Policy

The purpose of this policy is to prevent injury to or independent contractor personnel. Procedures detailed in this policy encompass an Energy Isolation Program and supported by a Life Saving Rule.

Procedures shall be used to ensure that the machine, equipment and/or system is isolated from all potentially hazardous energy, as well as locked-out and/or tagged-out and tested before personnel perform any servicing or maintenance activities where the unexpected energized, start-up or release of stored energy could cause personal injury.

In addition to following procedures included in this policy, all workers engaged in work involving energy sources are required to conduct a Job Hazard Analysis (JHA) as well as a Last-Minute Risk Assessment (LMRA) on each task in which they are involved.

No plant or equipment may be worked upon unless all energy sources, to include kinetic energy, potential energy, pressure, electrical energy, thermal energy or chemicals, have been effectively isolated, locked-out, tagged-out and tested in accordance with an Energy Isolation Plan, or in accordance with the live work process.

Facility managers must review plant and equipment that is frequently required to be isolated and assess the benefit of installing local isolation means if local disconnects do not already exist. Where local isolation is not available, isolation must occur at the next available lockable isolation point regardless of the impact of this on other equipment or facility operations. If no convenient isolation point can be identified, the isolation must occur at the main energy source (i.e. the motor control center).

Exhibits

Exhibit I1-1: Site Specific Survey
Exhibit I1-2: Multiple Source Procedures
Exhibit I1-3: Electrical Permit
Exhibit I1-4: Energy Isolation Checklist
Energy Isolation Life Saving Rule

References

United States: OSHA 29 CFR 1910.147 & 1910.119 MSHA 30 CFR 56/57.12000
National Fire Protection Association (NFPA) standard 70E “Electrical Safety in the Workplace, 2018 Edition”
Canada: Occupational Health and Safety Act, R.S.O. 1990, c. O.1; R.R.O. 1990, Reg. 851: INDUSTRIAL ESTABLISHMENTS and/or R.R.O. 1990, Reg. 854: MINES AND MINING PLANTS as applicable
Mexico: The Mexican Federal Labor Law

Components

Procedures

1.0 Energy Isolation Plan

1.1 Every site must prepare an Isolation Plan for each individual piece of equipment that has the potential for the uncontrolled release of energy.

1.2 Isolation Plans must be approved by the facility manager or their designee as having been tested prior to use.

1.3 The Energy Isolation Plan must identify the specific elements of each piece of equipment that will require isolation, the form(s) of energy associated with each, and specify:

1.3.1 Sources of energy;

1.3.2 Isolation locations;

1.3.3 Method of isolation;

1.3.4 Tagging methods; and

1.3.5 Method of effectively testing that the equipment cannot be re-energized. The energy isolation plans are to be documented via the Brady Lockout Writer software package or utilizing Exhibit I1-1: Site Specific Survey until the Brady system is activated.

1.4 Equipment must be labelled with a unique identifier to facilitate the correct identification of items that must be isolated and de-energized.

1.5 The Energy Isolation Plan must be updated when equipment or processes change ensuring the plan is always current.

1.6 The Energy Isolation Plan must be readily available to anyone who may need to work on equipment.

2.0 Definitions

2.1 **De-energizing** – Isolation and removal of residual energy from the equipment to be worked on (e.g., release or removal of kinetic energy, pressure, electrical energy, heat or chemicals).

2.2 **Effective Isolation** – The energy source has been isolated, locked and tagged and the isolation is proved to be effective by testing.

2.3 **Energy Isolation Plan** – A plan developed by a competent worker for each piece of plant and equipment that has the potential of uncontrolled release of energy. Energy Isolation plans are to be created using the Brady Lockout Writer software package.

2.4 **Group Lockout** – A lockout that occurs when more than one individual will be performing maintenance on a single piece of equipment simultaneously with one authorized individual that is in charge of the entire group lockout.

2.5 **Isolation** – The separation of equipment or circuits from energy sources.

