



# Electrical Safety Policy

Health and Safety FCX-HS03 | Release 07/2018 | Version 1

## POTENTIAL FATAL RISKS

Exposure to Electrical Hazards

## CRITICAL CONTROLS

- Access Control
- Barriers and Segregation
- Electrical PPE
- Energized Electrical Work Permit Execution
- Energy Isolation/LOTOTO
- Engineering Controls

## ELECTRICALLY QUALIFIED INDIVIDUAL

Only Electrically Qualified Individuals will perform de-energizing process to bring equipment to electrically safe work condition.

An Electrically Qualified Individual:

- Has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations
- Has received safety training to identify the hazards and reduce the associated risk
- Is approved to perform energy isolation and dissipation
- Is approved to perform energy measurement/testing and/or tryout
- Qualified non-electrical personnel with the proper training may operate a disconnecting means under certain conditions and approvals - Reference **Switching for Non-Electrical Personnel Technical Supplement**

## LABELING REQUIREMENTS

- Electrical gear (breakers, cabinets, switches, panels etc.) must have labels that indicate:
  - Voltage
  - Equipment being powered or fed
- Reference **Arc Flash Management Technical Supplement** for arc flash labeling requirements

## POLICY

This policy intends to protect employees and contractors from the hazards of work around electrical installations and equipment.

1. Manage and reduce arc flash levels to the lowest possible.
2. Reduce exposure to electrical shock.
3. Provide protection to personnel when electrical work is performed.
4. Maintain electrical equipment and installations as safe and serviceable

## ACTIONS TO STAY SAFE

- Electrical risk assessment is required before starting the work.
- Review SOPs for specific task before starting electrical work.
- Equipment must be de-energized except under exceptional conditions or trouble shooting.

## ELECTRICALLY SAFE WORKING 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.

### Procedures to De-energize Electrical Equipment must include:

1. Determine all possible sources of electrical supply to the specific equipment. This may include: drawings, diagrams, and identification tags.
2. Shutdown all electrical loads from each source.
3. Open disconnecting devices for each source wearing the proper personal protective equipment for the task.
4. Whenever possible, visually verify a physical disconnection
5. Lock out sources of energy following FMI Lockout / Tag-out / Try-out (LOTOTO) Policy.
6. Release any stored electrical energy.
7. Release any stored mechanical energy.
8. Use an adequately rated portable test instrument to test each phase conductor or circuit part, where work is to be performed, to verify it is de-energized. Verify the testing unit before and after testing to determine the test instrument is operating correctly using a known voltage source.

Required personal protective equipment shall be worn while testing.

Tests to perform include:

- o Each phase to each other phase
- o Each phase to ground
- o Neutral to ground, if present

NOTE: Where the possibility of induced voltage or stored energy exists, physically ground the phase conductors or circuit parts before touching them.

## TECHNICAL SUPPLEMENTS & REFERENCES

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Energized Electrical Work and Permit  
Arc Flash Management  
Personal Protective Clothing and Equipment  
Switching for Non-Electrical Personnel  
NFPA 70E

## TRAINING REQUIREMENTS & AVAILABLE COURSES

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SFT\_FCX1013C LOTOTO Initial and Refresher  
NFPA 70E  
CPR / First Aid  
Contact Release  
Electrical Safety for Mining  
600V Switching for Non-Electricians

## ADDITIONAL SAFETY REQUIREMENTS

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- Never assume that an electrical circuit is de-energized
- Only use serviceable electrical equipment, tools, appliances and extension cords.
- Maintain clearances around electrical panels (18in. (0.5m) on each side, 36in. (1m) in front).
- Always use approved insulated tools to move trailing power cable, unless proper LOTOTO procedures have been followed to de-energize the trailing power cable.
- Do not drive over unprotected power cables.
- Maintain minimum clearance from overhead power lines:

Voltage (KV)	Minimum Clearance
Up to 50 KV	10 ft (3.3m)
50-200 KV	15 ft (4.6m)
200-350 KV	20 ft (6.1m)
350-500 KV	25 ft (7.6m)
500-750 KV	35 ft (10.6m)
750-1,000 KV	45 ft (13.7m)

### Important Terms:

**Arc Flash Boundary** - When an arc flash hazard exists, an approach limit from an arc source at which incident energy equals 1.2 cal/cm<sup>2</sup> (5 J/cm<sup>2</sup>)

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

**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.

**Diagnostic Testing/ Troubleshooting** - Taking readings or measurements of electrical equipment with approved test equipment that does not require making any physical change to the equipment.

