing power feeds, voltage, currents and parts used for construction, maintenance and operation of the equipment shall be provided.

3) **Shutdown Procedures** - Safety requirements and emergency shutdown procedures of equipment shall include control of hazardous energy (lockout/tagout) requirements.

4) **Approvals** – Drawings, standard operating procedures and equipment shall be approved by the Competent Person. Assembly of equipment shall comply with national standards where applicable unless research application requires exceptions. Equipment that does carry a listing or label from a NRTL shall be Field Evaluated. Proper safety shutdown procedures and PPE requirements shall be considered in the absence of grounding and/or bonding.

11.6. Laboratory Field Evaluation Process

1) The laboratory responsible for modification or custom fabrication of electrical equipment must complete or arrange for field evaluation of the equipment. The equipment must be inspected and approved by a Competent Person and documented on the *Attachment 5: Experimental Electrical Apparatus and Student Projects SOP*. The completed form must be submitted to the ESA (EHS) for review prior to start-up. The ESA will review the form and contact the lab if concerns are identified. Once the completed form has been approved by the ESA, the equipment can be considered approved for use.

2) Documentation: The following documents must be maintained by the laboratory that modified or fabricated the electrical equipment:

    a. Justification for in-house modifications of NRTL listed or labeled equipment or need for in-house fabrication of equipment.

    b. Design information and a schematic line drawing of the electrical work.

    c. Qualifications of the fabricator. Qualifications include adequate technical electrical/electronic and electrical safety knowledge.

    d. Completed *Attachment 5: Experimental Electrical Apparatus and Student Projects SOP*. The form must be maintained for the life of the equipment.

11.7. Experimental Electrical Apparatus Exposed to the Public

For experimental electrical apparatus that will be displayed to the public, utilize *Attachment 5: Experimental Electrical Apparatus and Student Projects SOP*

12. PROCESSES & PROCEDURES

12.1. Risk Assessment Procedure

The intent of this procedure is to perform a risk assessment, which includes a review of the electrical hazards, the associated foreseeable tasks, and the protective measures that are required in order to maintain a tolerable level of risk. This includes the following before work is started:

1) Identify the electrical hazards

2) Assess the risk by identifying and analyzing the tasks to be performed

3) Identify additional hazards that may be present within the work space

4) Implement risk control by determining the appropriate protective measures

12.1.1. Hierarchy of Risk Control Methods.

The risk assessment procedure requires that preventive and protective risk control methods be implemented in accordance with the following hierarchy:

1) Elimination
2) Substitution
3) Engineering controls
4) Awareness
5) Administrative controls
6) PPE

12.1.2. Additional Hazards & Considerations

Employees performing work in and around campus buildings may be exposed to other hazards not covered by this program. These include, but are not limited to:

1) **Fall Hazards:** Employees that work in elevated locations where there is exposure to an unguarded fall hazard of 4 feet or greater must be provided and use fall protective equipment and must be trained to use this equipment properly.

2) **Confined or Enclosed Spaces:** A confined or enclosed space is a space that is large enough for an employee to enter and perform work, that has limited or restricted means for entry or exit, and that is not intended for continuous employee occupancy. Examples include, but are not limited to, sewers, silos, tanks, boilers, tunnels, vaults and manholes. Employees that perform work in confined or enclosed spaces must be trained to perform this work safely and must comply with the requirements of UNM Confined Space Program.

3) **Hazardous Materials:** If you use or work around chemicals or other hazardous materials, you must be trained on how to read and interpret the Safety Data Sheet (SDS), formerly Material Safety Data Sheet (MSDS), for the material. You must also be informed of how to gain access to SDS's/MSDS's, how to safely handle, and how to store these materials.

4) **Hot Work Operations:** Abrasive grinding, welding, cutting and brazing, torch cutting and similar hot work operations are required to be permitted if performed outside of an approved hot work area. Permits and additional information may be obtained from EHS.

5) **Lockout/Tagout:** Work conducted around other types of energized systems (for example, pneumatic, pressurized, spring-actuated and similar) must be addressed using approved lockout/tagout procedures and must comply with UNM's Lockout/Tagout Safety Program.

6) **Asbestos and Lead Materials:** Asbestos is commonly found in mechanical rooms and spaces, and may be present in pipe insulation, ceiling tile, plasters, flooring and electric wire insulation. Lead is commonly found in older paints and coatings. Both materials are potentially serious health hazards. It is a university requirement, therefore, that all maintenance and renovation work that impacts building components, systems or equipment must be reviewed by EHS. All testing and abatement must be performed by qualified personnel; contact EHS at 505-277-2753.

7) Work associated with electric power generation, transmission and distribution systems.

Training and additional information on the above programs may be obtained through FM and EHS.

12.1.3. Ergonomics

Ergonomics is an applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely. Job activities that can lead to fatigue, discomfort, or pain when do them repeatedly or for long periods of time.

These include:

1) Exerting force to perform a task or to use a tool.
2) Working in positions such as bending, stooping, twisting, and overhead reaching.
3) Using awkward hand, wrist, elbow, or shoulder postures.
4) Remaining in the same position for a long time with little or no movement.
5) Continuous pressure from a hard surface or edge on any part of the body.
6) Working in very hot or cold temperatures, produced by climate, equipment, or machines.
7) Sitting on, standing on, or holding equipment or tools that vibrate. In addition, stressful conditions can increase muscle tension and reduce awareness of proper work technique.
8) Stressful conditions can increase muscle tension and reduce awareness of proper work technique.

Ergonomics should always be taken into consideration when reviewing the scope of work, and appropriate safe work practices should be identified and implemented.

Ergonomic Safe work practices:

1) **PPE:**
    a. Wear safety gear that fits. Protect your knees from hard, sharp surfaces by wearing knee pads. Wear appropriate eye protection to protect your eyes from debris and flying particles. Protect your hands from friction and sharp edges by wearing gloves.
2) **Select the right tool:**
    a. Choose tools that fit your hand comfortably and have soft grips. A good handle grip prevents your hand from slipping while using the tool. Consider using tools that reduce the amount of force or movements you use. Keep tools well maintained.
    b. Plan what you are going to do. Carry only the tools or equipment you will need. Wear a tool belt that fits and distribute the tools and materials evenly.
3) **Housekeeping:**
    a. Pick up debris and scrap material to prevent trips, slips, and falls. Good housekeeping allows you and your equipment to get closer to your work.

12.2. Electrically Safe Work Condition.

Energized electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts shall be put into an electrically safe work condition before an employee performs work if any of the following conditions exist:

1) The employee is within the limited approach boundary.
2) The employee interacts with equipment where conductors or circuit parts are not exposed but an increased likelihood of injury from an exposure to an arc flash hazard exists.

12.3. Outage/Shutdown Requests

All outage/shutdown requests shall be filled and approved in accordance with Attachment 9: *Utilities SOP M01 Planned Interruption of Utility Service*

12.4. Control of Hazardous Energy (Lockout/Tagout) Program

All lockout/tagout activities shall be performed in accordance with the UNM Control of Hazardous Energy Program (Attachment 2).

12.5. Energized Work (Permit Required)

Under NFPA 70E, there are only two instances in which an employee can work on live parts.

1) When de-energizing would interrupt essential life support, emergency alarms or ventilation systems.
2) When the organization can demonstrate that de-energizing the system would introduce additional or increased hazards or that it is infeasible due to equipment design or operational limitations.

In these situations, the UNM Energized Work Permit Procedure (Attachment 1) must be completed and approved by an authorized person.

12.6. Job Safety Planning and Job Briefing

Before starting any job that involves exposure to electrical hazards, the Qualified Person shall complete a job safety plan and conduct a job briefing with the employees involved.

12.6.1. Job Safety Planning

The job safety plan shall be in accordance with the following:

1) Be completed by a qualified person
2) Be documented
3) Include the following information:
    a. A description of the job and the individual tasks
    b. Identification of the electrical hazards associated with each task
    c. A shock risk assessment in for tasks involving a shock hazard

d. An arc flash risk assessment for tasks involving an arc flash hazard

e. Work procedures involved, special precautions, and energy source controls

12.6.2. Job Briefing

The job briefing shall cover the job safety plan and the information on the energized electrical work permit, if a permit is required.

12.6.3. Change in Scope

Additional job safety planning and job briefings shall be held if changes occur during the course of the work that might affect the safety of employees.

12.7. Selecting and Maintaining PPE

12.7.1. Protective Equipment

Employees working in areas where there are potential electrical hazards must be provided with, and must use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed. The department must provide electrical safety-related personal protective equipment required by this program at no cost to the employee.

12.7.2. Workmanship and finish

Rubber insulating equipment must meet the American Society of Testing and Materials (ASTM) standards D120-87, D178-93, D1048-93, D1049-93, D1050-90, or D1051-87 as applicable. Manufactured equipment which does not indicate compliance with these ASTM standards must be tested using the AC and DC proof tests and related procedures as described in these ASTM standards.

Blankets, gloves and sleeves must be produced by seamless process. Insulating blankets, matting, covers, lines, hose, gloves, and sleeves made of rubber must be marked to indicate the class of equipment (e.g., Class 0 equipment must be marked Class 0, Class 1 marked Class 1, and so forth). Non-ozone-resistant equipment other than matting must be marked Type I. Ozone-resistant equipment other than matting shall be marked Type II. Markings must be nonconductive and must be applied in a way that will not damage the insulating qualities. Markings on gloves must be confined to the cuff portion of the glove.

Equipment must be free of harmful physical irregularities. Surface irregularities (e.g., indentions, protuberances, or imbedded foreign materials) may be present on rubber goods because of imperfections on forms or molds or because of manufacturing difficulties. These surface irregularities are acceptable under the following conditions:

1) The indention or part that sticks out blends into a smooth slope when the material is stretched, or

2) The foreign material remains in place when the insulating material is folded and stretches with the insulating material surrounding it.

12.7.3. In-service Care and Use

The department must make certain that electrical protective equipment is kept in a safe, reliable condition, and that the following requirements are met:

1) Maximum use voltages for rubber protective equipment must conform to those listed in Table 1, from the OSHA 1910.137 - Electrical Protective Equipment.

TABLE 1
RUBBER INSULATING EQUIPMENT, MAXIMUM USE VOLTAGE

Class of Equipment & Glove Tag Color	Maximum AC Voltage[1]	Maximum DC Voltage
Class 00 – Color Beige	500	750
Class 0 – Color Red	1,000	1,500
Class 1 - White	7,500	11,250
Class 2 - Yellow	17,000	25,500
Class 3 - Green	26,500	39,750
Class 4 - Orange	36,000	54,000

[1] The maximum use voltage is the ac voltage (rms) classification of the protective equipment that designates the maximum nominal voltage of the energized system that may be safety worked. The nominal design voltage is equal to the phase-to-phase voltage on multiphase circuits. However, the phase-to-ground potential is considered to be the nominal design voltage:

1) If there is no multiphase exposure in a system area and if the voltage is limited to the phase-to-ground potential, or

2) If the electrical equipment and devices are insulated or isolated or both so that the multiphase exposure on a grounded wye circuit is removed.

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

3) An air test must be performed on rubber insulating gloves before use.

4) Insulating equipment with a hole, tear, puncture or cut, ozone cutting or checking, an embedded foreign object, any change in texture including swelling, softening, hardening, or becoming sticky or inelastic, or any other defect that could damage the insulating property must not be used.

5) All protective equipment must be used and maintained in accordance with the manufacturer's instructions.

6) Insulating equipment found to have defects that might affect its insulating properties must be removed from service until electrical tests have been performed that indicate it is acceptable for continued use.

7) Where the insulating capability of protective equipment is subject to damage during use, the insulating material shall be protected by an outer covering of leather or other appropriate material.

8) Rubber insulating equipment must be tested on a schedule as shown in Table 5.

TABLE 2
RUBBER INSULATING EQUIPMENT TEST INTERVALS

Type of Equipment	When to Test
Rubber insulating line hose	Upon indication that the insulating value is suspect
Rubber insulating covers	Upon indication that insulating value is suspect
Rubber insulating blankets	Before first issue and every 12 months thereafter [1]
Rubber insulating gloves	Before first issue and every 6 months thereafter [1]
Rubber insulating sleeves	Before first issue and every 12 months thereafter [1]

[1] If the insulating equipment has been electrically tested but not issued for service, it may not be placed into service unless it has been electrically tested within the previous 12 months.

Employees must clean insulating equipment as needed to remove foreign substances, and store insulating equipment where it is protected from light, temperature extremes, excessive humidity, ozone, and other substances and conditions that may cause damage. Employees must visually examine their gloves prior to each use and to avoid handling sharp objects.

Protector gloves must be worn over insulating gloves except as follows:

1) Protector gloves need not be used with Class 0 gloves, under limited-use conditions, where small equipment and parts manipulation require unusually high finger dexterity.

2) Any other class of glove may be used for similar work without protector gloves if is demonstrated that the possibility of physical damage to the gloves is small and if the class of glove is one class higher than that required for the voltage involved. Insulating gloves that have been used without protector gloves may not be used at a higher voltage until they have been electrically tested.

The employee must ensure that they do not use insulating equipment that fails to pass visual inspections or electrical tests except as follows:

1) Rubber insulating line hose may be used in shorter lengths if the defective portion is cut off.

2) Rubber insulating blankets may be repaired with a compatible patch as long as the physical and electrical properties equal or exceed those of the blanket.

3) Rubber insulated blankets may be salvaged by cutting and removing the defective area from the undamaged portion of the blanket if the undamaged area remaining is greater than 22 inches by 22 inches for Class 1, 2, 3 and 4 blankets.

4) Rubber insulating gloves and sleeves with minor physical defects, such as small cuts, tears or punctures may be repaired by application of a patch with the same electrical and physical properties as the surrounding material.

5) Rubber insulating gloves and sleeves with minor surface blemishes may be repaired with a compatible liquid compound.

6) Repairs to gloves are permitted only in the area between the wrist and reinforced edge of the opening.

Repaired insulating equipment must be retested before it may be returned to service. These tests must be documented in writing, and indicate the type(s) of test(s) performed, equipment tested (specifically by referencing an applied marking, serial number or similar), date, name of tester, and the results of the tests. These test results must be maintained in a permanent log.

12.7.4. General Protective Equipment and Tools

1) Nonconductive head protection must be worn whenever there is danger of head injury from electric shock or burn due to contact with exposed energized parts.
2) Protective equipment for the eyes and/or face must be worn whenever there is danger of injury to the eyes or face from electric arcs, flashes or flying objects resulting from electrical explosion.
3) Insulated tools or handling equipment must be used by employees working near exposed energized conductors or circuit parts if the tools or handling equipment might contact such conductors or parts.
4) If the insulating capability of insulated tools or handling equipment is subject to damage, the insulating material must be protected.
5) Protective shields, protective barriers, or insulating materials must be used to protect each employee from shock, burns, or other electrically related injuries while employees are working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur.
6) When normally enclosed live parts are exposed for maintenance or repair, they are to be guarded to protect unqualified persons from contact with the live parts.
7) Fuse handling equipment, insulated for the circuit voltage, must be used to remove or install fuses when the fuse terminals are energized.
8) Ropes and hand lines used near exposed energized parts must be nonconductive.

12.8. Test Instruments and Equipment

12.8.1. Testing

Only qualified persons shall perform tasks such as testing, troubleshooting, and voltage measuring on electrical equipment where an electrical hazard exists.

12.8.2. Rating

Test instruments, equipment, and their accessories shall be as follows:

1) Rated for circuits and equipment where they are utilized
2) Approved for the purpose
3) Used in accordance with any instructions provided by the manufacturer

12.8.3. Design

Test instruments, equipment, and their accessories shall be designed for the environment to which they will be exposed and for the manner in which they will be utilized.

12.8.4. Visual Inspection and Repair

Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects and damage before each use. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service. No employee shall use it until a person(s) qualified to perform the repairs and tests that are necessary to render the equipment safe has done so.

12.8.5. Operation Verification

When test instruments are used for testing the absence of voltage on conductors or circuit parts operating at voltages equal to or greater than 50 volts, the operation of the test instrument shall be verified on any known voltage source before and after an absence of voltage test is performed.

12.9. Hazard Alerting Techniques

The following alerting techniques must be used to warn and protect employees from electrical shock hazards, burns, or failure of electric equipment parts.

1) Safety Signs and Tags - Safety signs, safety symbols, or accident prevention tags are to be used where necessary to warn employees about electrical hazards that may endanger them.

2) Barricades – Barricades are used in conjunction with safety signs where necessary to prevent or limit employee access to work areas exposing employees to uninsulated energized conductors or circuit parts. Conductive barricades may not be used where they might cause an electrical contact hazard.

3) Attendants - If signs and barricades do not provide sufficient warning from electrical hazards, an attendant is to be stationed to warn and protect employees.

12.10. Ground-Fault Circuit-Interrupter (GFCI Protection)

12.10.1. General

Employees shall be provided with ground-fault circuit-interrupter (GFCI) protection where required by applicable state, federal, or local codes and standards. Listed cord sets or devices incorporating listed GFCI protection for personnel identified for portable use shall be permitted.

12.10.2. Maintenance and Construction Activities

GFCI protection shall be utilized whenever an employee is operating or using cord sets (extension cords) or cord- and plug-connected tools related to maintenance and construction activity supplied by 125-volt, 15-, 20-, or 30-ampere circuits.

Where employees operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30-☐ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be implemented.

12.10.3. Outdoors

GFCI protection shall be provided when an employee is outdoors and operating or using cord sets (extension cords) or cord- and plug-connected equipment supplied by 125-volt, 15-, 20-, or 30-☐ampere circuits. Where employees working outdoors operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30-ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be implemented.

12.10.4. Conductive or Wet Work Locations.

Portable cord- and plug-connected electric equipment used in conductive or wet work locations shall be approved for use in those locations. In work locations where employees are likely to contact or be drenched with water or conductive liquids, ground-fault circuit-interrupter protection for personnel shall be used.

12.10.5. Testing Ground-Fault Circuit-Interrupter Protection Devices

GFCI protection devices shall be tested in accordance with the manufacturer's instructions.

12.11. Overcurrent Protection Modification

1) Overcurrent protection of circuits and conductors shall not be modified, even on a temporary basis, without full approval of the FM Trades Inspector.

2) 2017 NEC 240.87 Arc Energy Reduction - required for 1200A or larger circuit breakers. Energy-reducing maintenance switch to be used to reduce clearing time while the worker is working within an arc-flash boundary and then set back to a normal setting after the potentially hazardous work is complete.

3) Label disconnecting means and overcurrent protective devices (i.e., fused disconnect switches or circuit breakers) to identify the equipment and/or electrical services (e.g., feeders, panelboards, or switches) that they service. Identification must be accurate, legibly marked, and capable of withstanding the environment involved (e.g., a wet area, in the sun, or heat).

12.12. Stationary Equipment

Equipment shall be used and installed in accordance with the manufacturer's instructions and all applicable codes and regulations.

12.13. Portable Cord-and-Plug Connected Electric Equipment

This section applies to the use of cord- and plug-connected equipment, including cord- and plug-connected test instruments and cord sets (extension cords).

12.13.1. Handling and Storage

Portable equipment shall be handled and stored in a manner that will not cause damage. Flexible electric cords connected to equipment shall not be used for raising or lowering the equipment. Flexible cords shall not be fastened with staples or hung in such a fashion as could damage the outer jacket or insulation.

12.13.2. Grounding-Type Equipment

1) A flexible cord used with grounding-type utilization equipment shall contain an equipment grounding conductor.

2) Attachment plugs and receptacles shall not be connected or altered in a manner that would interrupt continuity of the equipment grounding conductor. Additionally, these devices shall not be altered in order to allow use in a manner that was not intended by the manufacturer.

3) Adapters that interrupt the continuity of the equipment grounding conductor shall not be used.

12.13.3. Visual Inspection and Repair of Portable Cord- and Plug-Connected Equipment and Flexible Cord Sets.

1) Frequency of Inspection. Before each use, portable cord- and plug-connected equipment shall be visually inspected for external defects (such as loose parts or deformed and missing pins) and for evidence of possible internal damage (such as a pinched or crushed outer jacket).

    a. *Exception: Stationary cord- and plug-connected equipment that remain connected once they are put in place and are installed such that the cord and plug are not subject to physical damage during normal use shall not be required to be visually inspected until they are relocated or repaired.*

2) Defective Equipment. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service. No employee shall use it until a person(s) qualified to perform the repairs and tests necessary to render the equipment safe has done so. It is UNM policy that the manufacturer (or authorized manufacturer representative) repair any defective or damaged tools or equipment.

3) Proper Mating. When an attachment plug is to be connected to a receptacle, the relationship of the plug and receptacle contacts shall first be checked to ensure that they are of mating configurations.

12.13.4. Connecting Attachment Plugs.

1) Employees' hands shall not be wet when plugging and unplugging flexible cords and cord- and plug-connected equipment if energized equipment is involved.

2) Energized plug and receptacle connections shall be handled only with insulating protective equipment if the condition of the connection could provide a conductive path to the employee's hand (example, if a cord connector is wet from being immersed in water).

3) Locking-type connectors shall be secured after connection.

12.13.5. Manufacturer's Instructions.

Portable equipment shall be used in accordance with the manufacturer's instructions and safety warnings.

12.14. Utilizing a Portable Generator

The term "Portable Generator" shall herein apply to all; portable hand carried units, portable units on a wheeled frame, trailer mounted units, or units within a self-contained trailer or truck, regardless of the unit's KVA or output rating.

1) Portable Generators that utilize cord and plug connections (extension cords that plug into a receptacle on the unit) are not required to have a CID permit for use. Please be advised that proper cord management for the safety of others is always required.

2) Portable Generators that use "Cam-Locks", Lugs, or other than "Cord & Plug" connections, and / or that involve any type of site distribution (i.e. sub-panels or distribution boxes) are required to have a CID permit and pre-use inspection. Generators that require a permit will need to have the generator frame connected to two (2) driven ground rods, at least 6 feet apart. The ground rod size, installation, and grounding conductor shall be as specified by the National Electrical Code.

Be advised that the installation of ground rods requires a pre-installation "Utility Spotting", to avoid hitting buried utilities. NOTE: Utility Spotting can take 5+ days to obtain and clear.

12.15. Entering a Flooded Space

FM Department Procedures and Guidelines *5080 "Entering a Flooded Space" (Attachment 3)* shall be followed prior to entering any flooded space on campus.

12.16. Auditing

12.16.1. Electrical Safety Program Audit.

The electrical safety program shall be audited to verify that the principles and procedures of the electrical safety program follow this standard. Audits shall be performed at intervals not to exceed 3 years.

12.16.2. Field Work Audit.

Field work shall be audited to verify that the requirements contained in the procedures of the electrical safety program are being followed. When the auditing determines that the principles and procedures of the electrical safety program are not being followed, the appropriate revisions to the training program or revisions to the procedures shall be made. Audits shall be performed at intervals not to exceed 1 year.