2.6 **Limited Approach Distance** – An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.

2.7 **Prohibited Approach Distance** – An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased risk of shock, due to electrical arc-over combined with inadvertent movement, for personnel working in close proximity to the energized electrical conductor or circuit part.

2.8 **Restricted Approach Distance** – An approach limit at a distance from an exposed energized electrical conductor or circuit part within which work is considered the same as making contact with the electrical conductor or circuit part.

2.9 **Unique Lock** – A lock allocated to an individual, with a single unique key.

3.0 Training Requirements

3.1 **Safety Training**. The training requirements contained in this section shall apply to personnel who face a risk of injury while performing their assigned duties that require the isolation of energy sources, those who supervise personnel who face a risk of injury from arc flash, and plant management (managers and superintendents). ALL safety training shall be documented. Such personnel shall be trained to:

3.1.1 Understand the restrictions of working on energized equipment;

3.1.2 Be capable of identifying all energy sources present on each piece of equipment and the control techniques necessary to ensure a safe working environment;

3.1.3 Understand techniques to differentiate between energized and non-energized components, determine their nominal voltage (for electrical energy), and use appropriate clearance distances;

3.1.4 Be familiar with methods of shock protection including the use of approach distances, insulating and shielding materials;

3.1.5 Realize the hazards of an arc flash/blast event;

3.1.6 Be able to determine the hazard/risk category and proper PPE for arc flash protection;

3.1.7 Understand the need to care for and inspect safety equipment prior to use.

3.2 **Refresher training** in safety-related work practices and applicable change in NFPA 70E shall be performed at intervals not to exceed 3 years.

3.3 **Emergency Procedures**. Personnel working on or near exposed energized electrical conductors or circuit parts shall be trained in methods of release of victims from contact with exposed energized conductors or circuit parts. Training will also include information on how to respond to a downed high voltage transmission line caused by either mobile equipment or severe weather and proper responses for other energy sources. Refresher training with respect to emergency procedures shall occur annually.

3.4 **Competent Worker**. A competent worker, as designated by the facility manager, is a worker who has, through a combination of training, education and experience, acquired knowledge and skills that enable them to perform work in accordance with the requirements specified in this policy and procedure:

To be deemed “competent” by a facility manager, a worker must possess the following:

3.4.1 The ability to effectively identify all sources of energy associated with the equipment to be worked on;

3.4.2 The ability to identify the controls necessary for managing the risks posed by the identified forms of energy; and

3.4.3 The ability to implement controls necessary for mitigating the risks posed by the forms of energy identified.

3.5 **Qualified Worker**. A worker who carries a license, journeyman certification, an industrial electrician certificate, (or equivalent), or has completed a plant electrical apprentice program is typically considered both “competent” and “qualified”. However, all personnel must provide requisite electrical safe work practice training records for the scope-of-work being undertaken in order to be considered “qualified”. The site must maintain up-to-date documentation indicating that the qualified worker has successfully completed the required electrical qualifications and has demonstrated competency in safe electrical work practices. An individual who is undergoing on-the-job training for the purpose of obtaining the skills and

knowledge necessary to be considered a qualified worker and who, in the course of such training, has demonstrated an ability to perform specific duties safely at his or her level of training, and who is under the direct supervision of a qualified worker, shall be considered to be a qualified worker for the performance of those specific duties.

For work involving electrical energy, only individuals possessing the following skills will be deemed qualified by the facility manager to perform electrical related work:

3.5.1 To distinguish exposed live electrical parts from other parts of electrical equipment;

3.5.2 To determine the nominal voltage of exposed live electrical parts;

3.5.3 To apply the safe approach distances specified in Table I-1(A); and

3.5.4 To establish electrically safe working conditions as established by Section 5.0 entitled "Establishing an Energy Isolated Safe Work Condition".