**De-energized** - Disconnected from external sources of voltage, locked, tagged, and measured for absence of voltage. There should be no source of potential difference between any metallic surfaces or ground. Personal protective grounds may be required.

**Energized Electrical Work** - When working within the restricted approach boundary or the arc flash boundary of exposed energized electrical conductors or circuit parts that are not placed in an electrically safe work condition. Requires an Energized Electrical Work Permit in some cases.

**Exposed** - Capable of being inadvertently, accidentally, unintentionally 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.

**Limited Approach Boundary** - An approach limit at a distance from an exposed energized conductor or circuit part within which a shock hazard exists.

**Low Voltage**- Any circuit greater than 50 volts but less than 1000 volts is considered to be low voltage.

**Medium Voltage** - Any circuit greater than 1000 volts but less than 34.5KV is considered to be medium voltage.

**Repair Work** - Any physical alteration of electrical equipment (such as making or tightening connections, removing or replacing components, etc.).

**Restricted Approach Boundary** – An approach limit at a distance from an exposed energized electrical conductor or a circuit part within which there is an increased likelihood of electric shock, due to movement, for personnel working in close proximity to the energized electrical conductor or circuit part.



## TECHNICAL SUPPLEMENT

ELECTRICAL SAFETY FCX-HS03 | ARC FLASH MANAGEMENT  
RELEASE 07/2018 | VERSION 1

### GENERAL INFORMATION

This technical supplement is intended to establish minimum requirements for electrical Arc Flash studies in all Freeport-McMoRan mining operations and plants in order to balance production requirements, distribution system reliability and troubleshooting, to protect equipment, and to define administrative safety controls to properly protect our people.

#### Management Process

FCX will assign an Electrical Safety Lead to oversee compliance to this policy and manage a process that includes: tracking the completion of electrical studies, application of arc flash labels, and updating of drawings.

#### Electrical Safety Lead

The Electrical Safety Lead, in coordination with site leaders, is responsible for verifying and documenting that each site is in compliance with FCX-HS03 Electrical Safety Policy. This includes verification and documentation that each site has updated arc flash results, in compliance with Arc Flash Study requirements section, and updated arc flash labels, single line drawings and an electrical equipment database, as defined in this document.

#### Arc Flash Engineer

The site will assign an Arc Flash Engineer should be a qualified Electrical Engineer, competent in performing all analysis required to complete the arc flash study and deliver arc flash labels.

The Arc Flash Engineer will keep the electrical equipment documentation/database updated, will be able to perform ad-hoc arc flash studies as needed, in the case of minor changes, and is responsible for performing or oversight of contract engineering when the site-wide arc flash study is completed in compliance with the Arc Flash Study Requirements section.

### Arc Flash Study Requirements

Three Phase electrical equipment, rated greater than 240V (RMS-LL), such as switchboards, panel boards, industrial control panels, meter socket enclosures, switchgear, and motor control centers (MCC) that are in other than dwelling units and that are likely to require examination, adjustment, servicing, or maintenance while energized shall have an arc flash analysis performed. One of two methods below shall be used to obtain the arc flash incident energy.

1. Incident Energy Analysis Method
2. Arc Flash PPE Category Method

Equipment rated equal to or less than 240V may be labeled as follows:

- 3-Phase equipment rated 240V may be labeled with an incident energy of 4.0cal/cm<sup>2</sup>.
- 3-Phase equipment rated less than 240V:
  - Fed by a transformer rated less than 125KVA, may be labeled with an incident energy of less than 1.2cal/cm<sup>2</sup>
  - Fed by a transformer rated greater than or equal to 125KVA, may be labeled with an incident energy of 4.0cal/cm<sup>2</sup>
- 1-Phase equipment rated 120V (RMS-LN):
  - Fed by a transformer rated less than 50KVA, may be labeled with an incident energy of less than 1.2cal/cm<sup>2</sup>
  - Fed by a transformer rated greater than or equal to 50KVA, may be labeled with an incident energy of 4.0cal/cm<sup>2</sup>