12.16.3. Lockout/Tagout Program and Procedure Audit.

The lockout/tagout program and procedures shall be audited by a qualified person at intervals not to exceed 1 year. The audit shall cover at least one lockout/tagout in progress. The audit shall be designed to identify and correct deficiencies in the following:

1) The lockout/tagout program and procedures

2) The lockout/tagout training

3) Worker execution of the lockout/tagout procedure

12.16.4. Documentation.

The audits required shall be documented and retained until the next audit.

12.17. Responding to Accidents/Incidents

Employees who are present when a person receives an electric shock—other than a carpet shock—shall follow *UNM Medical Procedure Flip Chart (Attachment 8)* for more information.

For all accidents:

1) Contact 911 as appropriate
    a. When calling from a UNM land line in Albuquerque, you will be connected to UNMPD automatically. When calling from a cell phone, be sure to identify that the emergency is on UNM property.
2) Contact supervisor or on-call manager and notify them of the incident.
    a. Supervisor or on-call manager must fill out an Accident/Incident/Near Miss Report must be filled with EHS and Risk Services (https://ehs.unm.edu/accident-incident-spill-reporting/index.html)
3) Injured employee must report to EOHS, or the nearest urgent care facility, for evaluation. If after hours, employee should report to urgent care or emergency care facility for evaluation.

If employee is unresponsive:

1) Contact 911
    a. When calling from a UNM land line in Albuquerque, you will be connected to UNMPD automatically. When calling from a cell phone, be sure to identify that the emergency is on UNM property.
2) Follow instructions of 911 Operator as appropriate.
3) Assess the area. If you decide to take further action:
    a. Enter only if safe.
    b. De-energize the equipment or separate the injured person from the equipment using insulated devices.
    c. Provide first aid as needed.
    d. Secure the scene, if possible, so that the cause of the accident can be investigated and addressed fully; do not move equipment more than necessary.
4) Contact supervisor or on-call manager and notify them of the incident.
    a. Supervisor or on-call manager must fill out an Accident/Incident/Near Miss Report must be filled with EHS and Risk Services (https://ehs.unm.edu/accident-and-incident-reporting.html)

12.18. Accident/Incident Reporting & Investigation

In the past, the term "accident" was often used when referring to an unplanned, unwanted event. To many, "accident" suggests an event that was random, and could not have been prevented. Since nearly all worksite fatalities, injuries, and illnesses are preventable, OSHA suggests using the term "incident" investigation.

All incidents or near miss incidents should be reported as soon as possible to EHS and Risk Services at https://ehs.unm.edu/accident-and-incident-reporting.html.

Once obtained, EHS will notify the appropriate entities and perform a Root Cause Analysis investigation.

13. LIST OF ATTACHMENTS

1) UNM Energized Electrical Work SOP
2) Control of Hazardous Energy Program
3) Entering Flooded Spaces SOP
4) Electrical Specifications for Contractors and UNM Personnel Doing Work at the University of New Mexico
5) Experimental Electrical Apparatus and Student Projects SOP
6) Testing and Working on Energized Circuits SOP
7) New electrical work entering energized electrical panels or switchgears SOP
8) UNM Medical Procedure Flip Chart
9) Utilities SOP M01 Planned Interruption of Utility Service
10) Guidelines for Contractors doing Mechanical and Electrical work at UNM
11) Custom Electrical Equipment Field Evaluation Form

ATTACHMENT 1: UNM ENERGIZED ELECTRICAL WORK SOP

I. General. [130.1]

This section covers requirements for work involving electrical hazards such as the electrical safety-related work practices, assessments, precautions, and procedures when an electrically safe work condition cannot be established.

Safety-related work practices shall be used to safeguard employees from injury while they are exposed to electrical hazards from electrical conductors or circuit parts that are or can become energized.

When energized electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts are not put into an electrically safe work condition, and work is performed as permitted in accordance with 110.4, all of the following requirements shall apply:

(1) Only qualified persons shall be permitted to work on electrical conductors or circuit parts that have not been put into an electrically safe work condition.

(2) An energized electrical work permit shall be completed as required by 130.2.

(3) A shock risk assessment shall be performed as required by 130.4.

(4) An arc flash risk assessment shall be performed as required by 130.5.

All requirements of this section shall apply whether an incident energy analysis is completed or if Table 7(C)(15)(a), Table 7(C)(15)(b), and Table 7(C)(15)(c) are used in lieu of an incident energy analysis.

II. Energized Electrical Work Permit. [130.2]

(A) When Required.

When work is performed as permitted in accordance with 110.4, an energized electrical work permit shall be required and documented under any of the following conditions:

(1) When work is performed within the restricted approach boundary

(2) When the employee interacts with the equipment when conductors or circuit parts are not exposed but an increased likelihood of injury from an exposure to an arc flash hazard exists

(B) Elements of Work Permit.

The work permit shall include, but not be limited to, the following items:

(1) Description of the circuit and equipment to be worked on and their location

(2) Description of the work to be performed

(3) Justification for why the work must be performed in an energized condition *[see 110.4]*

(4) Description of the safe work practices to be employed *(see 130.1)*

(5) Results of the shock risk assessment *[see 130.4(A)]*

a. Voltage to which personnel will be exposed

b. Limited approach boundary *[see 130.4(F), Table 130.4(E)(a), and Table 130.4(E)(b)]*

c. Restricted approach boundary *[see 130.4(G), Table 130.4(E)(a), and Table 130.4(E)(b)]*

d. Personal and other protective equipment required by this standard to safely perform the assigned task and to protect against the shock hazard *[see 130.4(F), 130.7(C)(1) through (C)(16), and 130.7(D)]*

(6) Results of the arc flash risk assessment *[see 130.5]*

a. Available incident energy at the working distance or arc flash PPE category *(see 130.5)*

b. Personal and other protective equipment required by this standard to protect against the arc flash hazard *[see 130.5(F), 130.7(C)(1) through (C)(16), Table 130.7(C)(15)(c), and 130.7(D)]*

c. Arc flash boundary *[see 130.5(E)]*

(7) Means employed to restrict the access of unqualified persons from the work area *[see 130.7(E)]*

(8) Evidence of completion of a job briefing, including a discussion of any job-specific hazards *[see 110.5(I)]*

(9) Energized work approval (authorizing or responsible management, safety officer, or owner, etc.) signature(s)

Informational Note: For an example of an acceptable energized work permit, see Figure J.1.

(C) Exemptions to Work Permit.

Electrical work shall be permitted without an energized electrical work permit if a qualified person is provided with and uses appropriate safe work practices and PPE in accordance with this program under any of the following conditions:

(1) Testing, troubleshooting, or voltage measuring

(2) Thermography, ultrasound, or visual inspections if the restricted approach boundary is not crossed

(3) Access to and egress from an area with energized electrical equipment if no electrical work is performed and the restricted approach boundary is not crossed

(4) General housekeeping and miscellaneous non-electrical tasks if the restricted approach boundary is not crossed

III. Shock Risk Assessment. [130.4]

(A) General.

A shock risk assessment shall be performed:

(1) To identify shock hazards

(2) To estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health

(3) To determine if additional protective measures are required, including the use of PPE

(B) Estimate of Likelihood and Severity.

The estimate of likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health shall take into consideration all of the following:

(1) The design of the electrical equipment

(2) The electrical equipment operating condition and the condition of maintenance

(C) Additional Protective Measures.

If additional protective measures are required, they shall be selected and implemented according to the hierarchy of risk control identified in 110.5(H)(3). When the additional protective measures include the use of PPE, the following shall be determined:

(1) The voltage to which personnel will be exposed

(2) The boundary requirements

(3) The personal and other protective equipment required by this standard to protect against the shock hazard

(D) Documentation.

The results of the shock risk assessment shall be documented.

(E) Shock Protection Boundaries.

The shock protection boundaries identified as limited approach boundary and restricted approach boundary shall be applicable where personnel are approaching exposed energized electrical conductors or circuit parts. Table 130.4(E)(a) shall be used for the distances associated with various ac system voltages. Table 130.4(E)(b) shall be used for the distances associated with various dc system voltages.

Table 130.4(E)(a) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Alternating-Current Systems

(1)	(2)	(3)	(4)
	Limited Approach Boundary[b]		
Nominal System Voltage Range, Phase to Phase[a]	Exposed Movable Conductor[c]	Exposed Fixed Circuit Part	Restricted Approach Boundary[b]; Includes Inadvertent Movement Adder
Less than 50 V	Not specified	Not specified	Not specified
50 V–150 V[d]	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	Avoid contact
151 V–750 V	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	0.3 m (1 ft 0 in.)
751 V–15 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.7 m (2 ft 2 in.)
15.1 kV–36 kV	3.0 m (10 ft 0 in.)	1.8 m (6 ft 0 in.)	0.8 m (2 ft 9 in.)
36.1 kV–46 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	0.8 m (2 ft 9 in.)
46.1 kV–72.5 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 6 in.)
72.6 kV–121 kV	3.3 m (10 ft 8 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 6 in.)
138 kV–145 kV	3.4 m (11 ft 0 in.)	3.0 m (10 ft 0 in.)	1.2 m (3 ft 10 in.)
161 kV–169 kV	3.6 m (11 ft 8 in.)	3.6 m (11 ft 8 in.)	1.3 m (4 ft 3 in.)
230 kV–242 kV	4.0 m (13 ft 0 in.)	4.0 m (13 ft 0 in.)	1.7 m (5 ft 8 in.)
345 kV–362 kV	4.7 m (15 ft 4 in.)	4.7 m (15 ft 4 in.)	2.8 m (9 ft 2 in.)

500 kV–550 kV	5.8 m (19 ft 0 in.)	5.8 m (19 ft 0 in.)	3.6 m (11 ft 8 in.)
765 kV–800 kV	7.2 m (23 ft 9 in.)	7.2 m (23 ft 9 in.)	4.9 m (15 ft 11 in.)

Notes:

(1) For arc flash boundary, see 130.5(E).

(2) All dimensions are distance from exposed energized electrical conductors or circuit part to employee.

[a]For single-phase systems above 250 volts, select the range that is equal to the system's maximum phase-to-ground voltage multiplied by 1.732.

[b]See definition in Article 100 and text in 130.4(D)(2) and Informative Annex C for elaboration.

[c]*Exposed movable conductors* describes a condition in which the distance between the conductor and a person is not under the control of the person. The term is normally applied to overhead line conductors supported by poles.

[d]This includes circuits where the exposure does not exceed 120 volts nominal.

Table 130.4(E)(b) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Direct-Current Voltage Systems

(1)	(2)	(3)	(4)
	Limited Approach Boundary		Restricted Approach Boundary; Includes Inadvertent Movement Adder
Nominal Potential Difference	Exposed Movable Conductor*	Exposed Fixed Circuit Part	
Less than 50 V	Not specified	Not specified	Not specified
50 V–300 V	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	Avoid contact
301 V–1 kV	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	0.3 m (1 ft 0 in.)
1.1 kV–5 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.5 m (1 ft 5 in.)
5 kV–15 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.7 m (2 ft 2 in.)
15.1 kV–45 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	0.8 m (2 ft 9 in.)
45.1 kV– 75 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 6 in.)
75.1 kV–150 kV	3.3 m (10 ft 8 in.)	3.0 m (10 ft 0 in.)	1.2 m (3 ft 10 in.)

150.1 kV–250 kV	3.6 m (11 ft 8 in.)	3.6 m (11 ft 8 in.)	1.6 m (5 ft 3 in.)
250.1 kV–500 kV	6.0 m (20 ft 0 in.)	6.0 m (20 ft 0 in.)	3.5 m (11 ft 6 in.)
500.1 kV–800 kV	8.0 m (26 ft 0 in.)	8.0 m (26 ft 0 in.)	5.0 m (16 ft 5 in.)

Note: All dimensions are distance from exposed energized electrical conductors or circuit parts to worker.

**Exposed movable conductor* describes a condition in which the distance between the conductor and a person is not under the control of the person. The term is normally applied to overhead line conductors supported by poles.

(F) Limited Approach Boundary.

(1) Approach by Unqualified Persons.

Unless permitted by 130.4(F)(3), no unqualified person shall be permitted to approach nearer than the limited approach boundary of energized conductors and circuit parts.

(2) Working at or Close to the Limited Approach Boundary.

Where one or more unqualified persons are working at or close to the limited approach boundary, the alerting methods in 130.7(E) shall be applied to advise the unqualified person(s) of the electrical hazard and warn him or her to stay outside of the limited approach boundary.

(3) Entering the Limited Approach Boundary.

Where there is a need for an unqualified person(s) to cross the limited approach boundary, a qualified person shall advise the unqualified person(s) of the possible hazards and continuously escort the unqualified person(s) while inside the limited approach boundary. Under no circumstance shall unqualified person(s) be permitted to cross the restricted approach boundary.

(G) Restricted Approach Boundary.

No qualified person shall approach or take any conductive object closer to exposed energized electrical conductors or circuit parts than the restricted approach boundary set forth in Table 130.4(E)(a) and Table 130.4(E)(b), unless one of the following conditions applies:

(1) The qualified person is insulated or guarded from energized electrical conductors or circuit parts operating at 50 volts or more. Insulating gloves and sleeves are considered insulation only with regard to the energized parts upon which work is performed.

(2) The energized electrical conductors or circuit parts are insulated from the qualified person and from any other conductive object at a different potential.

IV. Arc Flash Risk Assessment. [130.5]
(A) General.

An arc flash risk assessment shall be performed:

(1) To identify arc flash hazards

(2) To estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health

(3) To determine if additional protective measures are required, including the use of PPE

(B) Estimate of Likelihood and Severity.

The estimate of the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health shall take into consideration the following:

(1) The design of the electrical equipment, including its overcurrent protective device and its operating time

(2) The electrical equipment operating condition and condition of maintenance

(C) Additional Protective Measures.

If additional protective measures are required they shall be selected and implemented according to the hierarchy of risk control identified in 110.5(H)(3). When the additional protective measures include the use of PPE, the following shall be determined:

(1) Appropriate safety-related work practices

(2) The arc flash boundary

(3) The PPE to be used within the arc flash boundary

Table 130.5(C) shall be permitted to be used to estimate the likelihood of occurrence of an arc flash event to determine if additional protective measures are required.

Table 130.5(C) Estimate of the Likelihood of Occurrence of an Arc Flash Incident for ac and dc Systems

Task	Equipment Condition[a]	Likelihood of Occurrence[b]

Reading a panel meter while operating a meter switch.	Any	No
Performing infrared thermography and other non-contact inspections outside the restricted approach boundary. This activity does not include opening of doors or covers.		
Working on control circuits with exposed energized electrical conductors and circuit parts, nominal 125 volts ac or dc, or below without any other exposed energized equipment over nominal 125 volts ac or dc, including opening of hinged covers to gain access.		
Examination of insulated cable with no manipulation of cable.		
For dc systems, maintenance on a single cell of a battery system or multi-cell units in an open rack.		
For ac systems, work on energized electrical conductors and circuit parts, including electrical testing.	Any	Yes
Operation of a CB or switch the first time after installation or completion of maintenance in the equipment.		
For dc systems, working on energized electrical conductors and circuit parts of series-connected battery cells, including electrical testing.		
Removal or installation of CBs or switches.		
Opening hinged door(s) or cover(s) or removal of bolted covers (to expose bare, energized electrical conductors and circuit parts). For dc systems, this includes bolted covers, such as battery terminal covers.		
Application of temporary protective grounding equipment, after voltage test.		
Working on control circuits with exposed energized electrical conductors and circuit parts, greater than 120 volts.		
Insertion or removal of individual starter buckets from motor control center (MCC).		
Insertion or removal (racking) of circuit breakers (CBs) or starters from cubicles, doors open or closed.		
Insertion or removal of plug-in devices into or from busways.		

Examination of insulated cable with manipulation of cable. Working on exposed energized electrical conductors and circuit parts of equipment directly supplied by a panelboard or motor control center. Insertion or removal of revenue meters (kW-hour, at primary voltage and current). Insertion or removal of covers for battery intercell connector(s). For dc systems, working on exposed energized electrical conductors and circuit parts of utilization equipment directly supplied by a dc source. Opening voltage transformer or control power transformer compartments. Operation of outdoor disconnect switch (hookstick operated) at 1 kV through 15 kV. Operation of outdoor disconnect switch (gang-operated, from grade) at 1 kV through 15 kV.		
Operation of a CB, switch, contactor, or starter. Voltage testing on individual battery cells or individual multi-cell units. Removal or installation of covers for equipment such as wireways, junction boxes, and cable trays that does not expose bare, energized electrical conductors and circuit parts. Opening a panelboard hinged door or cover to access dead front overcurrent devices. Removal of battery nonconductive intercell connector covers.	Normal	No
Maintenance and testing on individual battery cells or individual multi-cell units in an open rack Insertion or removal of individual cells or multi-cell units of a battery system in an open rack. Arc-resistant equipment with the DOORS CLOSED and SECURED, and where the available fault current and fault clearing time does	Abnormal	Yes

not exceed that of the arc-resistant rating of the equipment in one of the following conditions:

(1) Insertion or removal of individual starter buckets

(2) Insertion or removal (racking) of CBs from cubicles

(3) Insertion or removal (racking) of ground and test device

(4) Insertion or removal (racking) of voltage transformers on or off the bus

[a]Equipment is considered to be in a "normal operating condition" if all of the conditions in 110.4(D) are satisfied.

[b]As defined in this standard, the two components of risk are the likelihood of occurrence of injury or damage to health and the severity of injury or damage to health that results from a hazard. Risk assessment is an overall process that involves estimating both the likelihood of occurrence and severity to determine if additional protective measures are required. The estimate of the likelihood of occurrence contained in this table does not cover every possible condition or situation, nor does it address severity of injury or damage to health. Where this table identifies "No" as an estimate of likelihood of occurrence, it means that an arc flash incident is not likely to occur. Where this table identifies "Yes" as an estimate of likelihood of occurrence, it means an arc flash incident should be considered likely to occur. The likelihood of occurrence must be combined with the potential severity of the arcing incident to determine if additional protective measures are required to be selected and implemented according to the hierarchy of risk control identified in 110.5(H)(3).

(D) Documentation.

The results of the arc flash risk assessment shall be documented.

(E) Arc Flash Boundary.

(1) The arc flash boundary shall be the distance at which the incident energy equals 1.2 cal/cm^2 (5 J/cm^2).

Informational Note:

For information on estimating the arc flash boundary, see Informative Annex D.

(2) The arc flash boundary shall be permitted to be determined by Table 130.7(C)(15)(a) or Table 130.7(C)(15)(b) when the requirements of these tables apply.

(F) Arc Flash PPE.

One of the following methods shall be used for the selection of arc flash PPE:

(1) The incident energy analysis method in accordance with 130.5(G)

(2) The arc flash PPE category method in accordance with 130.7(C)(15)

Either, but not both, methods shall be permitted to be used on the same piece of equipment. The results of an incident energy analysis to specify an arc flash PPE category in Table 130.7(C)(15)(c) shall not be permitted.

(G) Incident Energy Analysis Method.

The incident energy exposure level shall be based on the working distance of the employee's face and chest areas from a prospective arc source for the specific task to be performed. Arc-rated clothing and other PPE shall be used by the employee based on the incident energy exposure associated with the specific task. Recognizing that incident energy increases as the distance from the arc flash decreases, additional PPE shall be used for any parts of the body that are closer than the working distance at which the incident energy was determined.

The incident energy analysis shall take into consideration the characteristics of the overcurrent protective device and its fault clearing time, including its condition of maintenance.

The incident energy analysis shall be updated when changes occur in the electrical distribution system that could affect the results of the analysis. The incident energy analysis shall also be reviewed for accuracy at intervals not to exceed 5 years.

Table 130.5(G) identifies the arc-rated clothing and other PPE requirements of Article 130 and shall be permitted to be used with the incident energy analysis method of selecting arc flash PPE.

Table 130.5(G) Selection of Arc-Rated Clothing and Other PPE When the Incident Energy Analysis Method Is Used

Incident energy exposures equal to 1.2 cal/cm^2 up to and including 12 cal/cm^2

Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy[a]

Arc-rated long-sleeve shirt and pants or arc-rated coverall or arc flash suit (SR)

Arc-rated face shield and arc-rated balaclava or arc flash suit hood (SR)[b]

Arc-rated outerwear (e.g., jacket, parka, rainwear, hard hat liner, high-visibility apparel) (AN)[e]

Heavy-duty leather gloves, arc-rated gloves, or rubber insulating gloves with leather protectors (SR)[c]

Hard hat

Safety glasses or safety goggles (SR)

Hearing protection

Leather footwear[d]

Incident energy exposures greater than 12 cal/cm^2

Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy[a]

Arc-rated long-sleeve shirt and pants or arc-rated coverall or arc flash suit (SR)

Arc-rated arc flash suit hood

Arc-rated outerwear (e.g., jacket, parka, rainwear, hard hat liner, high-visibility apparel) (AN)[e]

Arc-rated gloves or rubber insulating gloves with leather protectors (SR)[c]

Hard hat

Safety glasses or safety goggles (SR)

Hearing protection

Leather footwear[d]

SR: Selection of one in group is required.

AN: As needed.

[a]Arc ratings can be for a single layer, such as an arc-rated shirt and pants or a coverall, or for an arc flash suit or a multi-layer system if tested as a combination consisting of an arc-rated shirt and pants, coverall, and arc flash suit.

[b]Face shields with a wrap-around guarding to protect the face, chin, forehead, ears, and neck area are required by 130.7(C)(10)(c). Where the back of the head is inside the arc flash boundary, a balaclava or an arc flash hood shall be required for full head and neck protection.

[c]Rubber insulating gloves with leather protectors provide arc flash protection in addition to shock protection. Higher class rubber insulating gloves with leather protectors, due to their increased material thickness, provide increased arc flash protection.

[d]Footwear other than leather or dielectric shall be permitted to be used provided it has been tested to demonstrate no ignition, melting, or dripping at the estimated incident energy exposure.

[e]The arc rating of outer layers worn over arc-rated clothing as protection from the elements or for other safety purposes, and that are not used as part of a layered system, shall not be required to be equal to or greater than the estimated incident energy exposure.

(H) Equipment Labeling.

Electrical equipment such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling units and that are likely to require examination, adjustment, servicing, or maintenance while energized shall be marked with a label containing all the following information:

(1) Nominal system voltage

(2) Arc flash boundary

(3) At least one of the following:

a. Available incident energy and the corresponding working distance, or the arc flash PPE category in Table 130.7(C)(15)(a) or Table 130.7(C)(15)(b) for the equipment, but not both

b. Minimum arc rating of clothing

c. Site-specific level of PPE

Exception No. 1:

Unless changes in electrical distribution system(s) render the label inaccurate, labels applied prior to the effective date of this edition of the standard shall be acceptable if they complied with the requirements for equipment labeling in the standard in effect at the time the labels were applied.

Exception No. 2:

In supervised industrial installations where conditions of maintenance and engineering supervision ensure that only qualified persons monitor and service the system, the information required in 130.5(H)(1) through 130.5(H)(3) shall be permitted to be documented in a manner that is readily available to persons likely to perform examination, servicing, maintenance, and operation of the equipment while energized.