Table I-1(A)

Nominal System Voltage Range, Phase to Phase, AC	LIMITED APPROACH BOUNDARY		RESTRICTED APPROACH BOUNDARY	PROHIBITED APPROACH BOUNDARY
	Exposed Movable Conductor	Exposed Fixed Circuit Part		
< 50 V	Not Specified	Not Specified	Not Specified	Not Specified
50 V - 300 V	10 feet 0 inches (3.0 m)	3 feet 6 inches (1.0 m)	Avoid Contact	Avoid Contact
301 V - 750 V	10 feet 0 inches (3.0 m)	3 feet 6 inches (1.0 m)	1 foot 0 inch (0.3 m)	0 feet 1 inch (25 mm)
751 V - 15 kv	10 feet 0 inches (3.0 m)	5 feet 0 inches (1.5 m)	2 feet 2 inches (0.7 m)	0 feet 7 inches (0.2 m)
For nominal system voltage exceeding 15 kv, NFPA 70E approach boundary tables should be consulted prior to work.				

Personnel considered "competent" and/or "qualified" may be personnel or independent contractors. However, each facility manager or their designee will maintain a list of personnel considered "competent" and/or "qualified".

4.0 Testing Instruments and Equipment

4.1 **Rating**. Test instruments, equipment, and their accessories shall be rated for circuits and equipment to which they will be connected.

4.2 **Visual Inspection and Testing /Certification (0-600 volts)**. Test instruments and equipment and all personnel test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects and damage before the equipment is used. If there is a defect or evidence of damage that might expose personnel to injury, the defective or damaged item shall be removed from service, and no personnel shall use it until repairs and tests necessary to render the equipment safe have been made.

Digital multi meters shall be sent out for certification and safety integrity check after an event such as but not limited to tripped internal overload protection, meter sustains a sharp impact, visible damage or does not pass pre-work inspection but in no case shall intervals exceed 5 years.

4.3 **Metering for 0-600 Volts**. Test instruments and equipment used on power circuits, including but not limited to, three phase motors, motor controls or soft starts, variable speed drives, 277 volt lighting, and power distribution panels should have a minimum rating of IEC 61010 Cat III – 600V, Cat IV – 600 V and be UL (Underwriters Laboratories) or CSA (Canadian Standards Association) or equivalent approved.

4.4 **Metering for > 600 Volts and Testing /Certification**. A non-contact voltage probe rated and certified for the voltages being tested, must be available for electrical personnel performing maintenance on equipment operating at or above 600 Volts and be UL or CSA or equivalent approved.

Non-Contact voltage probes and contact voltage meters shall be sent out for certification and safety integrity check after an event such as but not limited to tripped internal overload protection, meter sustains a sharp impact, visible damage or does not pass pre-work inspection but in no case shall intervals exceed 3 years.

5.0 Establishing an Energy Isolated Safe Work Condition

5.1 General. All sources of energy must be isolated and dissipated. All electrical circuit conductors and circuit parts shall be considered energized until all sources of energy are removed, at which time they shall be considered de-energized. Electrical circuit conductors and circuit parts shall not be considered to be in an electrically safe condition until all sources of energy (to include control voltage) are removed, the disconnecting means is under lockout/tagout/tryout, the absence of voltage is verified by an approved voltage testing device and an attempted start of the equipment, and, where exposure to energized facilities exists, are temporarily grounded. Lockout/tagout/tryout requirements shall apply to fixed, permanently installed equipment, to temporarily installed equipment, and to portable equipment.

An energy isolated safe work condition shall be achieved by the adhering to the following six (6) step process:

#1 Notify all affected personnel of intent to service equipment and the reason therefore.

#2 Determine all possible sources of energy to the specific equipment to include control sources.

#3 Shut down using the energy-isolating device so that the equipment is isolated from its energy source. Stored energy must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, valving, etc. For electrical equipment, after properly interrupting the load current, open the disconnecting device(s) for each source.

#4 Apply lockout/tagout/tryout devices in accordance with a documented and established site-specific policy.