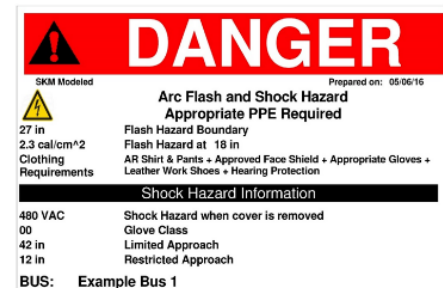
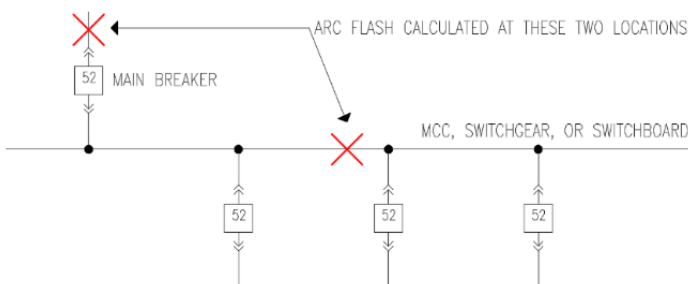
Reference – Electrical Power Research Institute (EPRI) for equipment 50V to 240V

Re-engineering review is required when arc flash levels in 480VAC MCC bus bars are greater than 40 cal/cm<sup>2</sup>. Engineering controls will be required for any 480VAC MCC bus bar as a minimum.

**Re-engineering should be based on adjustment of relay protection, implementation of maintenance switches (for instantaneous trip), replacement of protection devices, replacement of circuit breakers and the implementation of arc flash reduction devices like Fast Acting fuses, ultra-fast earthing switches or others.**

**Arc Flash Labels, Single Line Drawings, Electrical Equipment Documentation / Database:**

- Accurate arc flash calculations require a complete representation of system configuration and electrical equipment data, to include an arc flash model. Sites must maintain:
  - Electrical drawings
  - Arc flash Model
  - Electrical equipment database (if feasible or must have annual reviews of the first two bullets)
- Each department will have a person responsible to manage and maintain their electrical drawings. Electrical drawings will be updated per MOC procedures.
- Any changes to electrical drawings must:
  - Be provided to the Arc Flash engineer
  - Be signed by the appropriate electrical supervisor or superintendent
  - Be evaluated for accuracy
  - Updated in the drawing database/system
  - Generate new arc flash labels if necessary
- Additionally, electrical equipment documentation or database, arc flash calculations, arc flash labels, and single line drawings shall be reviewed at least every 5 years.
- The results of the Incident Energy Analysis must be on an arc flash label, to be applied directly to the equipment. Labels must contain the following, at a minimum: (see example below)
  1. Nominal equipment voltage
  2. Arc Flash Boundary
  3. Either available incident energy (or) minimum required arc rating of clothing
- Every switchgear, switchboard or MCC with a main breaker will have two arc flash stickers. The first one indicating the arc flash level in the bus bar and the second one indicating the arc flash in the bus bar upstream of the main breaker:





## TECHNICAL SUPPLEMENT

ELECTRICAL SAFETY FCX-HS03 | PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT  
RELEASE 07/2018 | VERSION 1

### GENERAL INFORMATION

- This defines the minimum requirements that must be followed if work requires circuits of 50 volts or more to be energized. Electrical personnel include for example: electricians, instrument technicians, relay technicians, linemen, electrical engineers, electrical superintendents, and in some cases computer/communications technicians.
- This policy does not cover operators or non-electrical personnel.
- Only electrically qualified individuals will be allowed to perform the work. No work will be performed without the proper safety equipment being worn. The following are the minimum requirements when working around electrical equipment and is intended to meet the standards of the current edition of the NFPA 70E.
- Refer to the Arc Flash Calculation Technical supplement for specific rules for incident energy analysis.

### Process for PPE selection; Energized Electrical Work

1. Prior to performing energized work, an electrical risk assessment shall be performed to determine if a hazard exists. The “Arc Flash Risk Assessment” flow chart at the end of this document may be used as an acceptable Arc Flash Risk Assessment.
2. If an electrical risk assessment determines that an arc flash hazard exists, the results from the incident energy analysis (arc flash label) shall be used to determine the following:
  - a. Arc Flash Boundary
  - b. Arc flash PPE required to perform the energized work within the Arc Flash Boundary
3. If an Incident Energy Analysis has not been performed for the equipment, (no arc flash label is present) the “Arc Flash Risk Assessment” flow chart may be used to determine the appropriate level of PPE. Inform a supervisor so that an Incident Energy Analysis can be performed.
4. Prior to performing energized work, the Arc Flash Boundary determined by the Incident Energy Analysis shall be used to provide flagging, barricading or an attendant to prevent unqualified personnel from entering the boundary.