The method of calculating and the data to support the information for the label shall be documented. The data shall be reviewed for accuracy at intervals not to exceed 5 years. Where the review of the data identifies a change that renders the label inaccurate, the label shall be updated.

The owner of the electrical equipment shall be responsible for the documentation, installation, and maintenance of the marked label.

V. Personal and Other Protective Equipment. [130.7]
(A) General.

Employees exposed to electrical hazards when the risk associated with that hazard is not adequately reduced by the applicable electrical installation requirements shall be provided with, and shall use, protective equipment that is designed and constructed for the specific part of the body to be protected and for the work to be performed.

(B) Care of Equipment.

Protective equipment shall be maintained in a safe, clean, and reliable condition and in accordance with manufacturers' instructions. The protective equipment shall be visually inspected before each use. Protective equipment shall be stored in a manner to prevent damage from physically damaging conditions and from moisture, dust, or other deteriorating agents.

(C) Personal Protective Equipment (PPE).

(1) General.

When an employee is working within the restricted approach boundary, the worker shall wear PPE in accordance with 130.4. When an employee is working within the arc flash boundary, he or she shall wear protective clothing and other PPE in accordance with 130.5. All parts of the body inside the arc flash boundary shall be protected.

(2) Movement and Visibility.

When arc-rated clothing is worn to protect an employee, it shall cover all ignitible clothing and shall allow for movement and visibility.

(3) Head, Face, Neck, and Chin (Head Area) Protection.

Employees shall wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with energized electrical conductors or circuit parts or from flying objects resulting from electrical explosion. Employees shall wear nonconductive protective equipment for the face, neck, and chin whenever there is a danger of injury from exposure to electric arcs or flashes or from flying objects resulting from electrical explosion. If employees use hairnets or beard nets, or both, these items shall be arc rated.

(4) Eye Protection.

Employees shall wear protective equipment for the eyes whenever there is danger of injury from electric arcs, flashes, or from flying objects resulting from electrical explosion.

(5) Hearing Protection.

Employees shall wear hearing protection whenever working within the arc flash boundary.

(6) Body Protection.

Employees shall wear arc-rated clothing wherever there is possible exposure to an electric arc flash above the threshold incident energy level for a second degree burn [1.2 cal/cm^2 (5 J/cm^2)].

(7) Hand and Arm Protection.

Hand and arm protection shall be provided in accordance with 130.7(C)(7)(a), (C)(7)(b), and (C)(7)(c).

(a) *Shock Protection.* Employees shall wear rubber insulating gloves with leather protectors where there is a danger of hand injury from electric shock due to contact with exposed energized electrical conductors or circuit parts. Employees shall wear rubber insulating gloves with leather protectors and rubber insulating sleeves where there is a danger of hand and arm injury from electric shock due to contact with exposed energized electrical conductors or circuit parts. Rubber insulating gloves shall be rated for the voltage for which the gloves will be exposed. Rubber insulating gloves shall be permitted to be used without leather protectors, under the following conditions:

(1) There shall be no activity performed that risks cutting or damaging the glove.

(2) The rubber insulating gloves shall be electrically retested before reuse.

(3) The voltage rating of the rubber insulating gloves shall be reduced by 50 percent for class 00 and by one whole class for classes 0 through 4.

(b) *Arc Flash Protection.* Hand and arm protection shall be worn where there is possible exposure to arc flash burn. The apparel described in 130.7(C)(10)(d) shall be required for protection of hands from burns. Arm protection shall be accomplished by the apparel described in 130.7(C)(6).

(c) *Maintenance and Use.* Electrical protective equipment shall be maintained in a safe, reliable condition. Insulating equipment shall be inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of having caused damage. Insulating gloves shall be given an air test, along with the inspection. Maximum use voltages for rubber insulating gloves shall not exceed that specified in Table 130.7(C)(7)(a). The top of the cuff of the protector glove shall be shorter than the rolled top of the cuff of the insulating glove by at least the distance specified in Table 130.7(C)(7)(a).

(d) *Periodic Electrical Tests*. Rubber insulating equipment shall be subjected to periodic electrical tests. Test voltages shall be in accordance with applicable state, federal, or local codes and standards. The maximum intervals between tests shall not exceed that specified in Table 130.7(C)(7)(b).

Table 130.7(C)(7)(a) Maximum Use Voltage for Rubber Insulating Gloves

Class Designation of Glove or Sleeve	Maximum ac Use Voltage rms, volts	Maximum dc Use Voltage avg, volts	Distances Between Gauntlet and Cuff, minimum
00	500	750	13 mm (0.5 in.)
0	1,000	1,500	13 mm (0.5 in.)
1	7,500	11,250	25 mm (1 in.)
2	17,000	25,500	51 mm (2 in.)
3	26,500	39,750	76 mm (3 in.)
4	36,000	54,000	102 mm (4 in.)

Table 130.7(C)(7)(b) Rubber Insulating Equipment, Maximum Test Intervals

Rubber Insulating Equipment	When to Test
Blankets	Before first issue; every 12 months thereafter*
Covers	If insulating value is suspect
Gloves	Before first issue; every 6 months thereafter*
Line hose	If insulating value is suspect
Sleeves	Before first issue; every 12 months thereafter*

*New insulating equipment is not permitted to be placed into service unless it has been electrically tested within the previous 12 months. Insulating equipment that has been issued for service is not new and is required to be retested in accordance with the intervals in this table.

(8) Foot Protection.

Where insulated footwear is used as protection against step and touch potential, dielectric footwear shall be required. Insulated soles shall not be used as primary electrical protection.

Informational Note:

Electrical Hazard footwear meeting ASTM F2413, *Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear*, can provide a secondary source of electric shock protection under dry conditions.

(9) Factors in Selection of Protective Clothing.

Clothing and equipment that provide worker protection from shock and arc flash hazards shall be used. If arc-rated clothing is required, it shall cover associated parts of the body as well as all flammable apparel while allowing movement and visibility.

Clothing and equipment required for the degree of exposure shall be permitted to be worn alone or integrated with flammable, nonmelting apparel. Garments that are not arc rated shall not be permitted to be used to increase the arc rating of a garment or of a clothing system.

(a) *Layering.* Nonmelting, flammable fiber garments shall be permitted to be used as underlayers in conjunction with arc-rated garments in a layered system. If nonmelting, flammable fiber garments are used as underlayers, the system arc rating shall be sufficient to prevent breakopen of the innermost arc-rated layer at the expected arc exposure incident energy level to prevent ignition of flammable underlayers. Garments that are not arc rated shall not be permitted to be used to increase the arc rating of a garment or of a clothing system.

Informational Note:

A typical layering system might include cotton underwear, a cotton shirt and trouser, and an arc-rated coverall. Specific tasks might call for additional arc-rated layers to achieve the required protection level.

(b) *Outer Layers.* Garments worn as outer layers over arc-rated clothing, such as jackets, high-visibility apparel, or rainwear, shall also be made from arc-rated material. The arc rating of outer layers worn over arc-rated clothing as protection from the elements or for other safety purposes, and that are not used as part of a layered system, shall not be required to be equal to or greater than the estimated incident energy exposure.

(c) *Underlayers.* Meltable fibers such as acetate, nylon, polyester, polypropylene, and spandex shall not be permitted in fabric underlayers.

Exception:

An incidental amount of elastic used on nonmelting fabric underwear or socks shall be permitted.

(d) *Coverage.* Clothing shall cover potentially exposed areas as completely as possible. Shirt and coverall sleeves shall be fastened at the wrists, shirts shall be tucked into pants, and shirts, coveralls, and jackets shall be closed at the neck.

(e) *Fit.* Tight-fitting clothing shall be avoided. Loose-fitting clothing provides additional thermal insulation because of air spaces. Arc-rated apparel shall fit properly such that it does not interfere with the work task.

(f) *Interference.* The garment selected shall result in the least interference with the task but still provide the necessary protection. The work method, location, and task could influence the protective equipment selected.

(10) Arc Flash Protective Equipment.

(a) *Arc Flash Suits.* Arc flash suit design shall permit easy and rapid removal by the wearer. The entire arc flash suit, including the hood's face shield, shall have an arc rating that is suitable for the arc flash exposure. When exterior air is supplied into the hood, the air hoses and pump housing shall be either covered by arc-rated materials or constructed of nonmelting and nonflammable materials.

(b) *Head Protection.*

(1) An arc-rated hood or an arc-rated balaclava with an arc-rated face shield shall be used when the back of the head is within the arc flash boundary.

(2) An arc-rated hood shall be used when the anticipated incident energy exposure exceeds 12 cal/cm^2 (50.2 J/☐cm^2).

(c) *Face Protection.* Face shields shall have an arc rating suitable for the arc flash exposure. Face shields with a wrap-around guarding to protect the face, chin, forehead, ears, and neck area shall be used. Face shields without an arc rating shall not be used. Eye protection (safety glasses or goggles) shall always be worn under face shields or hoods.

(d) *Hand Protection.*

(1) Heavy-duty leather gloves or arc-rated gloves shall be worn where required for arc flash protection.

(2) Where insulating rubber gloves are used for shock protection, leather protectors shall be worn over the rubber gloves.

(e) *Foot Protection.* Leather footwear or dielectric footwear or both provide some arc flash protection to the feet and shall be used in all exposures greater than 4 cal/cm^2 (16.75 J/cm^2). Footwear other than leather or dielectric shall be permitted to be used provided it has been tested to demonstrate no ignition, melting, or dripping at the estimated incident energy exposure or the minimum arc rating for the respective arc flash PPE category.

(11) Clothing Material Characteristics.

Arc-rated clothing shall meet the requirements described in 130.7(C)(12) and 130.7(C)(14).

Clothing consisting of fabrics, zipper tapes, and findings made from flammable synthetic materials that melt at temperatures below 315°C (600°F), such as acetate, acrylic, nylon, polyester, polyethylene, polypropylene, and spandex, either alone or in blends, shall not be used.

Exception:

Fiber blends that contain materials that melt, such as acetate, acrylic, nylon, polyester, polyethylene, polypropylene, and spandex, shall be permitted if such blends in fabrics are arc rated and do not exhibit evidence of melting and dripping during arc testing.

(12) Clothing and Other Apparel Not Permitted.

Clothing and other apparel (such as hard hat liners and hair nets) made from materials that do not meet the requirements of 130.7(C)(11) regarding melting or made from materials that do not meet the flammability requirements shall not be permitted to be worn.

Exception No. 1:

Nonmelting, flammable (non-arc-rated) materials shall be permitted to be used as underlayers to arc-rated clothing, as described in 130.7(C)(11).

Exception No. 2:

Where the work to be performed inside the arc flash boundary exposes the worker to multiple hazards, such as airborne contaminants, and the risk assessment identifies that the level of protection is adequate to address the arc flash hazard, non-arc-rated PPE shall be permitted.

(13) Care and Maintenance of Arc-Rated Clothing and Arc-Rated Arc Flash Suits.

(a) *Inspection.* Arc-rated apparel shall be inspected before each use. Work clothing or arc flash suits that are contaminated or damaged to the extent that their protective qualities are impaired shall not be used. Protective items that become contaminated with grease, oil, or flammable liquids or combustible materials shall not be used.

(b) *Manufacturer's Instructions.* The garment manufacturer's instructions for care and maintenance of arc-rated apparel shall be followed.

(c) *Storage.* Arc-rated apparel shall be stored in a manner that prevents physical damage; damage from moisture, dust, or other deteriorating agents; or contamination from flammable or combustible materials.

(d) *Cleaning, Repairing, and Affixing Items.* When arc-rated clothing is cleaned, manufacturer's instructions shall be followed. When arc-rated clothing is repaired, the same

arc-rated materials used to manufacture the arc-rated clothing shall be used to provide repairs.

(14) Standards for PPE.

(a) *General.* PPE shall conform to applicable state, federal, or local codes and standards.

(b) *Conformity Assessment.* All suppliers or manufacturers of PPE shall demonstrate conformity with an appropriate product standard by one of the following methods:

(1) Self-declaration with a Supplier's Declaration of Conformity

(2) Self-declaration under a registered quality management system and product testing by an accredited laboratory and a Supplier's Declaration of Conformity

(3) Certification by an accredited independent third-party certification organization

(c) *Marking.* All suppliers or manufacturers of PPE shall provide the following information on the PPE, on the smallest unit container, or contained within the manufacturer's instructions:

(1) Name of manufacturer

(2) Product performance standards to which the product conforms

(3) Arc rating where appropriate for the equipment

(4) One or more identifiers such as model, serial number, lot number, or traceability code

(5) Care instructions

Table 130.7(C)(14) Informational Note: Standards for PPE

Subject	Document Title	Document Number
Clothing — Arc Rated	Standard Performance Specification for Flame Resistant and Electric Arc Rated Protective Clothing Worn by Workers Exposed to Flames and Electric Arc	ASTM F1506
	Standard Guide for Industrial Laundering of Flame, Thermal, and Arc Resistant Clothing	ASTM F1449
	Standard Guide for Home Laundering Care and Maintenance of Flame, Thermal and Arc Resistant Clothing	ASTM F2757

	Live working — Protective clothing against the thermal hazards of an electric arc — Part 1-1: Test methods — Method 1: Determination of the arc rating (ELIM, ATPV, and/or EBT) of clothing materials and of protective clothing using an open arc	IEC 61482–1–1
	Live working — Protective clothing against the thermal hazards of an electric arc — Part 2: Requirements	IEC 61482–2
Aprons — Insulating	Standard Specification for Electrically Insulating Aprons	ASTM F2677
Eye and Face Protection — General	American National Standard for Occupational and Educational Professional Eye and Face Protection	ANSI/ISEA Z87.1
Face — Arc Rated	Standard Test Method for Determining the Arc Rating and Standard Specification for Personal Eye or Face Protective Products	ASTM F2178
Fall Protection	Standard Specification for Personal Climbing Equipment	ASTM F887
Footwear — Dielectric Specification	Standard Specification for Dielectric Footwear	ASTM F1117
Footwear — Dielectric Test Method	Standard Test Method for Determining Dielectric Strength of Dielectric Footwear	ASTM F1116
Footwear — Standard Performance Specification	Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear	ASTM F2413
Footwear — Standard Test Method	Standard Test Methods for Foot Protections	ASTM F2412
Gloves — Arc Rated	Standard Test Method for Determining Arc Ratings of Hand Protective Products Developed and Used for Electrical Arc Flash Protection	ASTM F2675/F2675M

Gloves — Leather Protectors	Standard Specification for Leather Protectors for Rubber Insulating Gloves and Mittens	ASTM F696
Gloves — Rubber Insulating	Standard Specification for Rubber Insulating Gloves	ASTM D120
Gloves and Sleeves — In-Service Care	Standard Specification for In-Service Care of Insulating Gloves and Sleeves	ASTM F496
Head Protection — Hard Hats	American National Standard for Head Protection	ANSI/ISEA Z89.1
Rainwear — Arc Rated	Standard Specification for Arc and Flame Resistant Rainwear	ASTM F1891
Rubber Protective Products — Visual Inspection	Standard Guide for Visual Inspection of Electrical Protective Rubber Products	ASTM F1236
Sleeves — Insulating	Standard Specification for Rubber Insulating Sleeves	ASTM D1051

(15) Arc Flash PPE Category Method.

The requirements of 130.7(C)(15) shall apply when the arc flash PPE category method is used for the selection of arc flash PPE.

(a) *Alternating Current (ac) Equipment.* When the arc flash risk assessment performed in accordance with 130.5 indicates that arc flash PPE is required and the arc flash PPE category method is used for the selection of PPE for ac systems in lieu of the incident energy analysis of 130.5(G), Table 130.7(C)☐(15)☐(a) shall be used to determine the arc flash PPE category. The estimated maximum available fault current, maximum fault-clearing times, and minimum working distances for various ac equipment types or classifications are listed in Table 130.7(C)(15)(a). An incident energy analysis shall be required in accordance with 130.5(G) for the following:

(1) Power systems with greater than the estimated maximum available fault current

(2) Power systems with longer than the maximum fault clearing times

(3) Less than the minimum working distance

(b) *Direct Current (dc) Equipment.* When the arc flash risk assessment performed in accordance with 130.5(G) indicates that arc flash PPE is required and the arc flash PPE category method is used for the selection of PPE for dc systems in lieu of the incident energy analysis of 130.5(G), Table 130.7(C)(15)(b) shall be used to determine the arc flash PPE category. The estimated maximum available fault current, maximum arc duration, and working distances for dc equipment are listed in 130.7(C)(15)(b). An incident energy analysis shall be required in accordance with 130.5(G) for the following:

(1) Power systems with greater than the estimated maximum available fault current

(2) Power systems with longer than the maximum arc duration

(3) Less than the minimum working distance

Informational Note No.1:

The arc flash PPE category of the protective clothing and equipment is generally based on determination of the estimated exposure level.

Informational Note No.2:

In most cases, closed doors do not provide enough protection to eliminate the need for PPE in situations in which the state of the equipment is known to readily change (e.g., doors open or closed, rack in or rack out).

(c) *Protective Clothing and Personal Protective Equipment (PPE).* Once the arc flash PPE category has been identified from Table 130.7(C)(15)(a) or Table 130.7(C)(15)(b), Table 130.7(C)(15)(c) shall be used to determine the required PPE. Table 130.7(C)(15)(c) lists the requirements for PPE based on arc flash PPE categories 1 through 4. This clothing and equipment shall be used when working within the arc flash boundary. The use of PPE other than or in addition to that listed shall be permitted provided it meets 130.7(C)(7).

Table 130.7(C)(15)(a) Arc Flash PPE Categories for Alternating Current (ac) Systems

Equipment	Arc Flash PPE Category	Arc Flash Boundary
Panelboards or other equipment rated 240 volts and below	1	485 mm (19 in.)

Parameters: Maximum of 25 kA available fault current; maximum of 0.03 sec (2 cycles) fault clearing time; minimum working distance 455 mm (18 in.)		
Panelboards or other equipment rated greater than 240 volts and up to 600 volts Parameters: Maximum of 25 kA available fault current; maximum of 0.03 sec (2 cycles) fault clearing time; minimum working distance 455 mm (18 in.)	2	900 mm (3 ft)
600-volt class motor control centers (MCCs) Parameters: Maximum of 65 kA available fault current; maximum of 0.03 sec (2 cycles) fault clearing time; minimum working distance 455 mm (18 in.)	2	1.5 m (5 ft)
600-volt class motor control centers (MCCs) Parameters: Maximum of 42 kA available fault current; maximum of 0.33 sec (20 cycles) fault clearing time; minimum working distance 455 mm (18 in.)	4	4.3 m (14 ft)
600-volt class switchgear (with power circuit breakers or fused switches) and 600-□volt class switchboards Parameters: Maximum of 35 kA available fault current; maximum of up to 0.5 sec (30 cycles) fault clearing time; minimum working distance 455 mm (18 in.)	4	6 m (20 ft)
Other 600-volt class (277 volts through 600 volts, nominal) equipment Parameters: Maximum of 65 kA available fault current; maximum of 0.03 sec (2 cycles) fault clearing time; minimum working distance 455 mm (18 in.)	2	1.5 m (5 ft)
NEMA E2 (fused contactor) motor starters, 2.3 kV through 7.2 kV Parameters: Maximum of 35 kA available fault current; maximum of up to 0.24 sec (15 cycles) fault	4	12 m (40 ft)

clearing time; minimum working distance 910 mm (36 in.)		
Metal-clad switchgear, 1 kV through 15 kV Parameters: Maximum of 35 kA available fault current; maximum of up to 0.24 sec (15 cycles) fault clearing time; minimum working distance 910 mm (36 in.)	4	12 m (40 ft)
Metal enclosed interrupter switchgear, fused or unfused type construction, 1 kV through 15 kV Parameters: Maximum of 35 kA available fault current; maximum of 0.24 sec (15 cycles) fault clearing time; minimum working distance 910 mm (36 in.)	4	12 m (40 ft)
Other equipment 1 kV through 15 kV Parameters: Maximum of 35 kA available fault current; maximum of up to 0.24 sec (15 cycles) fault clearing time; minimum working distance 910 mm (36 in.)	4	12 m (40 ft)
Arc-resistant equipment up to 600-volt class Parameters: DOORS CLOSED and SECURED; with an available fault current and a fault clearing time that does not exceed the arc-resistant rating of the equipment*	N/A	N/A
Arc-resistant equipment 1 kV through 15 kV Parameters: DOORS CLOSED and SECURED; with an available fault current and a fault clearing time that does not exceed the arc-resistant rating of the equipment*	N/A	N/A

N/A: Not applicable

Note:

For equipment rated 600 volts and below and protected by upstream current-limiting fuses or current-limiting molded case circuit breakers sized at 200 amperes or less, the arc flash PPE category can be reduced by one number but not below arc flash PPE category 1.

*For DOORS OPEN refer to the corresponding non-arc-resistant equipment section of this table.

Table 130.7(C)(15)(b) Arc Flash PPE Categories for dc Systems

Equipment	Arc Flash PPE Category	Arc Flash Boundary
Storage batteries, dc switchboards, and other dc supply sources Parameters: Greater than or equal to 100 volts and less than or equal to 250 volts Maximum arc duration and minimum working distance: 2 sec @ 455 mm (18 in.)		
Available fault current less than 4 kA	2	900 mm (3 ft)
Available fault current greater than or equal to 4 kA and less than 7 kA	2	1.2 m (4 ft)
Available fault current greater than or equal to 7 kA and less than 15 kA	3	1.8 m (6 ft)
Storage batteries, dc switchboards, and other dc supply sources Parameters: Greater than 250 volts and less than or equal to 600 volts Maximum arc duration and minimum working distance: 2 sec @ 455 mm (18 in.)		
Available fault current less than 1.5 kA	2	900 mm

		(3 ft)
Available fault current greater than or equal to 1.5 kA and less than 3 kA	2	1.2 m (4 ft)
Available fault current greater than or equal to 3 kA and less than 7 kA	3	1.8 m (6 ft.)
Available fault current greater than or equal to 7 kA and less than 10 kA	4	2.5 m (8 ft)

Notes:

(1) Apparel that can be expected to be exposed to electrolyte must meet both of the following conditions:

(a) Be evaluated for electrolyte protection

(b) Be arc rated

(2) A two-second arc duration is assumed if there is no overcurrent protective device (OCPD) or if the fault clearing time is not known. If the fault clearing time is known and is less than 2 seconds, an incident energy analysis could provide a more representative result.