#5 Confirm the equipment to be worked on is de-energized and all energy sources are isolated. This may be accomplished via an adequately rated voltage detector **and** by attempting to start the equipment to be worked on. Control switches, if present, **must**be set to manual prior to attempting to start the equipment, to prove it is isolated. After confirmation equipment will not start in manual from hand-off auto (HOA), turn switch to the off position and lock/tag at MCC.

CAUTION: Return operating control to "neutral" or "off" position after the test.

#6 Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being de-energized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty.

5.2 Site Specific Lockout/Tagout/Tryout Procedures: Each plant shall develop and implement lockout/tagout/tryout procedures incorporating, at a minimum, the six step process contained within the electrically safe work condition six step process contained within Section 5.

5.3 **Lockout/Tagout/Tryout Devices**. Locks and tags used for control of exposure to energy hazards shall meet the following:

5.3.1 A lockout device shall include a lock with one functional key. Duplication of lockout keys is prohibited;

5.3.2 Lockout devices shall be attached and the locking mechanism secured so that removal of the lockout device may only be accomplished by key;

5.3.3 The lockout device key shall remain in the possession of the individual installing the lock.

5.3.4 The tagout device shall be adequately affixed to the lockout device or disconnecting means;

5.3.5 The tagout device shall contain a suitable warning and be signed by the individual who is doing the work;

5.3.6 If more than one individual is doing the work, each individual doing the work shall affix their own lockout device.

5.3.7 In the event of a shift change prior to completion of work requiring establishment of an energy isolated safe work condition, all workers going off-shift shall remove their lock(s) and tag(s). All workers coming on-shift shall adhere to the requirements of Section 5.0.

5.4 **Lockout/Tagout Devices Installation**. Each worker who could be exposed directly or indirectly to a source of energy shall install a lockout/tagout device onto the equipment isolation point prior to beginning work on the affected equipment.

5.5 **Group Lockout Devices**. A single lock may be used to lockout the machine or equipment with the key being placed in a lockout box or cabinet, which allows the use of multiple locks to secure it. Each worker will then use their own lock to secure the box or cabinet. As each worker no longer needs to maintain their lockout protection, that worker will remove their lock from the box or cabinet.

5.6 **Lockout/Tagout Devices Removal**. Lockout/tagout devices shall be removed only by the individual(s) who installed the lock, unless site-specific policies and procedures have been developed that identify a safe means of removal by the facility manager or their supervisor designee.

5.7 **Electrical Circuit Interlocks**. Workers installing lockout/tagout devices shall evaluate interlocked circuits prior to device installation in order to ensure that no electrical circuit interlock operation can result in reenergizing the circuit being worked on.

5.8 **Control Devices**. Lockout/tagout devices shall be installed only on isolation point devices. Control devices, such as pushbuttons or selector switches, shall not be used as the primary isolating device.

5.9 **Stored Energy**. The site -specific lockout/tagout procedure required by Section 5 shall address the hazards of stored energy by ensuring that:

5.9.1 All capacitors are discharged;

5.9.2 High capacitance elements are short-circuited and grounded before the equipment is touched or worked on;

5.9.3 Springs are released or physical restraint applied, when necessary, to immobilize mechanical equipment and pneumatic and hydraulic pressure reservoirs; and

5.9.4 Other sources of stored energy (e.g. head tanks, natural gas lines, etc.) are blocked or otherwise relieved.

5.10 **Equipment Release for Return to Service**. The site -specific procedure shall identify steps to be taken when the job or task requiring lockout/tagout is completed. The procedure should require that:

5.10.1 Before equipment is placed back into operation, appropriate tests and visual inspections are conducted to verify that all tools, mechanical restraints and electrical jumpers, shorts, and grounds have been removed, so that the circuits and equipment are in a condition to be safely energized;

5.10.2 Where appropriate, the personnel responsible for operating the machines or process shall be notified when equipment is ready for operation, and such personnel shall provide assistance as necessary to safely engage the equipment;

5.10.3 The area is to be inspected to ensure that nonessential items have been removed. This step ensures that all personnel are clear of exposure to dangerous conditions resulting from reenergizing the service and that blocked mechanical equipment or grounded equipment is cleared and prepared for return to service.