### Assessment and Shock Protection Boundaries

- Shock risk assessment is the process that identifies exposure to the potential electrical shock hazards, estimates the potential severity of a shock injury, estimates the likelihood of occurrence of this injury and then determines if protective measures are required and determines the appropriate protective measure to use.
- 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. Refer to the NFPA 70E Table 130.4(D) (a) for A.C. and Table 130.4(D) (b) for D.C.

The chart below shows part of the NFPA 70E Table 130.4(D) (a) for AC and Table 130.4(D) (b) for DC

AC Voltage Range	Limited Approach Boundary	Restricted Approach Boundary
Less than 50V	Not specified	Not specified
50V-150V	3 ft. 6 in. (1.07 m)	Avoid Contact
151-750V	3 ft. 6 in. (1.07 m)	1 ft. (0.3 m)
750V-15KV	5 ft. (1.52 m)	2 ft. 2 in. (0.6 m)

DC Voltage Range	Limited Approach Boundary	Restricted Approach Boundary
Less than 50V	Not specified	Not specified
50V-300V	3 ft. 6 in. (1.07 m)	Avoid Contact
300V-1KV	3 ft. 6 in. (1.07 m)	1 ft. (0.3 m)

### Arc Flash PPE

- All personnel inside the flash hazard boundary must follow the same arc flash clothing requirements. If the proper safety equipment is not available, the individual performing the work must clear and guard the area of all affected personnel before any work is performed. The arc flash PPE shall be selected based on the incident energy shown on the arc flash label, or from the “Arc Flash Risk Assessment” flow chart when an arc flash label is not present. The table below shall be used to determine the required PPE once the incident energy is known.
- The Company will provide the required protective clothing for the designated employees working under the mandates of this technical supplement. Cotton underclothing is necessary to maintain maximum burn protection.
- When the incident energy exceeds 40 cal/cm<sup>2</sup>, energized work shall not be performed and the circuit must be de-energized at a location upstream of the work area where the incident energy is less than 40cal/cm<sup>2</sup>.