Table 130.7(C)(15)(c) Personal Protective Equipment (PPE)

Arc-Flash PPE Category	**PPE**
1	**Arc-Rated Clothing, Minimum Arc Rating of 4 cal/cm² (16.75 J/cm²)**[a]
	Arc-rated long-sleeve shirt and pants or arc-rated coverall
	Arc-rated face shield[b] or arc flash suit hood
	Arc-rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner (AN)[f]

	Protective Equipment
	Hard hat
	Safety glasses or safety goggles (SR)
	Hearing protection (ear canal inserts)[c]
	Heavy-duty leather gloves, arc-rated gloves, or rubber insulating gloves with leather protectors (SR)[d]
	Leather footwear[e] (AN)
2	**Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm^2 (33.5 J/cm^2)[a]**
	Arc-rated long-sleeve shirt and pants or arc-rated coverall
	Arc-rated flash suit hood or arc-rated face shield[b] and arc-rated balaclava
	Arc-rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner (AN)[f]
	Protective Equipment
	Hard hat
	Safety glasses or safety goggles (SR)
	Hearing protection (ear canal inserts)[c]
	Heavy-duty leather gloves, arc-rated gloves, or rubber insulating gloves with leather protectors (SR)[d]
	Leather footwear[e]
3	**Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 25 cal/cm^2 (104.7 J/cm^2)[a]**
	Arc-rated long-sleeve shirt (AR)
	Arc-rated pants (AR)
	Arc-rated coverall (AR)
	Arc-rated arc flash suit jacket (AR)
	Arc-rated arc flash suit pants (AR)
	Arc-rated arc flash suit hood

	Arc-rated gloves or rubber insulating gloves with leather protectors (SR)[d]
	Arc-rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner (AN)[f]
	Protective Equipment
	Hard hat
	Safety glasses or safety goggles (SR)
	Hearing protection (ear canal inserts)[c]
	Leather footwear[e]
4	**Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 40 cal/cm^2 (167.5 J/cm^2)[a]**
	Arc-rated long-sleeve shirt (AR)
	Arc-rated pants (AR)
	Arc-rated coverall (AR)
	Arc-rated arc flash suit jacket (AR)
	Arc-rated arc flash suit pants (AR)
	Arc-rated arc flash suit hood
	Arc-rated gloves or rubber insulating gloves with leather protectors (SR)[d]
	Arc-rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner (AN)[f]
	Protective Equipment
	Hard hat
	Safety glasses or safety goggles (SR)
	Hearing protection (ear canal inserts)[c]
	Leather footwear[e]

AN: As needed (optional). AR: As required. SR: Selection required.

[a]*Arc rating* is defined in Article 100.

[b]Face shields are to have wrap-around guarding to protect not only the face but also the forehead, ears, and neck, or, alternatively, an arc-rated arc flash suit hood is required to be worn.

[c]Other types of hearing protection are permitted to be used in lieu of or in addition to ear canal inserts provided they are worn under an arc-rated arc flash suit hood.

[d]Rubber insulating gloves with leather protectors provide arc flash protection in addition to shock protection. Higher class rubber insulating gloves with leather protectors, due to their increased material thickness, provide increased arc flash protection.

[e]Footwear other than leather or dielectric shall be permitted to be used provided it has been tested to demonstrate no ignition, melting or dripping at the minimum arc rating for the respective arc flash PPE category.

[f]The arc rating of outer layers worn over arc-rated clothing as protection from the elements or for other safety purposes, and that are not used as part of a layered system, shall not be required to be equal to or greater than the estimated incident energy exposure.

(D) Other Protective Equipment.

(1) Insulated Tools and Equipment.

Tools and handling equipment used within the restricted approach boundary shall be insulated. Insulated tools shall be protected from damage to the insulating material.

Informational Note:

See 130.4(E), Shock Protection Boundaries.

(a) *Requirements for Insulated Tools.* The following requirements shall apply to insulated tools:

(1) Insulated tools shall be rated for the voltages on which they are used.

(2) Insulated tools shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.

(3) Insulated tools and equipment shall be inspected prior to each use. The inspection shall look for damage to the insulation or damage that can limit the tool from performing its intended function or could increase the potential for an incident (e.g., damaged tip on a screwdriver).

(b) *Fuse or Fuseholder Handling Equipment.* Fuse or fuseholder handling equipment, insulated for the circuit voltage, shall be used to remove or install a fuse if the fuse terminals are energized.

(c) *Ropes and Handlines.* Ropes and handlines used within the limited approach boundary shall be nonconductive.

(d) *Fiberglass-Reinforced Plastic Rods.* Fiberglass-reinforced plastic rod and tube used for live-line tools shall meet the requirements of applicable portions of electrical codes and standards dealing with electrical installation requirements.

(e) *Portable Ladders.* Portable ladders shall have nonconductive side rails when used within the limited approach boundary or where the employee or ladder could contact exposed energized electrical conductors or circuit parts. Nonconductive ladders shall meet the requirements of applicable state, federal, or local codes and standards.

(2) Barriers.

Exposed energized electrical conductors or circuit parts operating at 50 volts or more shall be guarded by a barrier in accordance with 130.7(D)(2)(a) through 130.7(D)☐☐(2)(c)to prevent unintentional contact while an employee is working within the restricted approach boundary of those conductors or circuit parts. Barriers shall be supported to remain in place and shall prevent unintentional contact by a person, tool, or equipment.

(a) *Rubber Insulating Equipment.* Rubber insulating equipment used for protection from unintentional contact with energized conductors or circuit parts shall be rated for the voltage and shall meet the requirements of applicable state, federal, or local codes and standards.

(b) *Voltage-Rated Plastic Guard Equipment.* Plastic guard equipment for protection of employees from unintentional contact with energized conductors or circuit parts, or for protection of employees or energized equipment or material from contact with ground, shall be rated for the voltage and shall meet the requirements of applicable state, federal, or local codes and standards.

(c) *Physical or Mechanical Barriers.* Physical or mechanical (field-fabricated) barriers shall be installed no closer than the restricted approach boundary distance given in Table 130.4(E)(a) and Table 130.4(E)(b). While the barrier is being installed, the restricted approach boundary distance specified in Table 130.4(E)(a) and Table 130.4(E)(b) shall be maintained, or the energized conductors or circuit parts shall be placed in an electrically safe work condition.

(E) Alerting Techniques.

(1) Safety Signs and Tags.

Safety signs, safety symbols, or tags shall be used where necessary to warn employees about electrical hazards that might endanger them. Such signs and tags shall meet the requirements of applicable state, federal, or local codes and standards.

(2) Barricades.

Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas containing energized conductors or circuit parts. Conductive barricades shall not be used where it might increase the likelihood of exposure to an electrical hazard. Barricades shall be placed no closer than the limited approach boundary given in Table 130.4(E)(a) and Table 130.4(E)(b). Where the arc flash boundary is greater than the limited approach boundary, barricades shall not be placed closer than the arc flash boundary.

(3) Attendants.

If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees. The primary duty and responsibility of an attendant providing manual signaling and alerting shall be to keep unqualified employees outside a work area where the unqualified employee might be exposed to electrical hazards. An attendant shall remain in the area as long as there is a potential for employees to be exposed to the electrical hazards.

(F) Look-Alike Equipment.

Where work performed on equipment that is de-energized and placed in an electrically safe condition exists in a work area with other energized equipment that is similar in size, shape, and construction, one of the alerting methods in 130.7(E)(1), (2), or (3) shall be employed to prevent the employee from entering look-alike equipment.

(G) Standards for Other Protective Equipment.

Other protective equipment required in 130.7(D) shall conform to the applicable state, federal, or local codes and standards.

VI. Other Precautions for Personnel Activities. [130.8]
(A) Alertness.

(1) Where Electrical Hazards Might Exist.

Employees shall be instructed to be alert at all times where electrical hazards might exist.

(2) When Impaired.

Employees shall not be permitted to work where electrical hazards exist while their alertness is recognizably impaired due to illness, fatigue, or other reasons.

(3) Changes in Scope.

Employees shall be instructed to be alert for changes in the job or task that could lead the person outside of the electrically safe work condition or expose the person to additional hazards that were not part of the original plan.

(B) Blind Reaching.

Employees shall be instructed not to reach blindly into areas that might contain exposed energized electrical conductors or circuit parts where an electrical hazard exists.

(C) Illumination.

(1) General.

Employees shall not enter spaces where electrical hazards exist unless illumination is provided that enables the employees to perform the work safely.

(2) Obstructed View of Work Area.

Where lack of illumination or an obstruction precludes observation of the work to be performed, employees shall not perform any task where an electrical hazard exists.

(D) Conductive Articles Being Worn.

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 energized electrical conductors or circuit parts.

(E) Conductive Materials, Tools, and Equipment Being Handled.

(1) General.

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 unintentional contact with energized electrical conductors or circuit parts. Such materials and equipment shall include, but are not limited to, long conductive objects, such as ducts, pipes and tubes, conductive hose and rope, metal-lined rules and scales, steel tapes, pulling lines, metal scaffold parts, structural members, bull floats, and chains.

(2) Approach to Energized Electrical Conductors and Circuit Parts.

Means shall be employed to ensure that conductive materials approach exposed energized electrical conductors or circuit parts no closer than that permitted by 130.4(F).

(F) Confined or Enclosed Work Spaces.

When an employee works in a confined or enclosed space (such as a manhole or vault) where an electrical hazard exists, the employer shall provide, and the employee shall use, protective shields, protective barriers, or insulating materials as necessary to protect against electrical hazards.

(G) Doors and Hinged Panels.

Doors, hinged panels, and the like shall be secured to prevent their swinging into an employee and causing the employee to contact exposed energized electrical conductors or circuit parts where an electrical hazard exists if movement of the door, hinged panel, and the like is likely to create a hazard.

(H) Clear Spaces.

Working space required by other codes and standards shall not be used for storage. This space shall be kept clear to permit safe operation and maintenance of electrical equipment.

(I) Housekeeping Duties.

Employees shall not perform housekeeping duties inside the limited approach boundary where there is a possibility of contact with energized electrical conductors or circuit parts, unless adequate safeguards (such as insulating equipment or barriers) are provided to prevent contact. Electrically conductive cleaning materials (including conductive solids such as steel wool, metalized cloth, and silicone carbide, as well as conductive liquid solutions) shall not be used inside the limited approach boundary unless procedures to prevent electrical contact are followed.

(J) Occasional Use of Flammable Materials.

Where flammable materials are present only occasionally, electric equipment capable of igniting them shall not be permitted to be used, unless measures are taken to prevent hazardous conditions from developing. Such materials shall include, but are not limited to, flammable gases, vapors, or liquids, combustible dust, and ignitable fibers or flying.

(K) Anticipating Failure.

When there is evidence that electric equipment could fail and injure employees, the electric equipment shall be de-energized, unless the employer can demonstrate that de-energizing introduces additional hazards or increased risk or is infeasible because of equipment design or operational limitation. Until the equipment is de-energized or repaired, employees shall be protected from hazards associated with the impending failure of the equipment by suitable barricades and other alerting techniques necessary for safety of the employees.

(L) Routine Opening and Closing of Circuits.

Load-rated switches, circuit breakers, or other devices specifically designed as disconnecting means shall be used for the opening, reversing, or closing of circuits under load conditions. Cable connectors not of the load-break type, fuses, terminal lugs, and cable splice connections shall not be permitted to be used for such purposes, except in an emergency.

(M) Reclosing Circuits After Protective Device Operation.

After a circuit is de-energized by the automatic operation of a circuit protective device, the circuit shall not be manually re-energized until it has been determined that the equipment and circuit can be safely energized. The repetitive manual reclosing of circuit breakers or re-energizing circuits through replaced fuses shall be prohibited. When it is determined from the design of the circuit and the overcurrent devices involved that the automatic operation of a device was caused by an overload rather than a fault condition, examination of the circuit or connected equipment shall not be required before the circuit is re-energized.

(N) Safety Interlocks.

Only qualified persons following the requirements for working inside the restricted approach boundary as covered by 130.4(G) shall be permitted to defeat or bypass an electrical safety interlock over which the person has sole control, and then only temporarily while the qualified person is working on the equipment. The safety interlock system shall be returned to its operable condition when the work is completed.

VII. Work Within the Limited Approach Boundary or Arc Flash Boundary of Overhead Lines. [130.9]

(A) Uninsulated and Energized.

Where work is performed in locations containing uninsulated energized overhead lines that are not guarded or isolated, precautions shall be taken to prevent employees from contacting such lines directly with any unguarded parts of their body or indirectly through conductive materials, tools, or equipment. Where the work to be performed is such that contact with uninsulated energized overhead lines is possible, the lines shall be de-energized and visibly grounded at the point of work or suitably guarded.

(B) Determination of Insulation Rating.

A qualified person shall determine if the overhead electrical lines are insulated for the lines' operating voltage.

(C) De-energizing or Guarding.

If the lines are to be de-energized, arrangements shall be made with the person or organization that operates or controls the lines to de-energize them and visibly ground them at the point of work. If arrangements are made to use protective measures, such as guarding, isolating, or insulation, these precautions shall prevent each employee from contacting such lines directly with any part of his or her body or indirectly through conductive materials, tools, or equipment.

(D) Employer and Employee Responsibility.

The employer and employee shall be responsible for ensuring that guards or protective measures are satisfactory for the conditions. Employees shall comply with established work methods and the use of protective equipment.

(E) Approach Distances for Unqualified Persons.

When unqualified persons are working on the ground or in an elevated position near overhead lines, the location shall be such that the employee and the longest conductive object the employee might contact do not come closer to any unguarded, energized overhead power line than the limited approach boundary in Table 130.4(E)(a), column 2 or Table 130.4(E)(b), column 2.

(F) Vehicular and Mechanical Equipment.

(1) Elevated Equipment.

Where any vehicle or mechanical equipment structure will be elevated near energized overhead lines, it shall be operated so that the limited approach boundary distance of Table 130.4(E)(a), column 2 or Table 130.4(E)(b), column 2, is maintained. However, under any of the following conditions, the clearances shall be permitted to be reduced:

(1) If the vehicle is in transit with its structure lowered, the limited approach boundary to overhead lines in Table 130.4(E)(a), column 2 or Table 130.4(E)(b), column 2, shall be permitted to be reduced by 1.83 m (6 ft). If insulated barriers, rated for the voltages involved, are installed and they are not part of an attachment to the vehicle, the clearance shall be permitted to be reduced to the design working dimensions of the insulating barrier.

(2) If the equipment is an aerial lift insulated for the voltage involved, and if the work is performed by a qualified person, the clearance (between the uninsulated portion of the aerial lift and the power line) shall be permitted to be reduced to the restricted approach boundary given in Table 130.4(E)(a), column 4 or Table 130.4(E)(b), column 4.

(2) Equipment Contact.

Employees standing on the ground shall not contact the vehicle or mechanical equipment or any of its attachments unless either of the following conditions apply:

(1) The employee is using protective equipment rated for the voltage.

(2) The equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the line than permitted in 130.9(F)(1).

(3) Equipment Grounding.

If any vehicle or mechanical equipment is capable of having parts of its structure elevated within the limited approach boundary of exposed movable conductors of energized overhead lines and is intentionally grounded, employees working on the ground near the point of grounding shall not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades, dielectric overshoe footwear, or insulation, shall be taken to protect employees from hazardous ground potentials (step and touch potential).

VIII. Underground Electrical Lines and Equipment. [130.10]

Before excavation starts where there exists a reasonable possibility of contacting electrical lines or equipment, the employer shall take the necessary steps to contact the appropriate owners or authorities to identify and mark the location of the electrical lines or equipment. When it has been determined that a reasonable possibility of contacting electrical lines or equipment exists, appropriate safe work practices and PPE shall be used during the excavation.

IX. Cutting or Drilling. [130.11]

Before cutting or drilling into equipment, floors, walls, or structural elements where a likelihood of contacting energized electrical lines or parts exists, the employer shall perform a risk assessment to:

(1) Identify and mark the location of conductors, cables, raceways, or equipment

(2) Create an electrically safe work condition

(3) Identify safe work practices and PPE to be used

X. Cutting, Removing, or Rerouting of Conductors. [130.12]

Where conductors are de-energized in order to cut, remove, or reroute them and the conductor terminations are not within sight from the point of work, such as where the conductors are remote from the source of supply in a junction or pull box, additional steps to verify absence of voltage or identify the conductors shall be taken prior to cutting, removing, or rerouting the conductors.

ATTACHMENT 2: CONTROL OF HAZARDOUS ENERGY PROGRAM

1. INTRODUCTION

This program contains requirements for the control of energy during servicing and/or maintenance of machines and equipment. The safety of all UNM employees is the foremost objective of the program as set forth by the University and as defined by OSHA in 29 CFR 1910.147.

2. SCOPE

This procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It shall be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources, and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

This program does not apply to:

1) Routine servicing and/or maintenance (i.e., adjusting, lubricating, and unjamming) which takes place during normal production operations **unless**:
    a. An employee is required to remove or bypass a guard or safety device
    b. An employee is required to place any part of their body into an area on machine or piece of equipment where work is actually performed upon the material being processed (point of operation), or where an associated danger zone exists during a machine operating cycle.
2) Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or start-up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.
3) Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrated that:
    a. Continuity of service is essential
    b. Shutdown of the system is impractical
    c. Documented procedures are followed and special equipment is used which will provide proven, effective protection for employees

3. Roles & Responsibilities

3.1. Environmental Health & Safety

1) Implements and maintains this program
2) Provides Lockout/Tagout hazard awareness training
3) Performs periodic inspections of facilities containing machinery and equipment
4) Initiates corrective action if program is not being followed

3.2. Facilities Management

1) Develops and implements lockout/tagout procedures for specific specialty equipment
2) Implements and enforces this program with all personnel and vendors
3) Performs maintenance and repair on UNM machinery and equipment

3.3. FM Area Managers

1) Implement and enforce this program with all personnel and vendors
2) Instruct their employees to the content of this program
3) Ensure that formal training is provided as required by the program
4) Develop specific training and procedures for equipment with multiple energy sources that reside in their area of control
5) Annually review the Lockout/Tagout Program to ensure the procedures and requirements are being followed
6) Maintain the FM Area Lockout/Tagout Logbook in accordance with this procedure.

3.4. Employees

1) Adhere to the requirements and restrictions set forth by this program

4. Training Requirements

1) Each employee who may be required to work on electrical/mechanical equipment shall be instructed in the safety significance of the lockout/tagout procedures.
2) Each new or transferred employee and other employees whose work operations are or may be in the area shall be instructed in the purpose and use of the lockout or tagout procedures.
3) UNM will provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application,

usage and removal of the energy controls are acquired by employees. The training shall include the following:

a. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

b. Each affected employee shall be instructed in the purpose and use of the energy control program.

c. All other employees whose work operations are or may be in an area where energy control procedures may be utilized shall be instructed about the procedure and about the dangers relating to attempts to restart or re-energize machines or equipment which are locked out or tagged out.

d. Employees shall also be trained in the following limitations of tags.

i. When a tag is attached to an energy isolating device means, it is not to be removed without permission of the authorized person responsible for the tag, and it is never to be bypassed, ignored or otherwise defeated.

ii. Tags must be legible and understandable by all authorized employees, affected employees and all other employees whose work operations are or may be in the area in order to be effective.

iii. Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

iv. Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

v. Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

4) All authorized and/or affected employees shall be trained in the Lockout/Tagout Program. The record of training will be maintained in the UNM Learning Central system and will include the employee's name, designated department and dates of training.

a. Retraining shall be provided for all authorized and affected employees on an annual basis or whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

b. Additional retraining shall also be conducted whenever a periodic inspection reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

c. Retraining shall re-establish employee proficiency and introduce new or revised control methods and procedures as necessary.

The Supervisor is responsible to ensure that employee training has been accomplished and is being kept up to date.

5. Machine Specific Lockout/Tagout Procedures

Equipment-specific written procedures shall be developed, documented and utilized for the control of potentially hazardous energy when any of the following elements exist

1) The equipment or machine has the potential for stored or residual energy, or the re-accumulation of stored energy after shut down, that may injury employees.
2) The equipment or machine has more than a single energy source that is required to completely de-energize the unit (steam, electrical, pneumatic, etc.).

The specific written procedures shall clearly outline the scope, purpose, authorization, rules and techniques to be utilized for the control of the equipment's hazardous energy and shall include:

1) A specific statement of the intended use of the procedure.
2) Specific steps to shut down, isolate, block and secure the equipment or machine to control the hazardous energy.
3) Steps for the placement, removal and transfer of the lockout devices and the responsibility for the devices.
4) Specific requirements for testing the equipment or machine to ensure the effectiveness of the lockout devices and other energy control devices.

6. Isolating Energy Systems

Whenever existing major equipment or a machine is repaired, renovated, replaced, and modified, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment shall be designed to accept a lockout device.

7. Lockout Devices

1) Each authorized employee shall be issued or have access to a padlock for lockout use. This padlock will only be used for lockout conditions and only by the employee who signed for it. The basis for this policy is one person, one lock, one key.
2) No person may utilize another's lock, use another's key, or work under another's lock.
3) Each lock shall be properly identified to the individual user with permanent identification, phone number, and assigned area.
4) Whenever new or different work is assigned where the item is on loan to a different department, the lock shall have the following information: date, time started, any phone number changes.

8. LOCKOUT PROCESS

Before an authorized or affected employee turns off a machine, equipment, or energized system, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

Any employee who performs maintenance, repair, set-up, or any other non-production work on, under, or between equipment which when energized can cause injury, shall locate and use the following steps to lockout the main power source of that equipment: Locate and identify all energy isolating devices that apply to the machine or equipment to be locked out.

8.1. Machinery & Equipment

8.1.1. De-Energizing Process

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
3) Shutdown the machine or equipment by its normal stopping procedure.
4) Operate the disconnect switch, circuit breaker, valve or other energy isolating device to isolate (disconnect) the machine or equipment from its energy source.
    a. NOTE: Switches, that open only the control circuit, are not positive disconnects and shall not be used for lock out protection.
5) Authorized employees shall affix lockout devices to each energy isolating device and other affected equipment.
6) If any controls are blocked or fuses removed, be sure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). In addition, all equipment not provided with a lockout device should be modified to accept a lock. The lockout devices shall:
    a. Be singularly, positively identified
    b. Be used ONLY for controlling hazardous energy devices
    c. Shall be durable and capable of withstanding all environments
    d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques
7) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.

a. NOTE: When a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

8) Once locked out and after ensuring that no affected employees are exposed, test equipment to make sure that it has been de-energized; this includes pushing control buttons and other pertinent equipment to ensure that there is no pressure build up, no energized circuits are present, and to inspect for any moving equipment that should be de-energized. Return all switches to the neutral or the "off" position after tests.

9) Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous residual energy must be relieved, disconnected, restrained, blocked or otherwise rendered safe (i.e., hydraulic pressure, spring tension, air pressure, etc.).

a. NOTE: If there is a possibility of re-accumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

10) Report any mishaps, unlocked conditions, unsafe conditions and/or any faulty connections to your supervisor immediately.

11) Do not close an open disconnect unless you are absolutely certain that it is safe to do so.

12) Contractors will furnish and use their own locks. Contractors shall be familiar and use the same lockout/tagout procedures or procedures similar to the one used by University employees.

8.1.2. Electrical Test Verification of De-energized Circuits

A qualified person shall use test equipment to test circuit elements and electrical parts that employees will be exposed to, and shall verify that these are de-energized. This test shall also determine if any energized condition exists as a result of inadvertently induced voltage, or unrelated voltage back feed, even if specific parts of the circuit were de-energized and are presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately before and immediately after this test.