5.11 **Commissioning locks**: (aka Engineering or supervisor locks) are not personal protective locks and should never be used for personal safety. Commissioning locks only protect equipment and process during equipment commissioning operations and may have more than one key under the control of one or more workers. The installation of a commissioning lock is no indication that a device has been de-energized or locked out for personal safety. Contact the process or project engineer listed on the commissioning lock tag for further information. ALWAYS follow proper lock, tag and try procedures for personal safety.

5.12 **Energy Control Device Removal, Other Than by Worker Placing the Isolation Device.** Only the facility manager may remove someone else's lock/isolation device and then only after the following steps have been taken and documented.

5.12.1 Verification by the facility manager that the authorized personnel who applied the device is not at the facility.

5.12.2 Make all reasonable efforts to contact the authorized personnel to inform them that their lockout/tagout device will be removed.

6.0 Working with Live Electrical Equipment

6.1 Live Work Process.

6.1.1 Only a qualified worker can perform live work on electrical equipment.

6.1.2 For live work the Exhibit I1-3 Electrical Permit must be utilized.

6.1.3 In situations where it is necessary to perform calibration, testing, inspection, maintenance or sampling on energized equipment, a documented risk assessment must be completed by a competent worker and approved by the facility manager. Prior to approval, the facility manager must be satisfied that:

6.1.3.1 There are no alternatives to performing the work live;

6.1.3.2 Supervision will occur during the period of testing;

6.1.3.3 A Last-Minute Risk Assessment is performed; and

6.1.3.4 Verification that the control measures identified in the risk assessment will be implemented prior to starting the activity.

Exemptions to Work Permit. Electrical work shall be permitted without an energized electrical work permit if a Qualified and/or Competent worker is provided with and uses appropriate safe work practices and PPE in accordance with this document 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. General housekeeping and miscellaneous non-electrical tasks if the restricted approach boundary is not crossed.

6.2 Working with Voltages Less Than 600. There is to be absolutely NO live work on voltage greater than 250 Volts unless the requirements contained within Section 6 are followed. While testing or calibrating equipment when voltage is present, the requirements of Section: *Live Work Process* apply, and workers must wear or use proper personal protective equipment (PPE) as specified in either Section: *Electrical Arc Flash Protection* depending on the nominal voltages present. In the rare circumstance that power cannot be de-energized, the decision to work on energized equipment (or unguarded energized parts) will require approval of the Facility manager (or their designee) and the Vice President/Safety & Health (or their designee). Such approval will require development of a detailed work plan which is to be strictly followed.

6.3 Working with Voltages Greater Than 600. There is to be absolutely NO live work on voltage greater than 600 by personnel. The only exception to this prohibition is power taps for new transformer installations by licensed contract personnel. (Note: The most desirable and safest power tap is one in which the transformer can be taken off-line. Consideration for this method should always be given prior to live tapping). In the rare circumstance that power cannot be de-energized, the decision to work on a live tap will require approval of the Facility manager (or their designee) and the Vice President/Safety & Health (or their designee). Such approval will require development of a detailed work plan which is to be strictly followed. No other live work is allowed for voltages above 600 volts.

7.0 Electrical Arc Flash Protection

An electrical arc flash is a short circuit through the air. When insulation or isolation between electrified conductors is breached or can no longer withstand the applied voltage, an arc flash occurs. As personnel work on or near[1] energized conductors or circuits, movement near or contact with the equipment, or a failure of the equipment, may cause a phase-to-ground and/or a phase-to-phase fault. The result is an arc flash that may result in temperatures as high as 5,000 °F.

The safest way to address situations with electrical equipment is to work only when equipment is de-energized via established energy isolation procedures. When energy isolation has occurred, no electrical energy is present, no arc flash hazard exists, and no arc flash precautions are necessary.