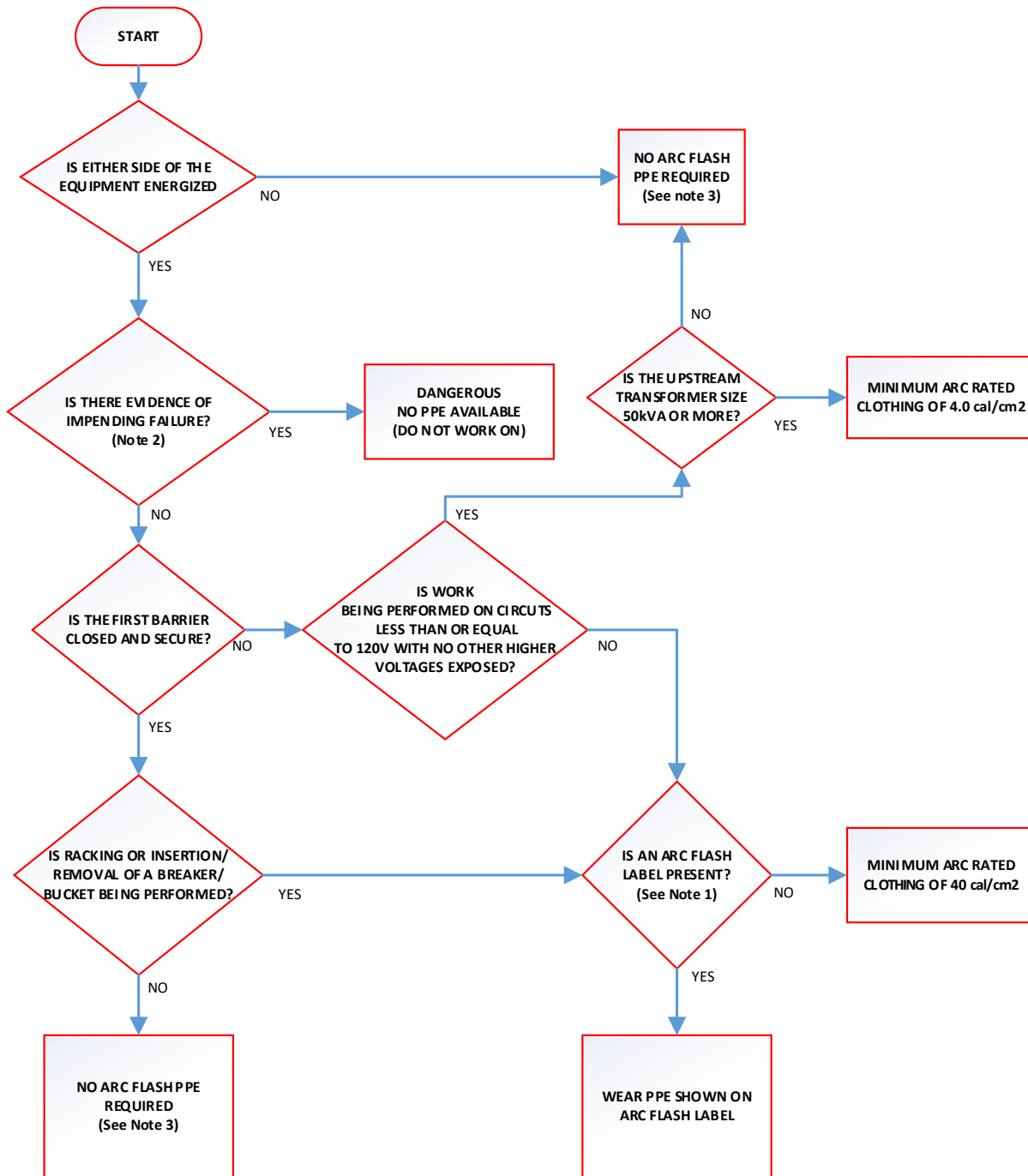
<b>Arc Flash Protective Clothing Table</b>
<b>Less than 1.2 cal/cm<sup>2</sup></b>
<ul style="list-style-type: none"> <li>• Hard hat</li> <li>• Safety glasses</li> <li>• Leather work shoes</li> <li>• Appropriate gloves</li> </ul>
<b>Greater than 1.2 cal/cm<sup>2</sup> AND Less than 8 cal/cm<sup>2</sup></b>
<ul style="list-style-type: none"> <li>• Arc-rated long-sleeve shirt and pants (or arc-rated coverall)</li> <li>• Arc-rated face shield w/ balaclava (or arc flash suit hood)</li> <li>• Arc-rated outerwear (e.g., jacket, parka, rainwear, hard hat liner)</li> <li>• Appropriate gloves</li> <li>• Safety glasses</li> <li>• Hearing protection</li> <li>• Leather work shoes</li> </ul>
<b>Greater than 8 cal/cm<sup>2</sup> AND Less than 40 cal/cm<sup>2</sup></b>
<ul style="list-style-type: none"> <li>• Arc-rated long-sleeve shirt and pants (or arc-rated coverall)</li> <li>• Arc-rated arc flash suit jacket and pants</li> <li>• Arc-rated arc flash suit hood</li> <li>• Arc-rated gloves or rubber insulating gloves with leather protectors</li> <li>• Safety glasses</li> <li>• Hearing protection</li> <li>• Leather work shoes</li> </ul>
<b>Greater than 40 cal/cm<sup>2</sup></b>
<b>waitNO APPROVED ARC FLASH PPE AVAILABLE. DO NOT WORK ON WHILE ENERGIZED</b>

<b>Incident Energy</b>	<b>Arc Flash/Shock Hazard Glove Requirements</b>	
	<b>Shock Hazard Present</b>	<b>No Shock Hazard</b>
Less than 1.2 cal/cm <sup>2</sup>	Rubber insulating gloves with leather protectors (Rubber insulating sleeves may also be required)	Heavy Leather gloves
Greater than 1.2 cal/cm <sup>2</sup> AND Less than 8 cal/cm <sup>2</sup>	Rubber insulating gloves with leather protectors (Rubber insulating sleeves may also be required)	Heavy Leather gloves OR Arc-rated gloves
Greater than 8 cal/cm <sup>2</sup> AND Less than 40 cal/cm <sup>2</sup>	Rubber insulating gloves with leather protectors (Rubber insulating sleeves may also be required)	Arc-rated gloves
Greater than 40 cal/cm <sup>2</sup>	<b>NO APPROVED ARC FLASH PPE AVAILABLE. DO NOT WORK ON ENERGIZED</b>	

All heavy leather gloves and leather protector gloves must be a minimum thickness 0.03 in. (0.08 cm)

### ARC FLASH RISK ASSESSMENT FLOW CHART

NOTE: A Shock Risk Assessment must still be performed to determine electrical shock PPE (rubber gloves, insulated tools, etc.)