8.1.3. Work on Energized Circuits

Work on Energized Circuits shall only be performed in accordance with the UNM Electrical Safety Program.

8.1.4. Re-Energizing Process

When the work is completed, the following steps should be performed in the order indicated:

1) Ensure that all tools and equipment are removed from within the workspace, and that all system components are properly connected.

2) Remove the locks/tags in accordance with Sections 10 and 11 of this procedure.

3) Re-energize the equipment and verify operation by pressing the “on” button.

8.2. Natural Gas Distribution Systems

8.2.1. De-energizing Process

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the system stoppage.
2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
3) Locate the gas control valve that supplies the piping or equipment to be serviced. Determine whether there is a secondary gas supply source as well.
4) Close and lock out and tag out the gas control valve. If more than one isolating valve is to be closed, the most upstream valves should be closed first.
5) If the natural gas is being shut off to permit servicing or maintenance of adjacent fuel-fired equipment, verify that any pilot or other flame no longer exists within that equipment.
    a. Attempt to re-start the equipment to verify that natural gas is no longer being supplied to the equipment.
6) Verify that the locked valve cannot be re-opened.
7) Purge gas system to atmospheric pressure before using any electrical equipment or using power compression tools, (i.e. ProPress).
8) Ensure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). The lockout devices shall:
    a. Be singularly, positively identified
    b. Be used ONLY for controlling hazardous energy devices
    c. Shall be durable and capable of withstanding all environments
    d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques
9) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.
    a. NOTE: When a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

8.2.2. Re-Energizing Process

When the work is completed, the following steps should be performed in the order indicated:

1) Ensure that all tools and equipment are removed from within the workspace, and that all system components are properly connected.

2) Remove the locks/tags in accordance with Sections 10 and 11 of this procedure.
3) Slowly open the gas control valve(s). If the odor of natural gas is detected, immediately close the valve(s) and re-examine all system connections.
4) Test all fittings/connections between shutoff valve and equipment.
5) Re-start any fuel-fired equipment taken out of service to verify that natural gas is now being supplied to that equipment.

8.3. Hot and Cold-Water Distribution Systems

8.3.1. De-Energizing Process

Should servicing or maintenance be required on these distribution systems, the steps listed below should be completed in the order indicated, prior to starting any work.

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
3) Identify the control valve(s) that isolate the flow of water through the system component or pipe section being serviced. If the work is to be performed on a piece of equipment, New Mexico plumbing code requirements require that control valves be located directly adjacent to the equipment being serviced.
4) Close and lock the control valves identified in step #1.
5) Using the applicable bleed valve or drain valve, relieve any residual hydraulic energy. Utilize system pressure gauges wherever possible to verify the release of this residual energy. The discharge of the residual water can also be physically observed.
6) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read “zero”.
7) Care should be exercise when opening system components. Bolts should all be loosened to confirm the absence of any remaining pressure, prior to removing the bolts.
8) Ensure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). The lockout devices shall:
    a. Be singularly, positively identified
    b. Be used ONLY for controlling hazardous energy devices
    c. Shall be durable and capable of withstanding all environments
    d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques
9) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.

a. NOTE: When a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

8.3.2. Re-energizing Process

When the work is completed, the following steps should be performed in the order indicated:

1) Ensure that all tools and equipment are removed from within the work space.
2) Verify that all bolts and equipment components are properly reattached.
3) Remove the locks/tags in accordance with Sections 10 and 11 of this procedure.
4) Close drain valves.
5) Observe the pressure gauges to confirm the system re-pressurization and check system for leaks.

8.4. Electric Pumps

8.4.1. De-energizing Process

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
3) Identify whether the electric motor installation has a local horse power rated disconnect switch to isolate energy to the motor and pump. If the disconnect is not horse power rated, contact the electrical department.
    a. If a local disconnect switch is present, "open" the switch to de-energize the pump.
    b. If a local disconnect switch is not present, contact the electrician’s group to lock out the pump breaker at the distribution panel.
4) Once the electric motor has been isolated, attempt to start the motor to verify that it is no longer energized. Once verified, press the stop button.
5) Identify the valves located on the suction and discharge side of the pump.
6) Close and lock each of the valves.
7) Using the applicable drain valve or pressure relief valve, relieve any residual hydraulic energy. Utilize system pressure gauges wherever possible to verify the release of this residual energy.
8) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read “zero”.
9) Care should be exercised when initially opening system components. Bolts should all be loosened to confirm the absence of any remaining pressure, prior to removing the bolts.
10) Ensure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). The lockout devices shall:
    a. Be singularly, positively identified

b. Be used ONLY for controlling hazardous energy devices
c. Shall be durable and capable of withstanding all environments
d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques

11) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.

a. NOTE: When a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

8.4.2. Re-energizing Process

Once the work is completed, the following steps should be performed in the order indicated:

1) Ensure that all tools and equipment are removed from within the work space.
2) Verify that all bolts and equipment components are properly reattached.
3) Remove the locks/tags in accordance with Sections 10 and 11 of this procedure.
4) Open the isolation valves.
5) Re-energize the electric pump, either by closing the local disconnect switch or by contacting an electrician and having them press the “close” button on the pump breaker.
6) Verify that the pump is now re-energized by pressing the “on” button, and observing the pressure gauges to confirm the system re-pressurization. Check for leaks.

8.5. Pressurized Air Systems

8.5.1. De-energizing Process

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
3) Identify the valve(s) which control the flow of air to the piece of equipment or piping section to be serviced.
4) Close and attach locks on each of the isolation valves identified in Step #1.
5) Using the applicable bleed valve or drain valve, slowly relieve any residual pneumatic energy. Utilize system pressure gauges wherever possible to verify the release of this residual energy. The discharge of this residual air can also be physically observed.
6) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read “zero”.
7) Care should be exercised when initially opening system components. Bolts should all be loosened to

confirm the absence of any remaining pressure, prior to removing the bolts.

8) Ensure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). The lockout devices shall:
    a. Be singularly, positively identified
    b. Be used ONLY for controlling hazardous energy devices
    c. Shall be durable and capable of withstanding all environments
    d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques
9) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.
    a. NOTE: When a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

8.5.2. Re-energizing Process

When the work is completed, the following steps should be performed in the order indicated:

1) Ensure that all tools and equipment are removed from within the work space.
2) Verify that all bolts and equipment components are properly reattached.
3) Remove the locks/tags in accordance with Sections 10 and 11 of this procedure.
4) Open the isolation valves. Observe the pressure gauges to confirm the system re-pressurization.
5) Test system for leaks.

8.6. Steam Distribution Systems

8.6.1. De-energizing Process:

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the system stoppage.
2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
3) Notify supervisor when steam to systems or multiple devices need to be shut off.
4) Locate the control valve(s) that supplies steam to the components being serviced. In most cases there will be local, hand-operated valve. If not, it will be necessary to go back to the boiler and locate the appropriate steam feed line.

5) Close and lock the appropriate steam control valve(s). If more than one isolating valve is to be closed, the most upstream valve should be closed first.

6) Use the closest applicable trap or vent to relieve any residual steam energy. Utilize system pressure gauges wherever possible to verify the release of this residual energy. The discharge of the residual steam can also be physically observed.

7) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read “zero”.

8) Care should be exercise when opening system components. Bolts should all be loosened to confirm the absence of any remaining pressure, prior to removing the bolts.

8.6.2. Re-Energizing Process:

When the work is completed, the following steps should be performed in the order indicated:

1) Ensure that all tools and equipment are removed from within the workspace, and that all system components are properly connected.

2) Remove the locks/tags from the steam control valve(s).

3) Slowly open the steam control valve(s). If a leak is detected, immediately close the valve(s) and re-examine all system connections.

8.7. Lab Fume Hoods

8.7.1. De-Energizing Process

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the system stoppage.

2) If the work is to be performed continuously by one technician, and that person has visual contact with the applicable control source for the duration of their work, a lock is not required. Tags are recommended as a general practice under these circumstances. Otherwise, a lock shall be affixed to the isolation source. If applicable, notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.

3) If hazards are not clearly identified, contact lab supervisor or SRS to ensure that conditions within the fume hood are sufficiently controlled and safe to permit fume shutdown. Also let the lab staff know that the hood will be temporarily shut down for repair.

4) Identify whether the electric fan motor has a local disconnect switch to isolate energy to the motor.

    a. If a local disconnect switch is present, "open" the switch to de-energize the motor. Lock the disconnect switch in the open position.

    b. If a local disconnect switch is not present, contact the electrician’s group to lock out the breaker at the distribution panel.

5) Once the electric fan motor has been isolated, attempt to start the fan to verify that it is no longer energized. Once verified, press the stop button.

8.7.2. Re-energizing Process

1) When the work is completed, the following steps should be performed in the order indicated:
2) Ensure that all tools and equipment are removed from within the workspace.
3) Remove all locks/tags from the isolation source.
4) Close the local disconnect switch, or have the electrician's group close the breaker at the distribution panel.
5) Start-up the fan to verify that the hood is now operational.
6) Inform lab staff that the job is complete and the fume hood is operational.

8.8. Boilers

8.8.1. De-energizing Process

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
3) Locate the valve(s) that control the supply of steam to the piping or section of the boiler that is being serviced.
4) Using drain valves or bleed valves, relieve any residual steam pressure in the lines to be serviced. Observe the system pressure gauges as an indicator of the energy being relieved.
5) Isolate the steam supply by closing and locking the steam control valve.
6) If the work to be performed will involve the natural gas system (i.e. piping or safety shutoff valves), locate the gas control valve that supplies the piping or shutoffs to be serviced. Determine whether there is a secondary gas supply source as well.
7) Close and lock the gas control valve. If more than one isolating valve is to be closed, the most upstream valves should be closed first.
8) If the work being performed will also involve electrically energized equipment, determine whether there is a local disconnect switch to isolate electrical energy.
9) If a local disconnect switch is present, "open" the switch.
10) If a local disconnect switch is not present, contact your supervisor for electrician support to lock out the circuit breaker at the distribution panel.
11) Once the electric energy has been isolated, attempt to start the equipment to verify that it is no longer energized. Once verified, press the stop button.

12) Verify that each of the locked valves cannot be either re-opened or switched to the close position.

8.8.2. Re-energizing Process

1) Once the work is completed, the following steps should be performed in the order indicated:
2) Ensure that all tools and equipment are removed from within the work space.
3) Verify that all bolts and equipment components are properly reattached.
4) Remove all locks and tags from the isolation valves, and assure that all drain valves and pressure relief valves are closed.
5) Open the isolation valves. If any leaks are detected, immediately close the valves and tighten up system components.
6) Re-energize the system by closing the local disconnect switch or by contacting an electrician and having them close the circuit breaker.
7) Verify that the equipment is now re-energized by pressing the “on” button, and observing the pressure gauges to confirm the system re-pressurization.

8.9. Air Handlers

8.9.1. De-energizing Process

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
3) Identify whether the electric motor has a local disconnect switch.
4) If a local disconnect switch is present, "open" the switch to de-energize the motor.
    a. Note: Some local disconnect switches are only adequate in de-energizing the control circuit. They do not prevent an individual from going to the circuit breaker and circumventing the control circuit and starting the machine. Therefore, unless it can be verified that the local disconnect switch can fully isolate the motor, the local disconnect switch shall not be used as the energy isolation device.
5) If a local disconnect switch is not present, or if it is present but does not fully isolate the motor, contact the electrician’s group to lock out the circuit breaker at the distribution panel.
6) Once the electric motor has been isolated, attempt to start the motor to verify that it is no longer energized. Once verified, press the stop button.
7) For work performed on, or in the vicinity of the fans or dampers, any residual potential energy should be relieved by either disengaging the coils or belt, or by providing a restraint mechanism sufficient to prevent the fans or dampers from any inadvertent movement.

8.9.2. Re-energizing Process

1) When the work is completed, the following steps should be performed in the order indicated:
2) Ensure that all tools and equipment are removed from within the workspace.
3) Remove all locks and tags from the isolation source.
4) Re-connect any coils or belts that were disengaged, and remove any restraint mechanism that was used.
5) Close the energy isolation device, whether it be located at a local switch or a breaker at the distribution panel.
6) If the energy isolation device was a breaker at the distribution panel, it should now be closed. Close the local disconnect switch.
7) Start-up the motor to verify that the unit is now operational.

8.10. Chillers

8.10.1. De-energizing Process

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
3) Identify whether the chiller has a local disconnect switch to isolate electrical energy to the unit.
4) Identify the valve(s) which control the flow of water and refrigerant to the chiller unit.
5) Close and attach locks and tags on each of the isolation valves identified in Step #1.
6) If a local disconnect switch is present, "open" the switch to de-energize the unit.
    a. Note: Some local disconnect switches are only adequate in de-energizing the control circuit. They do not prevent another individual from going to the circuit breaker and circumventing the control circuit and starting the unit. Therefore, unless it can be verified that the local disconnect switch can fully isolate the motor, the local disconnect switch shall not be used as the energy isolation device.
7) If a local disconnect switch is not present, or if it is present but does not fully isolate the motor, contact the electrician’s group to lock out the circuit breaker at the distribution panel.
8) Once the electrical energy has been isolated, attempt to start the unit to verify that it is no longer energized. Once verified, press the stop button.
9) Using the applicable bleed valve or drain valves, relieve any residual pressure within those sections of the unit to be serviced. Observe system pressure gauges wherever possible to verify the release of this residual energy.

10) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read “zero”.

11) Care should be exercised when initially opening system components. Bolts should all be loosened to confirm the absence of any remaining pressure, prior to removal.

8.10.2. Re-energizing Process

1) When the work is completed, the following steps should be performed in the order indicated:

2) Ensure that all tools and equipment are removed from within the work space.

3) Verify that all bolts and equipment components are properly reattached.

4) Remove all locks and tags from the isolation valves, and assure that all drain valves and bleed valves are closed.

5) Open the isolation valves.

6) Close the energy isolation device, whether it be a local switch or a breaker at the distribution panel.

7) If the energy isolation device was a breaker at the distribution panel, it should now be closed. Close the local disconnect switch.

8) Press the start button to verify that the unit is again operational.

8.11. Cooling Water Towers

8.11.1. De-energizing Process

1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.

2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.

3) Identify whether the electric motor has a local disconnect switch.

4) If a local disconnect switch is present, "open" the switch to de-energize the motor.

    a. Note: Some local disconnect switches are only adequate in de-energizing the control circuit. They do not prevent another individual from going to the circuit breaker and circumventing the control circuit and starting the unit. Therefore, unless it can be verified that the local disconnect switch can fully isolate the motor, the local disconnect switch shall not be used as the energy isolation device.

5) If a local disconnect switch is not present, or if it is present but does not fully isolate the motor, contact the electrician’s group to lock out the circuit breaker at the distribution panel.

6) Once the electric motor has been isolated, attempt to start the motor to verify that it is no longer energized. Once verified, press the stop button.

7) If work is to be performed on the sprayer heads, locate the isolation valve that controls water flow to those heads. Close and lock that isolation valve.

8) Using the applicable drain valve, relieve any residual hydraulic energy if work is to be performed on the sprayer heads.

9) For work performed on the belts or fans, any residual potential energy should be controlled by either disengaging the belt, or providing a restraint mechanism sufficient to prevent the fan from inadvertent movement.

8.11.2. Re-energizing Process

1) When the work is completed, the following steps should be performed in the order indicated:

2) Ensure that all tools and equipment are removed from within the work space.

3) Close the energy isolation device, whether it be a local switch or a breaker at the distribution panel.

4) If the energy isolation device was a breaker at the distribution panel, it should now be closed. Close the local disconnect switch.

5) If work was performed on the sprayer heads, open the isolation valve.

6) Re-start the unit to verify that it is operational.

9. TAGOUT PROCESS

Tagging out an energy source is NOT an acceptable alternative to a lockout device. Tags are essentially warning devices affixed to energy isolating devices and do not provide the physical restraint on those devices that are provided by a lock. However, when absolutely necessary to use only a tagout device, the following will apply:

1) Specific written procedures, approved by the supervisor and EHS, will be developed for each circumstance and/or piece of equipment requiring a tagout device in lieu of a lockout lock.

2) Tags shall be placed at the start control panel and where possible at the isolating device where the lock would have been placed.

3) Where possible, an additional means of protection shall be employed, i.e., the physical blocking of a control switch, removal of a valve handle, the removal of a circuit element, etc.

4) Tagout Devices shall:

   a. Be printed and constructed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible

   b. Be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected

   c. Be substantial enough to prevent inadvertent or accident removal and require a minimum of 50lbs of pressure exerted to remove.

d. Not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored

e. Warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: Do Not Start, Do Not Open, Do Not Close, Do Not Energize, Do Not Operate

10. Release from Lockout or Tagout

Before lockout or tagout devices are removed and energy is restored to the machine or equipment, the following actions shall be taken by the authorized employee(s) to ensure the following:

1) Affected employees shall be notified that the lockout or tagout devices are to be removed.

2) The work area shall be inspected to ensure that non-essential items have been removed and to ensure that machine or equipment components are operationally intact.

3) The work area shall be visually checked to ensure that all employees have been safely positioned before lockout or tagout devices are removed.

11. Lockout or Tagout Devices Removal

Once the system has been thoroughly inspected in accordance with Section 9, the following steps shall be taken when removing the lockout device:

1) Each lockout or tagout device shall be removed from each energy isolating device by the authorized employee who installed the lock and tag.

    a. If the authorized employee who installed the lock and tag is unavailable, see Section 12: Special Situations.

2) Remove the lock and tag and turn them into their supervisor for documentation of the completed project and update in the FM Area LOTO Log Book.

    a. NOTE: If any locks are left on the completed project, do not remove the tag; inform the supervisor immediately.

3) After lockout and/or tagout devices have been removed, and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout device(s) have been removed.

12. SPECIAL SITUATIONS

12.1. Lockout Interruption

In situations where lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequences shall be followed:

1) Clear machine or equipment of tools, materials and personnel.
2) Clear the controls of locks and/or tags.
3) Visually ensure all personnel are clear.
4) Energize the equipment for testing or positioning.
5) De-energize all systems and reapply energy control measures in accordance to Section 7, Locking Out Energy Sources, to continue servicing and/or maintenance.

12.2. Group Lockout or Tagout

When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

Group lockout or tagout devices shall be used in accordance with this program, in addition to the following specific requirements:

1) Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or a tagout device (such as an operations lock).
2) Provide the authorized employee information to determine the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment.
3) When more than one (1) crew, craft, department, etc., is involved, assignment of the group program is directed by one (1) authorized employee. The job associated lockout or tagout control responsibility given to an authorized employee is designated to coordinate all affected work forces and ensure continuity of protection.
4) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox or comparable mechanism when they begin work. They shall remove those devices when they stop working on the machine or equipment being serviced or maintained.

12.3. Shift or Personnel Changes

Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection. Provisions for the orderly transfer of lockout or tagout device protection between off-going and on-coming employees shall be included. The program goal is to minimize exposures to hazard(s) from the unexpected energization or start- up of the machine or equipment or from the release of stored energy. The program shall include at least the following elements:

1) If the job has not been completed prior to shift change or a personnel change, the supervisor and/or authorized employee shall affix their lock(s) to ensure lockout and tagout of the machine or equipment.
2) Affected personnel will remove their lock(s).
3) Complete and understandable information about work and any encountered problem(s) shall be directed to the on-coming person or group.

12.4. Authorized Employee Unavailable

When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed only under the direction of the Area Manager, provided that specific procedures and training for such removal have been developed, documented and incorporated into the energy control program. The program shall include the following elements:

1) Verification by the supervisor that the authorized employee who applied the device is not at the facility.
2) Make all reasonable efforts to contact the authorized employee to inform them that the lockout or tagout device is still on the affected machine or equipment, and that it needs to be removed (log time, date, if any one contacted).
3) With the supervisor's direction and presence at the lockout panel, remove the lock with necessary equipment.
4) Ensure that the authorized employee is informed of this action before they resume work at the facility.
5) The remaining steps from Section 10: Release from Lockout/Tagout.

13. REFERENCES

29 CFR 1910.147 Control of Hazardous Energy (Lockout/Tagout)

29 CFR 1910.333 Lockout/Tagout Electrical Safe Work Practice Standard

Attachment A: Example LOTO Log Book

WORK CENTER	LOCK #	NAME	MECHANICAL Yes No	ELECTRICAL Yes No

Attachment 3: Entering Flooded Spaces SOP

I. PURPOSE

This procedure is to outline steps to ensure personal safety when entering a flooded space.

II. GENERAL

Before staff can enter the space to assess the damage and begin clean-up and repair, steps must be taken to protect themselves, workers, and volunteers who have come to help.

III. PROCESS

1.0 Prior to entering the flooded space

- 1.1 Contact Facilities Management Utilities Division electricians to turn off power to the space, as directed, at the exterior main disconnect prior to anyone entering (typically at a pad-mounted switch ahead of the building's pad-mount transformer).
- 1.2 Be aware that a building may have more than one electrical service, as well as possibly one or more sources of backup/emergency power, e.g., standby engine- generators, UPSs, and emergency lighting inverters.
- 1.3 Area electricians and Utilities Division electricians will need to determine that all electrical hazards within and around the building are controlled. Only then can staff be certain that the space is electrically safe.

2.0 While working in the flooded space

- 2.1 Never touch electrical equipment if the ground is wet.
- 2.2 As an additional safety measure, after entering the space, open the main breaker(s)/fused switch(es) in the main electrical panel/switchboard as needed.
- 2.3 Shut off the water.
- 2.4 Stay well away from downed power lines and electrical wires. Electrocution is a major source of deaths in flooded areas. Electric current passes easily through water and soil. You can be electrocuted even if you only approach a downed power line.
- 2.5 Look for electrical system damage: sparks, broken or frayed wires, smell of burning insulation.
- 2.6 Do not turn power back on to electrical and mechanical equipment that is, or has been, wet until it has been properly dried, cleaned, repaired or restored, and inspected/tested per the recommendations given in NEMA's publication "Evaluating Water Damaged Electrical Equipment."