In addition to arc flash personal protective equipment specifications below, the use of arc-rated clothing (i.e. pants, shirts, coveralls, etc.) rated to at least 11 cal/cm^2 is required for those personnel regularly performing electrical work on or near energized conductors (e.g. troubleshooting electrical circuits, wiring MCC's, running cable, replacing starters, etc.).

[1] The phrase "on or near" implies that the worker is working directly on or in close proximity to exposed live electrical energy and should not be interpreted to apply to situations where a worker is performing non-electrical work beside, for example, an operating electrical motor with no exposed electrical energy.

7.1 **Electrical Tools**. While working on electrical equipment when voltage is present, electrical personnel and contractors will use only insulated tools compliant with ASTM F1505- 01 entitled "Standard Specification for Insulated and Insulating Hand Tools" rated at 1,000 Volts.

7.2 **Working on circuits between 50 - 150 volts**. Approved for Qualified and/or Competent worker. While electrical energy is present, work on or near equipment between 50 -150 volts will require the use of the following:

- 7.2.1 Safety glasses.
- 7.2.2 Insulated (1,000 Volt) tools.
- 7.2.3 Class E hard hat and liner.
- 7.2.4 Individual insert ear plugs.
- 7.2.5 Snug fitting, heat and flame resistant leather or leather palmed Kevlar gloves.
- 7.2.6 Arc-rated long sleeve shirt/pants or coveralls -- minimum 11 cal/cm^2 with 100% cotton-based layer (t-shirt, thermal undergarments, etc.).
- 7.2.7 Electrically rated leather work boots.

7.3 **Working on circuits between 150 - 250 volts**. Approved for Qualified and/or Competent workers. While electrical energy is present, work on or near equipment between 150 -250 volts will require the use of the following:

- 7.3.1 Arc-rated face shield.
- 7.3.2 Insulated (1,000 Volt) tools.
- 7.3.3 Rubber gloves with heavy duty leather outer gloves. Arc-rated leather work gloves when voltage testing or troubleshooting. (minimum Cut level 4 and Cut 5)
- 7.3.4 Class E hard hat and liner.
- 7.3.5 Individual insert ear plugs.
- 7.3.6 Arc-rated long sleeve shirt/pants or coveralls (minimum 11 cal/cm^2) with 100% cotton base layer (t-shirt, thermal under garments, etc.)
- 7.3.7 Safety glasses.
- 7.3.8 Electrically rated leather work boots.

7.4 **Working on circuits between 250 – 600 volts and 800 amps or less**. Approved for Qualified and/or Competent workers. While electrical energy is present, work on or near equipment between 250 – 600 volts and 800 amps or less will require the use of:

7.4.1 Arc-rated face shield and balaclava.

7.4.2 Rubber insulating gloves with heavy duty leather outer gloves for work requiring a permit as described in Section 7.2. Arc-rated leather work gloves when voltage testing or troubleshooting as described in Section 7.2 (minimum Cut level 4 and Cut 5).

7.4.3 Insulated (1,000 Volt) tools.

7.4.4 Class E hard hat and liner.

7.4.5 Individual insert ear plugs.

7.4.6 Arc-rated long sleeve shirt/pants or coveralls. (minimum 22 cal/cm^2) with 100% cotton base layer (t-shirt, thermal under garments, etc.).