- Notes:**
1. If No Arc Flash Label is present, Inform Supervisor so that an analysis can be performed.
  2. Examples may include: arcing, overheating, loose or bound equipment parts, unusual vibration, unusual smell, visible damage or deterioration.
  3. This does not preclude the requirements of site specific Arc Flash PPE, Most facilities require an 8cal/cm2 shirt and pants for all electrical personnel while working around electrical equipment.



**FREEMPORT-  
McMORAN**

# Energized Electrical Work Permit Electrical Safety FCX-HS03

JOB/WORK ORDER NUMBER	
REQUESTOR NAME/TITLE	
DATE	

**PART I: TO BE COMPLETED BY THE REQUESTER**

ITEM	COMMENTS
Description of circuit/equipment/job location	
Description of work to be done	
Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage	

**PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS DURING THE WORK**

ITEM	COMMENTS Use the back of this form or attach additional information if necessary.	Task Completed?	
		YES	NO
Detailed job description procedure to be used in performing the above detailed work			
Description of the safe work practices to be employed			
Result of the shock hazard analysis			
Determination of shock protection boundaries			
Result of the arc flash hazard analysis			
Determination of the arc flash protection boundary			
Necessary personal protective equipment to safely perform the assigned task:			
Means employed to restrict the access of unqualified persons from the work area			
Evidence of completion of a job briefing including discussion of any-job related hazard			
Do you agree the above described work can be done safely?			
Do you have a 2 <sup>nd</sup> electrically qualified person or trained attendant?			

**\*\*\* NOTE: If any of the above answers are no, return to requester. \*\*\***

**PART III: APPROVAL TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED**

Electrically Qualified Person(s)		Electrically Qualified Person(s)/Trained Attendant	
Operations Supervisor		Electrical Supervisor*	
APPROVER'S NAME			

**\*If the Electrical Supervisor is not available then contact must be made with the Sr. Electrical Supervisor or Electrical Superintendent. In the event none of the above can be contacted then contact must be made with the Department Manager and the Health and Safety Manager.**





## TECHNICAL SUPPLEMENT

ELECTRICAL SAFETY FCX-HS03 | ENERGIZED ELECTRICAL WORK

RELEASE 07/2018 | VERSION 1

### GENERAL INFORMATION

- Anytime work is performed on electrical equipment and circuits, every effort must be made to de-energize the power in order to perform the necessary tasks. However, there are times when de-energizing the circuit is not possible. In these cases, appropriate justifications are required and must follow the processes and procedures defined in this Technical Supplement.
- When working within the restricted approach boundary or the arc flash boundary of exposed energized electrical conductors or circuit parts that are not placed in an electrically safe work condition, work to be performed shall be considered energized electrical work.
- This policy applies to all qualified electrical personnel.
- Overhead line work is not covered under this policy.
- Only an electrically qualified individual may perform energized work.

#### Personnel

- When permitted energized work is performed, there must be a second person present that is able to maintain visual contact with the person performing the work.
- It is preferable that the second person be a “electrically qualified individual,” however, if this is not possible an attendant may be used.
- The attendant must be trained in methods of release of victims from contact with exposed energized electrical conductors or circuit parts.
- Attendants shall be trained to perform cardiopulmonary resuscitation (CPR) and how to properly use an automated external defibrillator (AED).

#### Apprentice / Interns

- Each apprentice or intern must prove they are capable of recognizing and avoiding the hazards associated with the work and have documented competency. Each must be directly supervised by a journeyman.
- No other personnel are considered qualified to perform energized electrical work under any circumstances.

### ENERGIZED WORK JUSTIFICATION

Prior to performing energized work, an electrical risk assessment must be completed to determine if an energized work permit must be completed.