3 Guidelines for cleaning up flooded space (based on the article *After the Flood: Safety Tips for Business Owners* (https://s0.hfdstatic.com/sites/the_hartford/files/after-the-flood-business.pdf)

- 3.1 Take immediate steps to ensure personal safety
- 3.2 Secure the spaces and utilities
- 3.3 Identify damage and begin clean-up of space contents
- 3.4 Decontaminate spaces and contents
- 3.5 Ensure worker safety during clean-up

3.6 Be aware of potential Carbon Monoxide poisoning from fuel-powered machinery used in cleaning up flooded spaces (i.e. generators, pumps, pressure washers etc…)

IV. REFERENCES

After the Flood: Safety Tips for Business Owners

V. ATTACHMENTS

5080a Flooded Building Checklist

Author: Vince Chavez
Manager,
Facilities Maintenance Division

Approved By: Al Sena
Director
Facilities Management

FACILITIES MANAGEMENT DEPARTMENT PROCEDURES AND GUIDELINES

5080
9/4/2019

Attachment 5080a

FACILITIES MANAGEMENT

Flooded Building Checklist

Building Name: _____

Of Floors: __Bsmt. __1st __2nd __3rd __4th __5th __6th __7th __ Pnthse

Location where water found:
_____
_____
__

Water appears to be: __Dripping __Constant __Gushing

Water is: __Draining (Where:_____)
__Ponding (__Small Pond __Spreading in Room)
__Flooding (Multiple Rooms or Floors)

Source of leak appears to be:
_____
_____

Leak can be easily isolated: __Yes __No/Other: _____

Water cleanup by: ___UNM ___Contractor/Other: _____

Notations_____
_____
_____
_____
____

Building Specifics

Fire Alarm: __Activated __NOT Activated

Backup Gen.: __ON __OFF __Unknown/Transfer $ Local: _____
__Entire Building __Egress only __ Isolated Systems

U.P.S. Systems: Qty: _____ Floor: _____ / Qty: _____ Floor: _____
: Qty: _____ Floor: _____ / Qty: _____ Floor: _____

FACILITIES MANAGEMENT DEPARTMENT PROCEDURES AND GUIDELINES

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9/4/2019

Cell Tower or Radio Equip. On Bldg.?: ___Yes ___No

Research Freezers?: ___NO __Yes/Floor___, __Yes/Floor___, __Yes/Floor__

Are Electrical Devices Wet?: __Yes __No
If Yes, Easily Isolated? __Yes __No

Is Electrical Distb. Equip. Wet?: __Yes __No
If Yes, Easily Isolated? __Yes __No

Are Live Animals in Bldg.?: __Yes __No
*In Critically Controlled Environment? __Yes __No
*Can Environment Power be Isolated "ON"? __Yes __No

Other Critical Building Systems

SYSTEM	LOCATION
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Known Building Hazards

Electrical:
_____
_____
__

Biologic:
_____
_____
__

Other:
_____
_____
__

ATTACHMENT 4: ELECTRICAL SPECIFICATIONS FOR CONTRACTORS AND UNM PERSONNEL DOING WORK AT THE UNIVERSITY OF NEW MEXICO

The following specifications are basic, general UNM Facilities Management Engineering & Energy Services Division (FM EESD) specifications that should be adhered to by Electrical Contractors and UNM personnel doing small electrical projects on UNM property. These specifications are especially relevant to projects which are performed by on-call contractors, or other electrical contractors working on small projects without actual blueprints and/or specification books. While all work performed on UNM property must meet or exceed the New Mexico Electrical Code (National Electrical Code plus amendments), the following specifications are UNM standards that shall be adhered to and may be beyond the minimum allowed by the code(s).

All UNM personnel working on "Annual Permit" or "New Permit" projects, and all contractors working at UNM on work requiring State of New Mexico Construction Industries Division (CID) permits are required to contact the applicable UNM Inspector(s) [Electrical (Will Monette-321-5627), Mechanical/Plumbing (Phred Dixon 228-4769)] at applicable project milestones (underground, distribution, rough-in, final) and prior to "Substantial Completion" to allow them the opportunity to inspect the work for "Code" and "UNM Specification" compliance either along with or prior to the CID inspector making the associated inspection. Inspections are completely at the discretion of the applicable UNM Inspector. All UNM Entities that engage in, manage, coordinate, or otherwise are involved with construction activities on the UNM campus are to adhere to the requirement above, and to advise their contractors of this requirement. ***Please be advised that failure to comply with the above may require the contractor, workmen, UNM personnel, and/or UNM Entity to expose any portion of the work that has been covered or concealed, if necessary, for the Inspector to inspect the work.***

Any defects found by the UNM Inspectors will be noted in a "Correction Notice" issued to the project, and is to be abated and re-inspected **PRIOR TO** the acceptance of the project by UNM.

During additions or alterations to existing facilities at UNM, all existing electrical work that is disturbed in any way, or that is deemed to be unsafe by the UNM or CID Inspector, must be corrected so as to conform to the New Mexico Administrative Code (NMAC) requirements for new buildings and to meet the specifications contained in this document

1) Permits and inspections MUST be obtained (from CID) in order to perform any electrical work at UNM, and should be displayed on the jobsite for the job duration.

2) Metal-clad and non-metallic cables (including types MI,AC,NM,MC,NMC,SNM,SE,USE,UF, or BX) should NOT be used on UNM property without the expressed consent of FM-EESD. Flexible metallic conduit with the appropriate conductors should be used for; fixture whips, equipment whips, or raceways "fished" down walls. In no instance should fixture or equipment whips exceed 6 feet in length. Flexible raceways "fished" into walls should terminate into a junction box immediately above the ceiling, and convert to conduit at that point.
3) All panels installed at UNM:
    a. Will be "Bolt-in" circuit breaker type.
    b. Will have copper busses.

c. Will be provided with neutral and equipment ground lugs (bars).
d. Will have a permanent label affixed to the panel front cover, showing the panel designation, panel voltage, and where it is fed from.
e. Will provide 30% unused (spare) capacity for future use.
f. NEMA 1 panels will be "Door-in-Door' construction.
g. For any recessed panel installed, in addition to the circuits for which it is being installed, will have 2 (ea) spare conduits (minimum ¾ trade size) stubbed from the panel into ceiling space above for future.
h. Bonding (grounding) bushings will be provided on all new panel feeders.
i. Will have "AIC" rating of all panels and circuit breakers approved by the FM EESD prior to installation.
j. Will have panel schedules which are typed, completed (updated) and protected from dirt by a plastic sleeve on the inside cover of the panel. This applies to both new and modified existing panels.
k. Will be provided with latch and lock.
l. Will be installed to meet the Code clearance requirements

4) All exposed conduit should be run parallel and perpendicular to the structure. PVC pipe shall NOT be used above grade (slab) except in special applications that have been re-approved by the FM-EESD. In all PVC conduit runs, all bends over 30 degrees and all stub-ups should be in wrapped galvanized rigid conduit.

5) All EMT fittings shall be of the compression type (gland & ring). Set-screw fittings will NOT be acceptable. All fittings shall be steel (not pot metal). Liquidtight flexible metallic conduit fittings shall be steel type (not pot metal). Flexible metallic conduit fittings shall be steel type (not pot metal).

6) Liquidtight flexible nonmetallic conduit is not permitted for installations at UNM.

7) All new lighting shall be LED type. Manufacturers/models shall be approved by FM EESD. Interior luminaires shall typically be 4000K CCT, high CRI and dimmable. Interior lighting controls (occupancy sensors and wall switches) shall be wireless (Echoflex or Lutron). Exterior light poles and wall-mounted luminaires shall match UNM standard products recently installed in adjacent areas.

8) Conductors shall be copper. However, 600V feeder conductors in sizes #1/0 AWG to 750 kcmil may be copper or aluminum alloy. Aluminum alloy conductors shall be compact stranded conductors of a recognized Aluminum Association 8000 Series aluminum alloy conductor material (AA-8000 series alloy), with Type XHHW-2, temperature rating 90° C insulation.

9) Labels shall be installed on all panels, disconnects, hardwired equipment, etc., identifying its designation, use and where it is fed from. Labels will be installed on all switches and receptacles, identifying its circuit. Arc flash hazard labels shall be installed on all panels.

10) The ends of all conduits containing wires of any type, shall be bushed.

11) All conduits must be adequately supported.

12) All persons performing electrical work at UNM must use and adhere to UNM's Electrical Safety Program, including their Control of Hazardous Energy (LOTO) policies ("Lock-out/Tag-out" and "Energized Electrical Work")

13) Exit signs shall be LED type with letter colors to match existing.

14) Standard tumbler switches shall be commercial specification grade, 20 amp, ivory. Duplex receptacles shall be commercial, specification grade, 20 amp, ivory. Receptacles in child care areas, waiting rooms, etc., shall be tamper-resistant type. All terminations must be made using the screw terminals, not the "stab- in" provisions. Receptacles in restrooms, in kitchens, in lab tables, on building exteriors, or within six feet of any water source shall be of the GFCI type.

15) Device cover plates shall, in general, match the color and type of the existing plates in the immediate vicinity. Where there are no existing plates to be matched, provide brushed satin stainless steel plates. Exterior receptacles shall have a cast steel or aluminum cover that is weatherproof with the attachment plug cap inserted or removed. Exterior receptacles shall be "WR" rated.

16) Where feasible, all protective devices shall be circuit breaker type. In other words, an enclosed circuit breaker is to be used in preference to a fused safety switch. Non-fused, heavy duty, safety switches may be acceptable for local equipment maintenance disconnection.

17) Motor-operated equipment (i.e. fan coil units) must be supplied by a minimum of a local manual motor starter with thermal overloads. It should be mounted on the side of the control enclosure, or within 3 feet maximum of the unit. Code required working clearances must be maintained in front of disconnects and control enclosures.

18) All motor operated equipment and its associated electrical equipment must maintain the NEC required working clearances to facilitate safe access and maintenance. The FM-EESD reserves the right to request equipment relocation if adequate working clearance is not provided.

19) Conductor splices/taps in gutters or large j-boxes shall be made using insulated, multi-cable connector blocks. Taped split-bolt connections are not acceptable.

20) All personnel shall be licensed for the work they are performing. A licensed Journeyman shall be present for ALL electrical work, and in no case will the Journeyman / Apprentice ratio exceed 2

Apprentices to 1 Journeyman. All personnel shall be trained for the hazards present in the tasks they are performing (e.g. confined spaces).

21) "Energized" electrical work (at greater than 50 volts) shall only be performed with the prior approval of the FM-EESD. An "Energized Electrical Work Permit" must be obtained. Any time "Energized" electrical work is performed, two qualified persons must be present at all times.

22) Submittals may be required for some equipment, or as requested by the FM-EESD. The contractor shall provide submittals for all major equipment.

23) Remove completely all abandoned or unused electrical equipment. Removal of abandoned conduit that is underground, is at the discretion of the FM-EESD.

24) All building power and utility outages must be coordinated and approved by the FM-EESD. Only FM Utilities Division will operate 12.47kV UNM utility power equipment.

25) All materials and workmanship by contractors shall be warranted for a period of 1 year after the date of "Final Acceptance".

26) The phasing of all conductors (#8 and larger) shall be identified by color coding tape. Conductors sizes #10 and smaller shall have colored insulation. The grounded (neutral) conductor sizes #6 and smaller shall be white or light gray, or have 3 continuous white stripes on other than green insulation. Grounded (neutral) conductors larger than size #6 shall be color coded white with coding tape. Grounding conductors sizes #6 and smaller shall have green insulation or be bare the entire length. Grounding conductors larger that size #6 shall be color coded green with coding tape.

27) All penetrations in fire-rated walls, shall be sealed with fire caulking or other approved method(s).

28) Subsurface Utilities. Owner will comply with NMSA 1978, Chapter 62, Article 14 (the New Mexico Excavation Law) by performing utility spotting activities or by employing a qualified utility spotting company, or both. The Owner will provide the latest and best underground utility information available regarding the campus in the form of Utility Mapping Drawings. In addition, the Contractor shall perform utility spotting work. The Contractor shall locate, spot and find all utilities within the project boundaries or affected by the project. The Contractor shall repair any and all damaged utilities caused by excavation and spotting activities. Costs for this work shall be included in the Contract Price. Owner will not recognize claims for spotting or repairing concealed or unknown subsurface utilities. The Owner will process an appropriate Change Order if concealed or unknown subsurface utilities must be relocated in order to construct the project as indicated in the Contract Documents.

29) Concrete paving and sidewalks shall be replaced in full panel sizes. Other paving (brick, pavers, etc.) shall be replaced to match the existing in every way.

30) No conductors shall be spliced within panelboards. Under no circumstances will “wire nuts” be accepted within any panelboard. Conductors shall NOT be installed within any panel or device raceway unless those conductors terminate within that specific panel or device.

31) Under no circumstances will nonmetallic “Wiremold” (surface raceway) contain any conductors which carry more that 50 volts. In all cases where “self-adhesive” surface raceway is used, in addition to the raceway adhesive, at least 2 mechanical fasteners per ten foot length shall also be used (straps, screws, etc.).

32) At no time will a contractor leave any electrical switchgear, panels, or energized devices open or exposed in a public area without having qualified electrical personnel working on or guarding the exposed electrical components.

33) All bolted pressure connections shall be torqued to manufacturer specifications and display torque strike marks.

34) The contractor is responsible for supplying the appropriate signs, flagging, and /or fencing to identify the construction area and to restrict entry. It is the duty of the contractor to ensure a safe environment to its staff, subcontractors, and any occupants in the vicinity.

35) In general and where practical, all conductors should be continuous (no splices) from their point of origin to their point of termination. In NO case should “Service Conductors” be spliced without the expressed consent of FM-EESD, and then only in a manner approved by the NEC and FM-EESD.

36) In NO case should the wire designation in an existing circuit be changed without the expressed consent of FM-EESD. Remodel work that requires converting an existing circuit from one voltage to another, should have the existing wires removed and correctly color coded wires re-installed. In the very rare instance where the existing wires are to be reused, wires that have had their designation changed (i.e. an existing “hot” converted to a “neutral”) will have their entire exposed length taped with the new appropriate color. Additionally, the altered conductor will be taped with the new color not only at its source and end device, but at every accessible point along the circuit. This includes but is not limited to; pull boxes, conduits, device boxes, gutters, panels, and anywhere else that the altered circuit can be accessed.

37) All service disconnecting switches (fused or non-fused) for rooftop or remote equipment are to be mounted on the exterior of the equipment and shall be heavy duty, hand-operated safety switches with ground bar kit and appropriate NEMA rating. Disconnects requiring screw in fuses or pull blocks are not acceptable. Equipment disconnect switches should be readily accessible, and should in no case require the removal of a panel or opening of a door to access the service disconnect. Furthermore, all

service disconnect switches shall have an adequate number of poles to interrupt all current carrying conductors to the unit. Disconnect switches mounted to the equipment shall not impede maintenance access to the equipment.

38) Prior to working on any circuits that supply motorized equipment, the contractor shall verify the (clockwise or counterclockwise) rotation of the equipment, and ensure that when re-energized, the equipment maintains proper rotation.

39) In NO case should “Push-in Connectors” (e.g., WAGO Wall-Nuts, IDEAL In- Sure, etc.) be used in any manner on electrical work performed at the University of New Mexico, without the expressed consent of FM-EESD. The splicing (or joining) together of wires, sizes #10 and smaller should be accomplished with industry standard twist-on wirenuts, butt-splices, or other NEC acceptable methods. The use of “Push-in Connectors” is prohibited for “pigtailing” wires in junction and device boxes, as well as in lighting fixtures, or virtually any other application. Individual luminaire disconnects (as required by the NEC) are specifically exempt from this requirement.

40) All electrical equipment is required to be approved as defined in Article 100 of the “National Electrical Code”, and as such, to be acceptable to the Authority Having Jurisdiction (AHJ). While the listing and rating of most common electrical equipment and components is standard, the listing and rating of equipment derived by combining standard components **is not**. As an example, while all the relays and other components placed in a box or panel to create a complex device (i.e. a DDC Control Panel) may individually have a “UL” listing, it is relevant to the components only. The complete assembly shall be evaluated and field certified by a “nationally recognized testing laboratory” as meeting the safety standards to operate together as a unit. Certification letter from the Engineer of Record may be considered in lieu of the above, if acceptable to the AHJ.

41) Use of Belleville washers (in lieu of lock washers) for all bus connections in switchgear, busduct or standalone (e.g., ground bar) is required. Properly torque all connections, using a calibrated torque wrench in accordance with manufacturer’s recommended values.

42) Lighting in ALL mechanical or electrical rooms/closets shall be operated with a standard light switch. Occupancy sensors are NOT acceptable in these locations.

43) Entrance to and Egress from Working Spaces:
When mounting equipment, several items relevant to “clearance” need to be considered. While adequate front and side-to-side clearance as defined by the National Electrical Code are essential, an additional key consideration should be personnel egress permitting workers to escape in an arc flash incident. When mounting the equipment, consideration must be given to situations wherein opening a side-hinged door on a panel or other equipment will impede the egress pathway. The same would be true of panel covers hinged at the top of equipment, or external handles or levers that would impede egress. Equipment should be mounted so that regardless of the condition of the equipment, a 28 inch clear opening is always available for egress.

44) Contractor's Electrical Safety Plan:

Contractors doing work at UNM are expected to have and follow their associated company's electrical safety plan. Submit the plan to the UNM Environmental Health & Safety (EH&S) for approval. The plan shall remain on file with EH&S. Any changes/updates shall be submitted to the EH&S.

45) No electrical conduits shall be mounted to or supported from any sheet steel ductwork or mechanical piping, unless it is specific to the ductwork or ductwork apparatus. Where conduit must be mounted to ductwork, the ductwork must be of adequate rigidity to firmly support the conduit. Furthermore, when conduit is mounted to ductwork, consideration must be given to ambient temperature and NEC Articles regarding temperature limitation of conductors.

46) When mounting sheet steel 4 sq. and 4 11/16 sq. (trade standard) boxes in any fashion other than surface mounted (i.e. within walls or to the sides of an enclosure), the box must have the appropriate factory supplied brackets for mounting. Use of the factory drilled holes in the box sides to mount to wood or metal framing studs will not be accepted, as these are not listed as a means of box support.

47) Each 20 amp, single pole branch circuit is to have its own #12 awg neutral, regardless of type of load on the circuit. (Shared neutrals are not acceptable.)

48) Recessed LED lighting shall be circuited using a conduit and j-box with flex whips (6' max) to each luminaire. Circuiting done using flex or conduit between luminaries (and using luminaire driver compartments as a raceway) is NOT acceptable.

49) New installations that involve pumps, blowers, motors, or any equipment subject to operational vibration, shall utilize insulated multi-tap connectors or insulated set screw wire connectors, to join/connect wires of the system. Standard wirenut connections are NOT acceptable.

50) Contractors installing electric/power quality meters are required to set up/program the meters, verify that the meters are properly connected (phasing of CTs and PTs), provided with fusing and shorting blocks, use a laptop computer to verify that meters are operating correctly, the display is accurate and is capable of being read remotely via Ethernet connection. The EIG Shark meters currently used at UNM are provided with software to facilitate installation and verify that they are connected properly. Shark meters shall be provided with an Ethernet card.

51) Regardless of a luminaire's "Listing and Labeling", all luminaires installed on UNM property over a tub or within a shower enclosure (wet location) shall have an "approved" lens installed in the luminaire that covers the lamp/LED chip.

52) Regardless of the "Listing and Labeling" on any clamp used for Grounding or Bonding purposes, none shall be allowed to connect a grounding or bonding conductor to a piece of rebar (for UFER ground connection). Connection of grounding and bonding conductors to rebar (for UFER ground connection) shall be accomplished solely by the use of exothermic welds.

53) Any conduit or raceway that penetrates the roof of a building, and utilizes a "Pitch-Pan" or "Roof-Jack" to protect the penetration, must be rigid in nature (i.e.; EMT, IMC, or GRC). In NO case should any type of flexible conduit or cable penetrate a roof utilizing a pitch-pan or roof-jack.

54) In general, colored conduit is not to be used at UNM, unless specifically authorized by both the

UNM Electrical Inspector and FM-EESD. Only “green” colored conduit is specifically authorized for use at UNM, which is used by the Energy Services division (or their contractors) of the UNM FM EESD in conjunction with applicable labels that identify it as an “Energy Services” control wiring conduit. No other colored conduits should be installed on any project at/for UNM without the proper authorization.

55) Eaton Dura-Blok or equal rooftop supports are required for all raceways on rooftop. Wood blocks are not acceptable. Conductors in rooftop conduits shall be derated based on direct sun exposure.

NOTE: Any comments or questions regarding these specifications should be directed to one of the following:

David A. Penasa, P.E.
Manager, University Facilities Engineering Facilities Management
Engineering & Energy Services Division
Mobile: (505) 269-8717
dpenasa@unm.edu

Will Monette
Electrical Trades Inspector
Facilities Management
Mobile: (505) 321-5627
wmonette@unm.edu

ATTACHMENT 5: EXPERIMENTAL ELECTRICAL APPARATUS AND STUDENT PROJECTS SOP

1. PURPOSE

From time to time, various disciplines create projects as part of their educational requirements that are displayed or otherwise accessible to the public. When these projects utilize electricity, they create a potential safety risk to the public and need to reviewed and approved prior to exposing the public to them.

The purpose of this SOP is to develop standard guidelines for these projects, as well as outline the review and approval process.

2. REQUIREMENTS OF EXPERIMENTAL ELECTRICAL APPARATUS

The following requirements shall be verified and enforced by the Principal Investigator (PI):

1. Aside from the building power connection point, all Experimental Electrical Apparatus (EEA) should be self-contained, in that once assembled it sits on the floor, table top, stand, rack, or within an enclosure for its specific purpose. The PI should not mount (affix) EEA to floors, walls, ceilings, tables, or any other item or surface that is a permanent fixture of a building owned by UNM. Such mounting is considered a building alternation and will need to be performed by FM in accordance with UAP 5050: Facility Maintenance, Repair, and Alternation.
2. All EEA shall be capable of having all electrical supply power disconnected from the apparatus. All disconnect points must:
    a. Be within 15 feet proximity of the apparatus,
    b. Maintain un-restricted access at all times, and
    c. Be clearly labeled and identified.
3. All EEA shall have appropriate warning signs relevant to all significant hazards visibly displayed.
4. All EEA shall be assembled with the safety of the users and any bystanders as the paramount consideration.
5. Any damaged EEA with exposed hazards shall be removed from service immediately and not re-energized until appropriate repairs are made.
6. Other than industry standard plugs (cord caps), any and all electrical supply circuits, up to and including the Building Power Connection Point, must be inspected and approved by:
    a. The applicable FM Maintenance Area Manager,
    b. The UNM Electrical Inspector, and

c. The NM Construction Industries Division (CID).

7. Additionally, all installations must be:

   a. Performed in accordance with the UNM Electrical Program.

2.1. Project Review & Approval

The following is a list of requirements, relative to the use of electrical power that must be met prior to public interface:

2.1.1. Job Hazard Analysis

The PI (or Faculty Advisor) shall complete a job hazard analysis (JHA) that identifies all potential hazards and controls implemented to eliminate those hazards.

2.1.2. JHA Review:

The PI (or Faculty Advisor) shall send the completed JHA form to:

1. The Dean of the appropriate college
2. UNM Environmental Health & Safety
3. UNM Electrical Inspector

2.1.3. Department Approval:

Upon review of the JHA, the Dean shall provide final approval of the project in writing.

2.1.4. Final Inspection:

After approval, and prior to public display, The PI (or Faculty Advisor) shall perform a field inspection verifying the following are in place:

1. Warning labels
2. Demarcation and barriers of live components
3. Written Standard Operating Procedure
4. Completed Job Hazard Analysis
5. Training and sign-off of all personnel working on or around the system
6. Emergency response procedures

2.2. Special Considerations

Any project that utilizes building electrical energy must be inspected by the UNM Electrical Inspector prior to being accessible to the public. The office of the UNM Electrical Inspector is at the UNM Service Building. The Inspector can be contacted:

1. By calling 505-321-5627, or

2. By submitting an Inspection Request via the FM Workorder System.

This request should come in at least a week before the EEA is launched.