7.4.7 Electrically rated leather work boots.

7.5 **Working on circuits between 250 – 600 volts and > 800 amps**. Approved for Qualified workers ONLY. While electrical energy is present, work on or near equipment between 250 – 600 volts will require the use of:

7.5.1 Arc-rated face shield and balaclava.

7.5.2 Rubber insulating gloves with heavy duty leather outer gloves, for work requiring a permit. Arc-rated leather work gloves when voltage testing or troubleshooting. (minimum Cut level 4 and Cut 5)

7.5.3 Arc-rated outer garments (e.g. flash suit jacket, pant, and hoot). Minimum 40 cal/cm^2

7.5.4 Insulated (1,000 Volt) tools.

7.5.5 Class E hard hat and liner.

7.5.6 Individual insert ear plugs.

7.5.7 Electrically rated leather work boots.

Note: All electrical rooms housing equipment rated 800 amps or greater should be equipped with insulated, personnel rescue hooks. We should also require a “watch person” with a communication device, (similar to confined space) be present when the task requires 40 cal/cm level PPM.

7.6 **Protective equipment ratings**. Protective equipment ratings. The Arc Flash protective equipment specified will have the following protective ratings:

7.6.1 At least 11 cal/cm^2 for voltages between 150 and 600 and 800 amps or less.

7.6.2 At least 40 cal/cm^2 for voltages greater than 600 and > 800 amps.

7.7 **Inspection of protective equipment and tools**. Protective equipment and protective tools shall be visually inspected for damage and defects before initial use and at intervals thereafter as service conditions require, but in no case shall the interval exceed 1 year. Insulating gloves shall be given an air test, along with the inspection before each day’s use.

7.8 **Insulating gloves**. Inspection, testing and certification of properly rated rubber insulating gloves must be maintained. Rubber insulating gloves must be tested and re-certified every six (6) months (color code differently for each six (6) month period). If certified gloves remain unused and stored in a sealed bag, their certification and use can be extended to 12 months.

7.9 **Live line tools (Hot sticks)**. Each live-line tool shall be wiped clean and visually inspected for defects before use. If any defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is present after wiping, the tool shall be removed from service, tested and re-certified, but in no case shall the interval exceed 2 years.

8.0 Line Breaking for protection caused by the unexpected release of hazardous materials

8.1 No one shall open any pipeline, or piece of process equipment, that contains or has ever contained a hazardous or hot material without complying with this procedure.

8.2 Individual in charge of repair/project:

8.2.1 The individual in charge of the repair/project shall have knowledge of the process under repair.

8.2.2 Needs to clearly identify the equipment to be worked on.

8.2.3 Obtain all necessary Safety Data Sheets SDS's for the hazardous material(s) present.

8.2.4 Review completed permit with all parties involved.

8.2.5 Insure all workers have been issued and are wearing the appropriate PPE.

8.2.6 Check the jobsite before to make sure all safe guards are in place and after to removed upon completion.

8.2.7 Shall have the area barricaded.

8.2.8 Shall notify workers in the affected area of the work that is to be performed.

8.2.9 Shall locate the nearest safety shower/eyewash station to the work area.

8.2.10 Shall be present when the line or process equipment is opened.

8.2.11 Notify lead operator periodically on the status of equipment.

8.2.12 Notify appropriate personnel upon completion of work.

8.3 Operations

8.3.1 Prepare equipment for repair.

8.3.2 Inform all affected personnel of status of the equipment prior to being taken out of service.

8.3.3 Inform all incoming operators of the repair work in progress or completed.

8.3.4 Inspect equipment upon completion of work and before being placed back into service.

8.4 Maintenance/Contractors

8.4.1 Review and understand job instructions and permits.

8.4.2 Review any additional procedures which may apply to the work being performed.

8.4.3 Review and understand all applicable SDS's.

8.4.4 Shall wear the appropriate PPE for the job as dictated by the SDS.

8.4.5 Notify affected personnel after equipment is safe for operation.

8.4.6 Notify appropriate personnel if the job has not been completed at the end of a normal shift.

8.4.7 Shall lock out and tag out all necessary equipment as listed on the permit.

8.4.8 Familiarize themselves with the nearest safety shower/eyewash station.

8.5 Prior to Opening:

8.5.1 The area shall be barricaded to prevent other plant personnel from entering the affected area.

8.5.2 Liquid material in the line shall be pumped and/or drained to a Section that can be isolated from the section to be opened. Liquid material, non-toxic, that can not be isolated must be drained to a suitable container and properly disposed of. All appropriate vents shall be opened to prevent vapor lock. All toxic material will be handled in accordance with their SDS's. The portion of the line to be opened shall be isolated from those preceding and following it in the most effective and safe manner as agreed upon by Maintenance, Operations, and worker in charge of repair/project.