#### Exposed

Employees need to understand electrical exposure as part of the risk assessment in any task. With electrical equipment, most enclosures provide a barrier from energized conductors. Sites need to protect employees from inadvertently, accidentally, unintentionally touching, or approaching nearer than a safe distance to electrical equipment. For example, working on smaller 480V panels where 480V disconnects or transformers may be placed in a panel with PLCs or other low voltage electronics.

#### Energized Work Permit Requirements

- Any Repair work while energized in the restricted approach boundary, including physical alteration of electrical equipment, such as tightening connections, removing or replacing components will require a permit. **See Energized Work Permit**
- An “Energized Electrical Work Permit” must be completed and signed by the qualified individual(s) doing the energized work and a member of Electrical Supervision.
- A permit is not required for diagnostic testing and troubleshooting. This work is still considered energized work and the appropriate personal protective equipment must be used.

#### Appropriate Justifications

Justification for energized work may include, but is not necessarily limited to, the following:

- Prove that the work is infeasible in a de-energized state due to equipment design or operational limitations.
- Interruption of life support equipment.
- Deactivation of emergency alarm systems, and shutdown of hazardous location ventilation equipment.
- De-energizing the circuit would create additional hazards or increased risks to those performing the work.

Loss of production is not a consideration for justifying the need for energized work. The first priority is the safety of those performing the work and those who are in the affected area.

## ENERGIZED WORK

- Each person working on energized equipment is required to know and understand each of the policies/guidelines that apply to the work being performed.
- The person performing the energized work has total control of the job without exception.

### Each person is responsible for:

- Safety of one's self and safety of fellow employees.
- Protection of all other personnel through the use of barricading, flagging, attendants, signage, etc.
- Protection of company property and the property of others.
- Notification of any unsafe condition. Work cannot proceed without first calling any unsafe condition to the attention of all personnel involved and completely mitigating all risks.

### Procedures for Energized Work

- An "Electrical Risk Assessment" to determine the need for energized work must be completed prior to starting the work.
- When required, an "Energized Electrical Work Permit" must be completed and signed by an appropriate member of electrical supervision.
- When performing energized work, insulated hand tools must be used. These tools will be rated for the appropriate voltage.
- For the proper personal protective clothing for energized work.
- All meters and test equipment must meet a minimum of Category III – 1000V as per ANSI/ISA S82.01 and IEC 61010-1 standards.

## MEDIUM VOLTAGE MCC WORK REQUIREMENTS

- **Performing repair work on Medium Voltage (1001V-34.5KV) while energized is not allowed.**
- Switching of motor starters or circuit breakers is not considered energized work as long as equipment is properly installed, maintained on a three year cycle, and has no evidence of impending failure.
- Racking (insertion or removal from the Bus) of starters or breakers when energized with doors open or closed is energized work. No energized work permit is required. Follow PPE information on the label. PPE should be worn while installing remote racking gear. Recommend "Remote Racking / Switching" be implemented and used on energized gear.
- Inserting or removing of starters / breakers from enclosure on an energized bus is energized work. No energized work permit is required. PPE must be worn per the Arc Flash label when the breaker is being removed and installed in the cubicle. PPE must also be worn per the Arc Flash label if breaker door is open when visually checking the position of the shutter.

## LOW VOLTAGE BUCKET WORK REQUIREMENTS

- Individual starter buckets may only be removed when there are no feasible alternatives due to equipment design or operational limitations and all options have been exhausted.
- Removal of a low voltage bucket from an energized MCC is considered Energized Work and an Energized Work permit is required to perform this task.
- MCCs that are designed with bus insulation protection for arc flash do not require an energized work permit. (See **Low Voltage MCC Work Requirements Table in this document**)

### Replacing major components

- Always remove the MCC bucket when major components are to be replaced, (i.e., overload blocks, starters, fuse holders, breakers, etc.) This is critical when the components are held in place with bolts protruding through the bucket back plane.

### Arc Flash Label

- The arc flash label attached to the bucket will supply employees with the required arc and shock information.
- If there is no arc flash label present then refer to Table 130.7 (C) (15) (a) of NFPA 70E or the corresponding table of the most current version of NFPA 70E. Inform your supervisor of this condition to have an arc flash analysis performed.

### Absence of Voltage Measure

- Test voltmeter on a known live circuit, perform voltage measurement on de-energized circuit, and then re-test meter on a known live circuit. In areas where a known live circuit may not be available a compact portable safety proving voltage tester is an acceptable means of testing the metering device before and after taking a measurement.