Projects utilizing line voltage (required to be plugged in) must be wired in a manner that is appropriate to the operating conditions (indoor, outdoor, extreme temperatures, steam, proximity to water, etc.).

Standard consumer electrical items must be rated for the environment in which they will operate. Any electrical components that require termination points to building power must be wired by a New Mexico Licensed Electrician with a valid New Mexico Journeyman Wireman License (NO Exceptions). The electrician must be available (with their license) at the time of inspection.

Additional considerations will be given to the following:

1. Wiring methods and workmanship,
2. The structural integrity of the overall project,
3. The safety of the public, esp. if the project is interactive, and
4. The ability of the project to function in the environment it is intended to be displayed in.

3. FM Engineering Guidelines

More requirements for all Contractors and UNM Personnel doing electrical work at the University can be found via the Electrical Specifications for Contractors put out by FM Engineering.

ATTACHMENT 6: TESTING AND WORKING ON ENERGIZED CIRCUITS SOP

Objective: In order to safely work on electrically energized equipment, distribution centers, switches, panels, circuits and devices each employee must be familiar with and follow this operating procedure.

1) Is it really necessary to work the circuit or equipment energized?
2) Submit an Energized Electrical Work Permit for approval.
3) Inform building users of possible loss of power to circuit or equipment
4) Use the *UNM/PPD Job Briefing and Planning Checklist*
5) Know what the hazard rating is:
    a. Refer to NFPA 70E Table 130.7 C (9)(a) (starting page 29)
6) Have the proper PPE for the hazard rating
    a. Refer to NFPA 70E Table 130.7 C (10) (starting page 33)
7) Set up arc flash boundaries according to hazard rating:
    a. Refer NFPA 70E Table 130.2 C (page 25)
    b. (Insure that proper signage is posted on barricades and barricades are made of a non-metallic material)
8) Proceed with testing/work on energized circuit
9) When testing/work is complete inform building users that testing is complete

ATTACHMENT 7: NEW ELECTRICAL WORK ENTERING ENERGIZED ELECTRICAL PANELS OR SWITCHGEARS SOP

Objective:

In order to reduce the disruptive and costly nature of extended electrical power outages, the following procedure addresses the requirement of new electrical work that needs to be connected to existing (presumably energized) electrical panels, switchgear, and/or apparatus.

1) Conduits that carry new electrical circuits which are required to be connected to energized panels or switchgear, should terminate in an appropriately sized junction box that has been set on top of, or temporarily supported to the side of the energized gear. NOTE: Temporary support to the sides of energized gear MUST be accomplished completely on the outside of the energized enclosure. Under NO circumstances may the junction box be attached directly to the gear until the gear is de-energized!
2) Circuit wire can then be installed in the conduit(s), leaving enough extra wire rolled up in the junction box to allow termination when the gear is de-energized.
3) After the gear is de-energized (locked and tagged out), matching holes can be cut (KO punch or holesaw) in the junction box and gear enclosure, and the two pieces joined together with the appropriate bushed and bonded conduit fittings, and the junction box permanently supported, independently of the gear.
4) The circuit conductors can then enter the gear through the bushed conduit fittings, and terminated to the appropriate device(s).
5) A complete check to make sure the gear is safe to re-energize should be made, all covers and safety devices re-attached.
6) Following the proper Lock out / Tag out procedures, the gear may then be re-energized.

Compiled and written by:
David Penasa & Larry H. Crum
PPD Engineering & Energy Services
@ 08/09/2006

ATTACHMENT 8: UNM MEDICAL PROCEDURE FLIP CHART

Table of Contents:

EMERGENCY PREPAREDNESS

Before an Emergency occurs – What can *you* do?

Be Prepared

- *Learn about UNM emergency communications and LoboAlerts*

Practice good safety habits

- *Be aware of your surroundings*
- *Identify potential hazards and recognize "out of the ordinary"*
- *Trust your instincts*

Have a plan – How will you respond if _____happens?

- *What will you do?*
- *Where should you go?*

In an emergency situation:

1st Make yourself safe – *or YOU can be of no benefit to anyone else;*

2nd Warn others *of the situation,*

3rd Call 911 for assistance – *Do not assume someone else will.*

EMERGENCY PREPAREDNESS

EMERGENCY ALERTS

Listen to the ***Alert Siren*** and the ***All Clear Siren @*** ***http://emanage.unm.edu/EMNS.shtml***

The University of New Mexico warning sirens will only be used for testing or to notify people on the UNM campus that situation exists that makes it unsafe to be outdoors.

Testing is conducted at the beginning of each semester to help familiarize the campus community with the sounds. These tests are broadly announced in advance through the UNM Webpage, email messages and local notices.

If you hear the warning siren and there has been no advance notification of a test assume it to be a real alert and take the following actions:

- ✓ Seek shelter in the nearest building
- ✓ Seek additional information from:
  - ✓ *LoboAlerts*
  - ✓ *Email Alerts*
  - ✓ *UNM Emergency Management Webpage*

EMERGENCY ALERTS

MEDICAL EMERGENCIES

Medical Emergencies can occur at any time and it is important to get medical assistance as quickly as possible by calling 911.

Before an emergency occurs:

- **Consider taking first aid and CPR classes.**
- **Learn valuable skills that may potentially save someone's life.**

While waiting for emergency medical services to arrive:

- ✓ **If necessary, attempt control any bleeding.**
- ✓ **Try to keep the person still, protect them from further injury as well as, curious on-lookers.**
- ✓ **Provide the medical personnel with as much information as possible.**

In a medical emergency:

- ✓ ***Ensure your safety first. You cannot help anyone if you become part of the problem***
- ✓ ***Call 911***
- ✓ ***If you can safely provide assistance, follow instructions given by the Emergency Operator***

MEDICAL EMERGENCIES

CAMPUS VIOLENCE

The University of New Mexico is committed to providing an academic environment that is free from violence.

Any acts or threatened acts of violence will not be tolerated.

University resources:

Police and Emergency Services
http://police.unm.edu
Emergency – 911
Non-emergency – **277-2241**

Counseling, Assistance and Referral Service (CARS)
http://www.cars.unm.edu
272-6868

Faculty Intervention Team (FIT)
http://www.unm.edu/~oset/fit
277-SAFE (7233)

Student Health and Counseling (SHAC)
http://www.shac.unm.edu
277-3136

Immediately call *911* if you observe a person:

- In possession of a firearm on campus.
- Displaying any type of weapon in a threatening manner.
- Physically assaulting another person by punching, shoving, jabbing, etc.
- In the act of destroying property.
- Making a specific and immediate threat of self-harm or, harm to others.

CAMPUS VIOLENCE

HAZARDOUS MATERIALS

Hazardous Materials must be handled carefully and properly disposed in compliance with state and federal regulations.

Material Safety Data Sheets (MSDS's) contain detailed information about individual chemicals.
These sheets are required for each chemical in the workplace and must be readily accessible.
If you have any doubt or concern about a hazardous material, contact:
Safety and Risk Services @ 277-2753

Container Labels should have:

- The name of the chemical
- Hazards of the chemical
- First aid information

Any container without a label should be considered hazardous.

Leftover Chemicals should be recycled or properly disposed of.

- ✓ Never throw chemicals in the trash or pour down a drain.
- ✓ Call 277-2753, ask for Chemical Safety Division.

Chemical Spills /Releases

- ✓ **E**vacuate the area
- ✓ **A**lert others in the area ***Call 911***
- ✓ **R**emain in a safe location

HAZARDOUS MATERIALS

SUSPICIOUS PERSON / BEHAVIOR

Suspicious Person:

A person whose presence or behavior is:

- **"out-of-the-ordinary"** or,
- **"does not belong"** in a particular place

If you observe a suspicious person or behavior:

- ✓ **Ensure your safety**
- ✓ **Call *911***
- ✓ **Provide as much detailed information as you can including: (Height, Weight, hair color, eye color, build, clothing description, tattoos.) Do they have a weapon or other suspicious object?**
- ✓ **Notify your friends, co-workers, supervisor so everyone is more aware and additional precautions can be taken if necessary.**

SUSPICIOUS PERSON / BEHAVIOR

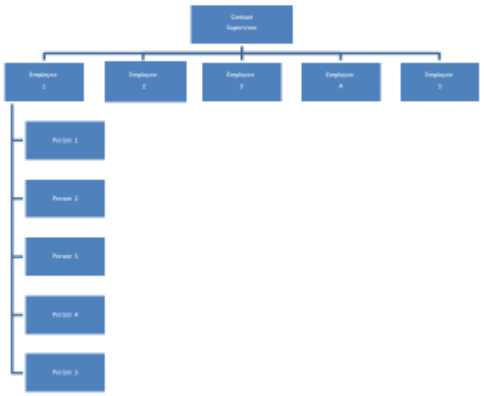
EMERGENCY PHONE TREE / CONTACTS

Emergency Phone Tree guidelines:

In order to account for all personnel during an emergency situation, every office should keep and update emergency contact information for all employees.

- ✓ **Contact information should be updated with every change in personnel or quarterly at a minimum.**
- ✓ **Call trees should be structured so that no individual is required to contact more than five (5) persons**
- ✓ **Upon completing their (5) contacts, each person will report their contact status to the supervisor.**

A phone tree can be expanded or contracted as needed



EMERGENCY PHONE TREE / CONTACTS

FIRE

NEVER attempt to extinguish large fires.

You should attempt to fight a fire ONLY under the following conditions:

1. **You have been trained how to use a fire extinguisher**
2. **The fire is small and contained.**
3. **You can do so without endangering your own safety.**
4. **The Fire Department has been called.**

Fire Extinguisher Procedures:

- ✓ ***Pull*** *the pin.*
- ✓ ***Aim*** *at the base of the fire.*
- ✓ ***Squeeze*** *the handle.*
- ✓ ***Sweep*** *side to side.*

In Case of Fire:

- ✓ **Alert all people in the immediate area, pull the fire alarm and call *911***
- ✓ **Contain - Close all doors to help contain the fire and smoke**
- ✓ **Extinguish or Evacuate**

FIRE

SUSPICIOUS OBJECTS / MAIL

Suspicious object:

Any object of unknown origin including a (an): envelope; package; backpack; briefcase; radio; shopping bag; etc.

Suspicious mail:

An envelope or package that may contain any or all of the following characteristics:

- ***No postal stamp***
- ***No return address***
- ***Restrictive markings such as "Personal!" or "Private!"***
- ***Oily stains or discolorations***
- ***Addressed to title only – (Operations Manager, Vice-President)***
- ***Strange odors***
- ***Excessively taped***

If you believe any object or mail to be suspicious, take the following actions:

- ✓ **Protect yourself.**
- ✓ ***Isolate yourself and others from the mail or package***
- ✓ **DO NOT touch, handle, smell, open or taste.**
- ✓ **Notify your supervisor.**
- ✓ ***Call 911***
- ✓ ***If you have come into contact with potential contaminants, wash your hands with soap and water.***

SUSPICIOUS OBJECTS / MAIL

EVACUATION

Planning for Evacuation

Before an emergency occurs:

- **Learn the locations of fire alarm pull stations and/or fire extinguishers**
- **Learn evacuation routes from different areas of the building**
- **Develop a plan and specify a location where all occupants can meet away from the building to help ensure everyone is accounted for**
- **Learn where the following areas are located:**

Areas of refuge - (a specified area designed to withstand the passage of smoke or fire for a required time)

Areas of rescue - (a specified area where mobility impaired individuals can await rescue from emergency responders)

If an evacuation is ordered:

- ✓ **Stop** what you are doing and immediately proceed to the nearest exit. Use Stairs to evacuate above and below ground levels.
- ✓ **Close** doors behind you as you leave. If there is a fire or chemical release, this will help contain it to the enclosed area.
- ✓ **Provide** assistance to customers, clients, patients or others who may need it.
- ✓ **Proceed** as quickly as possible to the designated evacuation location for your building or department. It recommended this be at least 100-150 feet away from the evacuated building.
- ✓ **Do Not** return or re-enter the building until you are given official authorization to do so.

EVACUATION

SEVERE WEATHER

Severe Weather:

- Seek shelter indoors and away from windows and glass.
- If you can hear thunder, you are close enough to be struck by lightning.
- Never shelter under a tree or near fences and poles.
- Strong winds can create hazards from flying debris.
- Never attempt to cross arroyos, rivers, creek beds or roads where water is running rapidly.

Cold temperatures:

- Cover your head, face and ears to minimize body heat loss.

Hot temperatures:

- Wear lightweight, light colored and loose fitting clothes.
- Drink plenty of non-alcoholic fluids (water) to avoid dehydration.
- The body must sweat to regulate temperature. If you stop sweating, seek immediate medical attention!

✓ **Be observant to changes occurring in the weather**

✓ **Watch and/or listen to weather reports on TV, radio, or internet**

✓ **Monitor LoboAlerts**

✓ **Recognize the emergency warning siren and take immediate shelter indoors away from windows and glass.**

✓ **Acquire necessary items (water, medications, clothes, food, cash, etc.) to sustain yourself from 48-72 hours in case you become stranded or unable to get home for an extended period of time.**

SEVERE WEATHER

SHELTER IN PLACE

Some buildings may have the necessary staff and training to lock their exterior doors.

<u>ONLY</u> trained staff should secure, lock, and monitor exterior doors as there is additional risk to themselves and potentially others around them.

- **Doors should be locked as quickly and safely as possible.**
- **An individual must be posted nearby each locked door to monitor access and assure doors remain locked.**
- **If trained staff is not available then, shelter in place and wait for emergency personnel to come to you.**
- **Individuals have a personal responsibility for their own safety and should not act to endanger themselves or others.**

There are certain circumstances where it is safer to be inside rather than outside. If the "Shelter in Place" order is given and/or the campus warning siren sounds:

- ✓ **Immediately get inside the nearest building and proceed to an interior room or hallway.**
- ✓ **Stay away from glass doors and windows.**
- ✓ **Monitor text message alerts, campus e-mail or the UNM webpage for further information and updates.**
- ✓ **Stay calm and stay put unless there is an immediate need to Leave (i.e. a visible fire or life threatening situation).**
- ✓ **Precisely follow all instructions from Law Enforcement or Emergency Personnel.**

SHELTER IN PLACE

BOMB THREAT / Procedures and Checklist

If you receive a bomb threat, gather as much information as you can.
Call 911, and follow all instructions provided by the emergency operator.

Telephone Threats:

- Note the time and check for caller ID information
- Note which line the call is coming in on
- Note the exact words of the caller, listen for any voice clues such as, male or female voice, noticeable accent or recognizable voice
- Try to gather detailed information from the caller, such as:
  - ***Where is the bomb located?***
  - ***What does the bomb look like?***
  - ***What is the bomb made of?***
  - ***Is the bomb set to explode at a certain time?***
- As soon as possible, let others nearby know what is going on
- Look for anything unusual and report it to responding personnel

Written or typed threats:

- Do not touch or handle a note more than absolutely necessary
- If you are evacuated, protect the note inside a book or between other sheets of paper, take it with you and turn it over to the police.

Bomb Threat Call Check List

DATE OF CALL _____ TIME CALL RECEIVED _____ TIME CALL ENDED _____ LINE USED _____ CALLER ID _____

EXACT WORDS OF CALLER:

_____
_____
_____
_____
_____

GATHER AS MUCH INFORMATION AS POSSIBLE:

Where is the bomb located? _____

What does the bomb look like? _____

What is the bomb made of? _____

Is the bomb set to explode at a certain time? _____

Circle or all that apply

Voice	Speech	Sex / Age	Manner	Background Noise	Familiarity with Facility	Accent	Language
Loud	Fast	**Male**	Calm	Music	Much	Local	Well Spoken
High Pitched	Slow	Adult	Rational	Factory	Some	Foreign	Irrational
Raspy	Stutter	Juvenile	Deliberate	Office machines	None	Region	Foul
Intoxicated	Slurred	Approximate Age___	Angry	Street Traffic		Race	Taped
Soft	Nasal		Irrational	Trains/Airplanes			Message Read
Deep	Disguised	**Female**	Emotional	Animals			Other:
Hoarse	Other:	Adult	Laughing	Quiet			
Other:		Juvenile	Incoherent	Other:			
		Approximate Age___					

Reported By: Name: _____ Position: _____

Telephone Number: _____ Date Report Completed: _____

BOMB THREAT / Procedures and Checklist

RESOURCES

UNM Police / Emergency Services
Emergency 911
Non-Emergency 505-277-2241
http://police.unm.edu

UNM Office of Emergency Management (OEM)
505-277-0330
http://emanage.unm.edu

UNM Safety and Risk Services (SRS)
505-277-2753
http://risk.unm.edu

Accessibility Resource Center
505-277-3506
http://as2.unm.edu

Dispute Resolution
505-277-2993
http://www.unm.edu/~askdrc

Student Affairs
505-277-0952
http://www.unm.edu/~ovpsa

UNM Office of Equal Opportunity (OEO)
505-277-5251
http://www.unm.edu/~oeounm

NM Poison & Drug Information Center
1-800-222-1222
http://www.hsc.unm.edu/pharmacy/poison

Agora Crisis Center
Helpline 505-277-3013
http://www.unm.edu/~agora

Addiction and Substance Abuse Program (ASAP)
505-925-2400
http://hospitals.unm.edu/bh/asap

ATTACHMENT 9: UTILITIES SOP M01 PLANNED INTERRUPTION OF UTILITY SERVICE

I. PURPOSE

The purpose of this procedure is to define the tasks and responsibilities associated with any planned outage of a Utility service. This procedure is only for outages that will affect buildings.

II. GENERAL

The interruption of any UNM Utility service has the potential to negatively impact students, faculty, and staff. Thus, outages of utility services must be properly planned and communicated to minimize or negate the impact.

Various entities shall be involved with scheduling, preparing, or planning an outage, but only UNM Utilities personnel are authorized to operate, start, stop, or otherwise alter UNM Utilities' equipment or services. PPD-Engineering, PPD-Facilities Maintenance, Planning, Design and Construction (PDC) and Contractors may perform work during the outage, but only UNM Utilities personnel shall initiate or conclude isolation of utilities. Lastly, no outage shall be performed without adhering to the tasks in this procedure. Exceptions to these requirements may be made if there is an emergency situation such as a personnel injury, fire, flooding, etc.

III. PROCESS

1.0 Outage Request

1.1. A party conducting work on campus identifies the need for an outage of utility services. If the outage is for PPD- Facilities Maintenance personnel to conduct work in an individual building, then they can use the process in section 7, below.

1.2. The party submits an outage request in writing to the Utilities Coordinator. Outage requests may be submitted via e-mail. The outage request must be submitted at least 11 calendar days prior to the proposed start date and must contain the following information:

1.2.1 Start Date and Time

1.2.2 Duration or End Date and Time

1.2.3 Name of Requester

1.2.4 Point of contact for party conducting the work

1.2.5 Scope of work to be performed,

1.2.6 Effected Utility Services purpose of the outage, and the objective of the outage

2.0 Review and Approval by Utilities

2.1. Upon receipt of the Outage Request, the Utilities Coordinator and appropriate Utilities Maintenance Supervisor shall identify the isolation points necessary to allow for the scope of work. The Utilities Coordinator shall then determine the buildings that will be affected. The isolation points and the effected buildings are added to the Outage Request,

2.2. The appropriate Utilities Supervisor reviews the Outage Request with the Utilities Operations Manager, Utilities Maintenance Manager, and the Utilities Coordinator to insure completeness and adequate resources are available to support the outage. If during the review it becomes

apparent that no buildings or facilities will be affected, it is not an outage and this procedure does not apply. However, the Areas where the work will take place should be notified.

2.3. The Utilities Operations and Maintenance Manager approves the Outage Request.

3.0 M&P Notification and Confirmation

3.1. The approved Outage Request is submitted by the Utilities Coordinator to the Facilities Maintenance Manager and the PPD-Area Managers with the information in the following table at least 10 calendar days prior to the requested start date. Outage Requests with less than 10 calendar days advanced notice must be approved by the Associate Director of Utilities and the Facilities Maintenance Manager.

3.1.1 Start Date and Time

3.1.2 Duration or End Date and Time

3.1.3 Name of Requester

3.1.4 Point of contact for party conducting the work

3.1.5 Scope of work to be performed,

3.1.6 Affected Utility Services

3.1.7 Isolation Points

3.1.8 Affected Buildings

3.1.9 Purpose and objective of the outage

3.2. The affected PPD-Area Manager(s) sends a written response (email acceptable) to the Utilities Coordinator acknowledging receipt of the request and providing any comments or concerns. The response must occur as rapidly as possible to allow for final preparations and must include the "Contact Persons" for the affected areas if the contact person is someone other than the Area Manager.

3.3. If the PPD-Area Manager(s) identifies serious consequences that will occur as a result of the outage, then he/she will contact the Utilities Coordinator to assist in determining an alternative plan to avoid the consequences.

3.4. The Utilities Coordinator notifies Safety and Risk Services (SRS) to determine whether fire protection is compromised.

4.0 Communication/Preparation/Planning

4.1. After the outage has been confirmed, the Utilities Coordinator communicates the confirmation in writing (email acceptable) to the following people:

Requester, Utilities Electrical Supervisor, Director of the PPD, Utilities Maintenance Supervisor, Associate Director of Engineering, Associate Director of Utilities, Utilities Operations Supervisor, Water Systems Supervisor, Utilities Engineer, Utilities Coordinator, Utilities Administrative Assistant, Utilities Operations and Maintenance Manager, UNM Police Department, Facilities Maintenance Manager, PCD, PPD-Area Managers (All), ITS –Alarms, SRS

4.2. A pre-outage meeting with appropriate personnel will be scheduled by the requestor of the outage. This meeting will review the scope of work and any safety preparations required (burn permits, confined space permits, LOTO, etc.) for the work.

4.3. SRS will determine the need for fire watches. They will schedule and communicate with the requestor and affected PPD-Area Manager to ensure training and coverage is provided. The requesting party is responsible for implementing and funding the fire watch.

4.4. Notification to the effected building(s) of the scheduled utility outage will be communicated to the building coordinators or contacts by the PPD-Area Managers.

5.0 Conducting the Outage

5.1. Utilities Division personnel perform the necessary isolations and arrange for the LOTO in conjunction with the affected PPD-Areas and the contractors, if any.

5.2. The work is performed, and the Utilities Coordinator is notified at the conclusion of the work.

5.3. The appropriate Utilities Supervisor, or designee, inspects the work performed for completeness and cleanliness.

5.4. The appropriate Utilities Supervisor, or designee, notifies the Utilities Operations Supervisor on duty and the Contact Person of the affected PPD-Areas that the work is complete and that the system will be returned to normal.

5.5. Utilities Division personnel remove the LOTO, any permits issued for the work (burn, confined space, etc.), and return the system to normal.