8.5.3 All electrical equipment involved shall be isolated in a way that they will be in-operational through both operator and computerized control. This equipment is to be locked out in accordance with the Energy Isolation Program. Air pumps, where applicable, will be physically disconnected from the air supply and tagged in-operational.

8.5.4 When dealing with flammable solvents follow the Hot Work Program.

8.5.5 Communication between maintenance and operations shall be such that each department knows that the equipment and/or the line is being opened and that no other process work or maintenance is being done on the equipment and/or line at the same time without mutual agreement that such work presents no danger to personnel working on the equipment/line.

8.5.6 Vessels containing hazardous material shall be cleaned in a suitable manner or deemed safe by qualified personnel before being opened and any work is performed.

8.5.7 The minimum personnel protective equipment as outline in the PPE guidelines and/or dictated by the SDS's shall always be worn. Additional PPE may be required by the worker responsible for the repair.

8.5.8 If the contents are unknown a safe means of accessing and sampling shall be followed.

8.6 Opening the Line/Equipment

8.6.1 Breaking into a line is, in essence, breaking into a closed system and requires extreme caution to avoid exposure to any material that might be contained in the system.

8.6.2 Always position yourself to avoid direction of potential spray.

8.6.3 Use shielding wherever possible, including the use of partial flange covers.

8.6.4 If it is absolutely necessary to weld or perform hot work on a pipe line that has not been flushed, washed, and opened, a nitrogen blanket must be used.

8.6.5 When line breaking welded pipe, the line shall be isolated, purged and nitrogen blanketed.

8.6.6 If is absolutely necessary to burn flange bolts off with a cutting torch and flammable liquid is involved, the line must be broken at the nearest flange without the use of a cutting torch. If the flanged line cannot be broken without the use of a cutting torch to remove the bolts, all flange bolts must be replaced one at a time before separating the flange joint. The flange can then be separated and opened to the atmosphere. The remaining portion of the line not being worked on must be blocked. A Hot Work Permit must be issued prior to any hot work.

8.6.7 Slowly loosen the bolts farthest away from the worker so that any remaining pressure may be safely relieved.

8.6.8 If material begins to drain as the bolts are loosened, allow the material to drain completely before continuing to remove the bolts. Insure there is an adequate container to drain material into.

8.6.9 If it is a threaded connection, loosen the fitting slowly and carefully. Position a container in a way to catch any material still present in the line.

8.7 Completion of Work

8.7.1 Lines:

8.7.1.1 A final check must be made to insure that all openings are properly closed.

8.7.1.2 The line must be pressurized, whenever possible, using an appropriate method and completely checked for leaks before any material is put back into the system.

8.7.1.3 If a steam, air, or water line is worked on, it can be checked by personnel familiar with the process using the material inside the line originally.

8.7.1.4 Wherever applicable, all flange bolts shall be checked for tightness and gaskets for compatibility.

8.7.1.5 All Energy Isolation, Confined Space and Hot Work procedures shall be completed.

8.7.2 Tanks/Vessels

8.7.2.1 If dealing with a vessel/tank, the tank/vessel must be free from any debris before material can be placed back in the tank/vessel.

8.7.2.2 All bolts shall be checked for tightness before tank/vessel is placed back into service.

8.7.2.3 Tank/vessel, as well as pipe lines, shall be monitored for signs of leakage during and after material is charged back into the tank/vessel.

9.0 Purchase, design and modification of plant and equipment

The best method for achieving effective isolation must be determined prior to purchasing, designing or modifying plant and equipment. Consideration will be given to local isolation means and the frequency of work that will require isolation.