### De-energized Bucket and De-energized MCC Bus

- No limits on minor repair work which can be performed once absence of voltage testing is complete. Prior to starting work, employee shall follow de-energizing steps /LOTOTO in the electrical policy.

### LOW VOLTAGE MCC WORK REQUIREMENTS

Work Type	Energy State	PPE Requirement	Energized Work Permit
Performing minor repairs such as making or tightening connections, removing or replacing components such as fuses, heaters, terminal strips, or any other component which are not held in place by bolts protruding through the bucket back plane.	MCC bucket circuits are <b>energized</b> .	Follow the PPE information on the arc flash label	Required
	Breaker in MCC bucket is open, and line side connections to the breaker are energized and accessible.	Follow the PPE information on the arc flash label	Required
	Breaker in MCC bucket is open, and line side connections to the breaker are energized <b>and not</b> accessible	Follow the PPE information on the arc flash label until the circuit is proven to be de-energized by performing an absence of voltage test.	Not Required
Work Type	Energy State	PPE Requirement	Energized Work Permit
Performing diagnostic testing, troubleshooting and voltage measurement.	MCC bucket circuits are <b>energized</b> .	Follow the PPE information on the arc flash label	Not Required
	Breaker in MCC bucket is open, and line side connections to the breaker are energized and accessible.	Follow the PPE information on the arc flash label	Not Required
	Breaker in MCC bucket is open, and line side connections to the breaker are energized <b>and not</b> accessible.	Follow the PPE information on the arc flash label until the circuit is proven to be de-energized by performing an absence of voltage test.	Not Required
Removing bucket to perform major repairs such as replacing overload blocks, starters, fuse holders, breakers, or any other component which are held in place by bolts protruding through the bucket back plane.	MCC bus is <b>energized</b> .	Follow the PPE information on the arc flash label	Required

\*NOTE – MCCs that are designed with bus insulation protection for arc flash do not require an energized work permit.



## TECHNICAL SUPPLEMENT

ELECTRICAL SAFETY FCX-HS03 | SWITCHING FOR NON-ELECTRICAL PERSONNEL

RELEASE 07/2018 | VERSION 1

### GENERAL INFORMATION

- This technical supplement covers the requirements for allowing qualified, non-electrical personnel at Freeport-McMoRan Operations to work in a safe manner when switching/operating designated electrical equipment.
- The process of operating electrical switches or disconnects has significant hazards associated with it. The potential for electrical arc, flash and blast hazards is always present and these conditions can cause severe damage, injury or even death.

### Requirements

- Unless specifically trained and authorized employees will not operate any disconnecting means rated greater than 300V voltage level.
- Area manager approval is required for non-electrical personnel who operate disconnect switches.
- Qualified non-electrical personnel, who are trained and authorized may operate a disconnecting means which meets all of the following conditions:
  - Is a disconnect switch or safety switch.
  - Voltage level above 300V and below 1000V.
  - Continuous current rated 200 Amperes or less.
  - Not located within an MCC room, control room, or switch room.
  - Marked with a "Label."
  - The equipment has been properly installed.
  - The equipment has been properly maintained in accordance with manufacturer recommendations and documented on a three year cycle.
  - The equipment has no evidence of impending failure.
- Properly maintained means that the equipment has been maintained in accordance with the manufacturer's recommendations and applicable industry codes and standards.
- Evidence of impending failure means there is evidence such as arcing, overheating, loose or bound equipment parts, visible damage, deterioration, etc., that may indicate a likelihood of impending failure.

### Labeling

- Any disconnecting means which trained and authorized non-electrical personnel are allowed to operate shall be labeled.
- The integrity of the disconnecting means (door latching mechanisms) must be verified by an electrician prior to placing the label.
- Each area will be responsible for identifying appropriate disconnecting means and applying the labels.

### Training

- Non-electrical personnel must be tasked trained regarding the type of disconnecting means they will be required to operate.
- The 600V Switch/Reset training shall contain elements consisting of the following:
  - Recognize and avoid specific hazards associated with electrical energy.
  - Safety-related work practices and procedural requirements to provide protection from the electrical hazards associated with their respective job or task assignments.
  - Identify and understand the relationship between electrical hazards and possible injury.
  - Identify disconnecting equipment they are qualified to operate.
  - Demonstrate the ability to perform operation of the disconnecting means.
  - Recognizing signs of potential failure