6.0 Post-Outage

6.1. Depending on the scope of the outage, a Post-Outage Review meeting may be held. This meeting is at the discretion of the Utilities Managers and will cover such topics as lessons learned, work remaining, improved methods, etc.

7.0 Request for Utility Outage from PPD Areas or Remodel

7.1. PPD-Facilities Maintenance staff may plan, coordinate, and execute complete individual building outages when building system repairs are required. If required, the Areas must request Utilities assistance to isolate utilities and the notification process through the Utilities Coordinator. The PPD-Area Manager is responsible for pre-outage customer notification. The Area requesting the outage will facilitate a pre-outage coordination meeting with appropriate staff to assure that the following issues are properly addressed:

7.1.1 Safety implications of continuing to occupy or work in the facility while some or all utilities are isolated, especially lack of fire detection/warning/suppression if water or electricity is turned off.

7.2. Before executing a building utility shutdown, the requestor will complete the "Outage Request" noted in Paragraph 1 (above). In an emergency, voice transmission of the request may be made. When the Utilities Coordinator receives an Outage Request from an Area, the communication will be regarded as an advisory of an impending outage to a single facility. The primary purpose of the communication is to inform the Utilities Division of temporary change in utility load and

if necessary, to request assistance with isolation of the facility. Requested Utility isolation requires a two (2) day notice. The PPD-Area Manager is not obligated to delay a planned building isolation for written approval of the Utilities Division, but the notice must be given and acknowledged by authorized Utilities staff who must also perform the isolation. Only Utilities personnel are authorized to operate any valve or disconnect within the tunnel or electrical distribution system belonging to Utilities.

7.3. Distribution of the outage notice follows the same procedures listed earlier in this document.

IV. REFERENCES

None

Author: L. Schuster

Responsible Parties: Utilities Operations and Maintenance Manager

Approved By: Associate Director for Utilities

Digitally signed by Lawrence J. Schuster
DN: cn=Lawrence J. Schuster, o=University of New Mexico, ou=PPD-Utilities Division, email=schuster@unm.edu, c=US
Date: 2017.11.22 13:24:02 -07'00'

Date:

ATTACHMENT 10: GUIDELINES FOR CONTRACTORS DOING MECHANICAL & ELECTRICAL WORK AT UNM

Contractor Information – Guidelines for Contractors

All work done on UNM property must conform to the following:

A. The National Electrical code and the Uniform Plumbing and Mechanical, and Building Code.
B. The State of New Mexico Electrical, Plumbing and/or Mechanical and Building Code.
C. The University of New Mexico Construction Specifications. Specifications can be found on the PPD Engineering Services website at http://iss.unm.edu/ppd/engineer.html.

All contractors working at UNM must have the following:

1. An appropriate contracting license, and qualified and licensed personnel performing the scope of work required
2. Appropriate insurance and bonding capacity for the value of the work, if over $25,000.
3. Posted wage rates if the project cost is over $60,000.
4. A printed company Safety Policy. All contractors must provide a copy of their company Safety Policy to UNM‟s Safety and Risk Services department prior to starting work. Contact the Manager of Administrative Operations at 1801 Tucker St., NE (Building 233) or at 277-6425
5. UNM tunnel and utility access requires „qualified party‟ training and authorization from the Utilities Division, prior to access. Contact Ford Utilities at 277-2464 for information.
6. Proper Personal Protective Gear (see NFPA 70-E).
7. Applicable permit(s) and UNM authorization. All work done at UNM requires a State of New Mexico, Construction Industries Division (CID) permit. (If you feel that your work qualifies for a Permit Exemption, contact PPD‟s Construction Support Services office.) An Energized Electrical Work Permit is required prior to starting work to install, remove, or work on any electrical apparatus while it is energized. Energized Electrical Work permits are available from Physical Plant area managers, the Physical Plant electrical engineer, or the Physical Plant electrical inspector. Welding permits are required for any brazing, soldering, or welding. Welding permits are available from UNM‟s Safety and Risk Services department. Ceiling entry permits are required from the respective Area Manager for work in the ceiling.
8. Clearance to excavate from the proper authority. All contractors are required to comply with the New Mexico Excavation Law. Access to UNM buried utility maps is available through PPD‟s Construction Support Services. Coordinate all One-Call services with PPD‟s Engineering office.

Note: Final invoices submitted to UNM for payment must be accompanied by a completed and signed New Mexico Construction Industries Department (CID) “Verification of Final Inspection” form, a copy of the “Final” Inspection Tag (green tag) or a UNM Electrical or Mechanical Permit Exemption form. The form submitted must be relevant to the project for which payment is requested. Final payment will not be authorized without a Certificate of Occupancy, if required.

Contractor Requirements for a Major Building Outage at UNM

All “Large” building outages that affect students, buildings, or the UNM utility system requires a 10-day advanced notice to, and authorization from, the University of New Mexico Utilities Division. All “Small” building outages such as several circuits or several rooms within a building require a 10-day advanced notice to, and authorization from, the applicable UNM Physical Plant area manager as directed by the Office of Construction Support. Any work requiring access to special areas, (or special non-standard working hours), must be authorized by and coordinated with the applicable Physical Plant area manager or Project Manager.

Outage Requirements - Contractor will hold pre-outage procedure, safety and coordination meeting to address the following items:

- Minimum 10-day advance request to Utilities and the area manager (except in emergencies).
- Company “Safety Policy” on file with UNM Safety and Risk Services.
- Complete all required training through Utilities, when applicable, such as tunnel access, etc.
- All participating employees are Licensed and Qualified, as required.
- Consideration given to building back-up power sources (generators, UPS, inverters, emergency lighting, etc.).
- Provide power as needed to cell phone and radio towers on building.
- All UNM-required permits, e.g. Energized Electrical Work, Welding, Ceiling Entry, etc. in place.
- Have scheduled UNM area technician support, when applicable.
- Building or area users have been notified, and concerns addressed.
- All required CID permits have been acquired and posted prior to beginning work.
- Contractor has complied with all State of New Mexico Excavation laws.
- Any, non-standard working hours have been pre-approved by the appropriate project manager and PPD.
- A written “outage procedure” has been supplied to all parties
- UNM Information Technologies/Fire and Security Services have been notified at 277-1140.
- Emergency contact numbers have been verified and are available.
- Work area has been secured from public access.
- UNM Police have been notified of outage times per the direction of the Project Manager.
- All areas losing power have been completely identified.
- Adjoining roadway and parking area access has been coordinated with UNM Parking and Transportation (PATS) at 277-1938.
- Outage will not conflict with pre-scheduled events anywhere on campus.
- Staging areas must be coordinated with the PPD Grounds manager. Contact 277-0615 for information.
- UNM’s Safety and Risk Services (SRS) must be notified of all building outages to determine appropriate fire watch procedures. Contact SRS at 277-4076 for information.

3.1. CID Permit and Plan Review Requirements

Contractors:

Any entity, company, or individual performing ***Electrical or Mechanical*** work on UNM property, regardless of scope, is ***required*** to obtain a "State" Permit prior to beginning work, and to include a CID-issued **Final Inspection Tag** or **Verification of Final Inspection** form (for their portion of the work) with their invoice for the work. In addition, based on the project scope, CID will determine, and may require, a trade specific set of Engineered Drawings, and/or CID approved Plan Reviews. Please note the following requirements:

Plan Reviews: Architect approved & stamped plans are required for any building or remodeled area that will contain, or can potentially contain, 10 or more people. The seals of both the engineer and architect are required on projects over $400,000 in valuation and/or occupant loads of fifty (50) or more.

Engineered Drawings: Engineering, stamped drawings are required for any project that meets ***any*** of the following criteria:

1) Has a single-phase power requirement of 100 KVA or larger.
2) Has a three-phase power requirement of 225 KVA or larger.
3) Has a "total" project value of $50,000.00 or greater.
4) New installation, repair and/or maintenance to gas/fuel piping or in performing new installation or replacement of a domestic and/or commercial water heaters.

A separate permit for installation, alterations, maintenance, or repair may apply when any one of the following criteria is met:

1) The structural integrity of the building is altered
2) Existing utility services are expanded. (E.g., new boiler, new air handler, new water service, new gas service, new sewage service, or new electrical gear or distribution of circuits.)
3) The footprint of the building is increased.
4) The existing building service lines are modified or relocated.
5) The high-voltage distribution system is repaired or altered.

If there are any questions on plan reviews and/or when stamped engineered or architectural drawings are required, please contact the CID Plan Review Section at (505) 476-4869.

Note: A contractor doing only maintenance work (e.g. fixture ballast change-outs or replacing plumbing fixtures, faucets and/or HVAC components), may apply for a UNM Electrical Permit Exemption from the Physical Plant's Electrical Inspector, or a UNM Mechanical Permit Exemption from the Physical Plant's Mechanical Inspector, prior to beginning work and to be determined by the appropriate inspector.

3.2. UNM Permitting Guidelines for UNM Personnel

UNM trades personnel perform work at the University in one of three categories; 1) Maintenance Work, 2) New Work, or 3) Emergency Work. The definition of these three categories is as follows:

A. **Maintenance Work**: Repair and maintenance, as used in the scope of Annual Permits per CID guidelines (14.5.2.19), is work that is necessary to maintain an established, approved mechanical and/or plumbing installation, which is required to keep the installation operating in its approved function and configuration. Repair and maintenance includes a like-for-like exchange of a portion or portions of an approved mechanical/plumbing installation. A CID permit is required for work on systems that are generally considered in the industry to be related to be life safety systems, or work that entails new construction, relocation, expansion or alteration of any electrical or mechanical/plumbing installation or any portion thereof. All UNM Electrical and Mechanical Trades staff conducting only repair and maintenance work is covered under the UNM Electrical or Mechanical annual permit. **Per CID, all Electrical or Mechanical and/or Plumbing Contractors conducting work on UNM properties will not conduct such work under the UNM Annual Permit**. A permit must be obtained from CID to work on existing systems that fall under permitting guidelines (UPC 103.1.2 / UMC 112.2) prior to beginning work. They may obtain their own annual permit to conduct repair and/or maintenance work on UNM properties, if approved by UNM. A service maintenance contract must be maintained and approved with UNM Purchasing and the Manager of Facilities per CID annual permitting guidelines.

(Examples: When removing an old receptacles, old electrical fixtures, old plumbing fixtures, and/or old HVAC components, the replacement fixtures, components would not necessarily have to be the same as the one it was replacing. However, the replacement fixture, components would need to be able to operate on the existing (un-modified) circuit, plumbing or HVAC. If the replacement fixture, components required changes to the existing circuit, plumbing or HVAC, this installation then becomes “New Work” or, it is maintenance work to replace a panel or safety switch with a new panel or safety switch, as long as the replacement is the same size and rating, and only the existing circuits are re-fed by the new device. If, however, the replacement device has a larger rating or capacity, or if new circuits are connected to it in addition to the existing circuits, this now becomes “New Work.”

B. **New Work**: New work is as the name implies; work on systems that are generally considered in the industry to be related to life safety systems, or work that entails new construction, relocation, expansion, or alteration of any electrical or mechanical and/or plumbing installation or any portion thereof that fall under permitting guidelines (UPC 103.1.2 / UMC 112.2). All New Work conducted by Electrical or Mechanical and/or Plumbing Contractors, or UNM Electrical or Mechanical Trades staff requires a state CID permit prior to beginning work. UNM Mechanical Trades staff shall obtain CID permits through the PPD Electrical or Mechanical Inspectors office. New Work performed by UNM Electrical or Mechanical Trades staff is still subject to the CID plan review and engineered drawing requirements.

(For example, adding new piping and/or fixtures to an area where none exist. In general, anytime new materials are introduced into an existing system, except for a Like device, becomes “new work.” For instance, adding a new panel circuit to an existing panel to run new, or existing devices, is new work. Replacing an existing safety switch with a panel, would be new work.)

C. **Emergency Work**: Where equipment replacement or repairs must be performed in an emergency situation, application for the appropriate permit must be made on the next working business day

per CID (14.5.2.20).

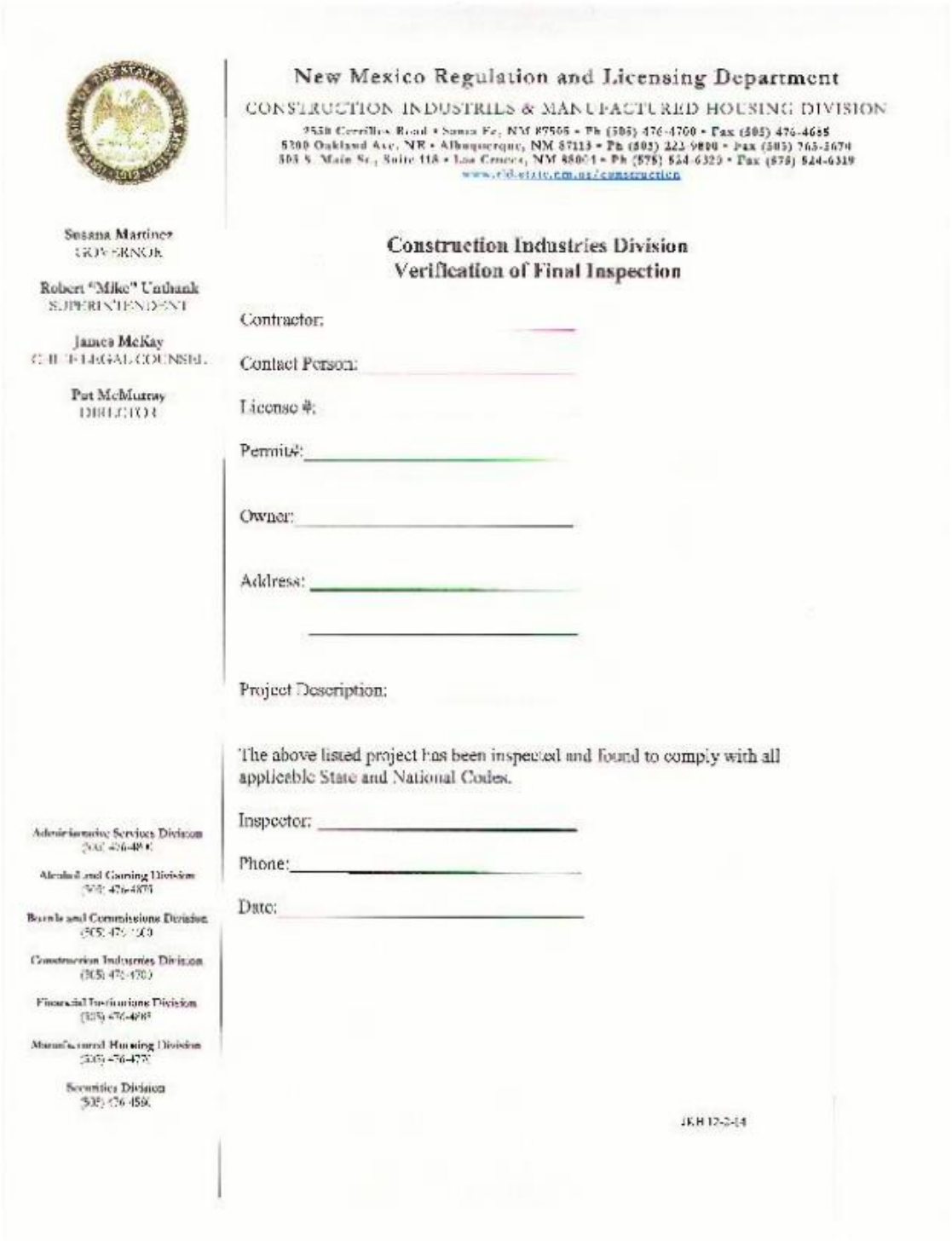
(*) The University of New Mexico is defined as "Commercial" per CID

<u>Commercial Annual Permit, Types & Scopes:</u> (Per New Mexico Administrative Code)

Electrical Repair & Maintenance: The scope of this permit is; repair or maintenance performed on existing electrical systems in commercial facilities. Repair and maintenance as used in the scope of this permit type means work that is necessary to maintain an established approved function and configuration. Repair and maintenance includes a like-for-like exchange of a portion or portions of an approved electrical installation, but does not include work on systems that are generally considered in the industry to be related to Life-Safety systems, or work that entails new construction, relocation, expansion, or alteration of an electrical installation or any portion thereof. It does not include; work on Life-Safety systems which is intended to protect the occupants of the structure such as fire protection, emergency and egress lighting systems, except the replacement of light bulbs and batteries in emergency lights and exit signs; work that entails new construction, relocation, expansion, or alteration of an electrical installation or any portion thereof; work on energized electrical systems of any kind; boilers; or work product or process that is hazardous to the public, or the occupants. Repair and maintenance includes like-for-like exchange of a portion or portions of an approved electrical installation, but does not include work on systems that are generally considered in the industry to be related to Life-Safety systems, or work that entails new construction, relocation, expansion, or alteration of an electrical installation or any portion thereof.

Mechanical/Plumbing Repair & Maintenance: The scope of this permit is: repair or maintenance performed on existing plumbing or mechanical systems to allow for the exchange of like parts or components in an existing mechanical or plumbing system in commercial facilities. It does not include: work on Life-Safety systems which are intended to protect the occupants of the structure such as fire protection and smoke evacuation systems; and, all venting; work that entails new construction, relocation, expansion, or alteration of a mechanical or plumbing installation or any portion thereof; work on gas piping systems of any kind, except repair of low-pressure gas leaks down-stream of the isolation valve to the appliance, limited to supply tubes or connections to gas valves or fuel train. Repair or replacement of gas valves, regulators, or fuel train; boilers; or work product or process that is hazardous to the maintenance technician, the public, or the occupants. Repair and maintenance as used in the scope of this permit type means work that is necessary to maintain an established, approved mechanical/plumbing installation, which work is required to keep the installation operating in its approved function and configuration. Repair and maintenance includes a like-for-like exchange of a portion or portions of an approved mechanical/plumbing installation, but does not include work on systems that are generally considered in the industry to be related to Life-Safety systems, or work that entails new construction, relocation, expansion, or alteration of a mechanical/plumbing installation or any portion thereof.

(*) Upon request, the University of New Mexico Electrical and/or Mechanical/Plumbing Inspectors will inspect CID's permitted work prior to the CID inspection.



New Mexico Regulation and Licensing Department

CONSTRUCTION INDUSTRIES & MANUFACTURED HOUSING DIVISION

2550 Cerrillos Road • Santa Fe, NM 87505 • Ph (505) 476-4700 • Fax (505) 476-4685
5200 Oakland Ave. NE • Albuquerque, NM 87113 • Ph (505) 222-9800 • Fax (505) 765-1670
505 S. Main St., Suite 118 • Las Cruces, NM 88001 • Ph (575) 524-6320 • Fax (575) 524-6319
www.rld.state.nm.us/construction

Susana Martinez
GOVERNOR

Robert "Mike" Unthank
SUPERINTENDENT

James McKay
CHIEF LEGAL COUNSEL

Pat McMurray
DIRECTOR

Construction Industries Division
Verification of Final Inspection

Contractor: _____

Contact Person: _____

License #: _____

Permit#: _____

Owner: _____

Address: _____

_____

Project Description:

The above listed project has been inspected and found to comply with all applicable State and National Codes.

Inspector: _____

Phone: _____

Date: _____

Administrative Services Division
(505) 476-4800

Alcohol and Gaming Division
(505) 476-4875

Boards and Commissions Division
(505) 476-4620

Construction Industries Division
(505) 476-4700

Financial Institutions Division
(505) 476-4985

Manufactured Housing Division
(505) 476-4775

Securities Division
(505) 476-4580

JRH 12-2-14

Electrical / Mechanical Permit Exception

The work listed below has been reviewed by the UNM Electrical and Mechanical Inspector, and has been determined to be of a maintenance nature, and does not require a State Permit. Typically, the nature of this work involves the repair or replacement of existing systems and/or equipment.

This Permit Exception is issued based on the original scope of work submitted by the Contractor to the Issuing Authority. Any changes to the original scope of work may require the Contractor to procure a valid, State of New Mexico Electrical or Mechanical Permit.

Any questions should be addressed to:
Larry H. Crum, UNM Electrical Inspector – Office: (505) 277-7829 or Cell: (505) 321-5627
Phred Pando-Dixon, UNM Mechanical Inspector – Office: (505) 277-1064 or Cell: (505) 228-4769

Date:_____

Contractor:_____

Contact Name:_____ Phone Number:_____

Location of Work:_____

_____

Scope of Work:_____

_____

_____

_____

Exemption Granted By:_____
(*name and date*)

_____
(*signature*)

Experimental Electrical Apparatuses

Any experimental electrical apparatuses or assembly of devices experimental in nature and requiring electricity to operate may be pre-assembled, purchased, donated or assembled by students or faculty, who have a basic knowledge of electrical theory and associated safety requirements. The point of demarcation of an experimental electrical apparatus is the point at which the building power is transferred to the apparatus via a receptacle, disconnect switch, circuit breaker (stand-alone or in a panel), transformer, or other similar device. All experimental electrical apparatuses should be self-contained, i.e. sits on the floor, table top, stand, rack or within an enclosure for its specific purpose. No experimental electrical apparatuses should be affixed to floors, walls, ceilings, tables, or any surface that is a permanent fixture. All experimental electrical apparatuses shall be capable of having all electrical supply power disconnected from the apparatus with no more than three motions of the hand, all within fifteen feet proximity of each other, and with unrestricted access at all times. All devices that disconnect the apparatus should be boldly and clearly labeled as “Experimental Power Disconnects”. Appropriate warning signs relevant to all significant hazards must be posted. In addition, all electrical equipment beyond the point of demarcation in rooms that are fire protected with a sprinkler system must be labeled as a “Potential Shock Hazard”. Other than industry standard plugs (cord caps), all electrical supply circuits up to and including the point of demarcation, must be approved by the appropriate PPD Maintenance Area and installed by a Licensed N.M. Journeyman Electrician. The general safety of all experimental electrical apparatuses and equipment must be verified by the UNM Electrical Inspector prior to initial start-up.

Portable Generator Permitting Requirements

Portable generators applies to all hand-carried units, units on a wheeled frame, trailer mounted units, or units within a self-contained trailer or truck, regardless of the unit‟s KVA or output rating. Portable generators that utilize cord and plug connections (extension cords that plug into a receptacle on the unit) are not required to have a CID permit for use, however proper cord management to ensure the safety of operators and end users is paramount.

Portable generators that use cam-locks, lugs, or other than cord and plug connections and/or involve any type of site distribution (sub-panels or distribution boxes) are required to have a CID permit and undergo a prestart-up inspection by the UNM Electrical Inspector. Generators that require a permit must have the generator frame connected to two ground rods at least six feet apart. The ground rod size, installation, and grounding conductor shall be as specified by the National Electrical Code. Please note that the installation of ground rods requires a pre-installation utility spotting to avoid underground utilities and may take up to five days to obtain a utility clearance.

Electrical Safety Program with Attachments - R30

Final Audit Report 2024-05-13

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By:	Thanatos VonFox (vgough@unm.edu)
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