

Electrical Safety Program - Qualified

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EHS Mosaic – North America Electrical Safety Qualified Program

1 PURPOSE

The North America Business Unit Electrical Safety Program Qualified (ESPQ) shall be used as the standard in establishing safe operating and maintenance practices and procedures for working with electrical equipment and systems that are low or high voltage. The intent is to prevent exposure to and protect the worker from electrical shock and arc flash hazards.

The priority is to avoid performing energized electrical work, or reduce risk related to the energized electrical work task to As Low As Reasonably Practicable (ALARP) unless de-energizing introduces additional hazards or increased risk, or the task is infeasible to be completed in a de-energized state. The potential exposure will be mitigated, or risk reduced through effective preventive and protective control measures.


Adhering to these electrical safety related work practices ensures that electric shock, arc flash and associated arc blast, or injuries associated with either direct or indirect electrical contact are minimized.

An Electrical Safety Program provides direction, policies, and practices for electrical safety. Each worker is expected to take reasonable care to protect themselves, other workers against injury.


2 SCOPE

This program applies to all Mosaic North America Qualified personnel and contractors performing work with and around electrical equipment at all Mosaic North America facilities.

This program does **NOT** apply to North America Non-Qualified employees and Non-Qualified contractors.

 **Note:** Qualified Person is defined as a Mosaic employee or contractor who has:

- Demonstrated skills and knowledge related to the construction, operation, and maintenance of electrical equipment / parts
- Received safety training to identify the hazards and reduce the risk of electrical equipment

 **Note:** A person can be considered qualified with respect to a certain equipment and associated tasks but still be considered unqualified for other equipment and tasks.

Workers shall comply at a minimum with the Mosaic Electrical Safety Program Qualified while performing work tasks on Mosaic Property.

The rules and policies outlined in the ESPQ are the minimum standards to be maintained. Conditions not specifically mentioned shall be governed by standard operating practices, standard instructions, and directives which are supplementary, but do not contravene these rules and policies or applicable Canadian Provincial or United States Federal/State safety legislation.

Definitions contained within this document are limited to this program.

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3 APPENDICES

The following appendices are associated with this Program:

Appendix	Appendix Title
A	Definitions
B	Roles and Responsibilities and Training
C	Energized Electrical Work Permit
D	Electrical Job Hazard Analysis (EJHA)
E	Electrical Hazard Risk Matrix
F	Electrical Specific PPE, Tools, and Equipment
G	Electrical Switching Plan
H	Labelling Specification and Schedule
I	Operational Readiness Checklist

4 ELECTRICAL SAFE WORK PRINCIPLES

- 4.1 Electrical work shall only be performed on de-energized electrical conductors and circuit parts (e.g. Establishing an Electrically Safe Work Condition) unless:
- De-energizing introduces additional hazards or increased risk.
 - It is impracticable due to:
 - Equipment design,
 - Operational limitations,
 - Maintenance requirements.
 - It is required for Diagnostic (testing) work including:
 - Commissioning
 - Troubleshooting
 - Maintenance
- 4.2 All electrical equipment should be considered energized until it is proven de-energized (e.g. tested for absence of voltage – “**TEST-BEFORE-TOUCH**”).
- 4.3 Workers shall be qualified, competent, and authorized for the work tasks they undertake, including the ability to identify the electrical hazards related to the work task.
- 4.4 Personnel shall receive appropriate workplace electrical safety training and technical skills training depending on their role.
- 4.5 Mosaic expects all electrical workers to follow the minimum safe work practices found in this *Electrical Safety Program Qualified* which include:
- De-energizing electrical equipment before Working On it (when practical).
 - Establishing an Electrically Safe Work Condition – see 4.6
 - Completing a Risk Assessment procedure/process for an assigned energized electrical work task.

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- Conducting an arc flash hazard and shock hazard analysis for justified energized electrical work.
- Interpreting the results of arc flash and shock hazard analysis and application of appropriate control measures.
- Applying the Arc Flash Boundary and Shock Approach Boundaries to the work task.
- Establishing an Electrical Work Zone at the Arc Flash Boundary or Limited Approach Boundary for shock (whichever is further away) – see 6.6 -6.11
- Ensuring Electrical Specific PPE, Tools and Equipment that meets applicable standards is specified, used, maintained, and worn appropriate to the hazard.
- All electrical incidents and near misses are reported.

4.6 Establishing an Electrically Safe Work Condition An electrically safe work condition is achieved when performed in accordance with the procedures of CSA Z462 or NFPA 70E, and verified by the following process:

- Determine all possible sources of electrical supply to the specific equipment. Reference all applicable up-to-date single line drawings, diagrams and identification tags as needed.
- After properly interrupting the load current, open the disconnecting device(s) for each source.
- Where it is possible, visually verify that all blades of the disconnecting devices are fully open, or that draw-out type circuit breakers are withdrawn to the fully disconnected position.
- Apply lock-out/tag-out devices in accordance with Mosaic Standard Lock Out / Tag Out Procedures.
- Use an appropriately rated voltage detector to test each phase conductor or circuit part to verify absence of voltage. Before and after each test, determine that the voltage detector is operating satisfactorily.

TEST-BEFORE-TOUCH

- On electrical systems 1000 volts or over, calibrated noncontact test instruments shall be permitted to be used to test each phase conductor.
- 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 temporary protective grounding equipment in accordance with the following:
 - **Placement:** Temporary protective grounding equipment shall be placed at such locations and arranged in such a manner as to prevent each employee from being exposed to a shock hazard (i.e., hazardous differences in electrical potential). The location, sizing, and application of temporary protective grounding equipment shall be identified as part of the employer's job planning.
 - **Capacity:** Temporary protective grounding equipment shall be rated to conduct the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault.

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- **Impedance:** Temporary protective grounding equipment and connections shall have an impedance low enough to cause immediate operation of protective devices in case of unintentional energizing of the electric conductors or circuit parts.

4.7 Temporary Power Systems At a minimum the requirements of the *CSA C22.1 – The Canadian Electrical Code (CEC)* or *NFPA 70 – National Electrical Code (NEC)* shall be met for any temporary power distribution system(s).

4.8 Where portable power generators are used, they shall be installed as per applicable codes and standards.

4.9 Prior to energizing newly installed electrical equipment, or re-energizing equipment that was made electrically safe for a maintenance work task, an operational readiness assessment should be carried out.

 **Reference:** *Appendix I Operational Readiness Checklist*

4.10 Blind Reaching Workers shall not reach blindly into equipment or into areas that might contain exposed energized conductors, circuit parts, pinch-points, or potential stored energy.

4.11 Working Alone (Energized) Workers must not work alone when performing tasks on energized electrical equipment with significant risk. These may include:

- a complex, non-routine task
- equipment that is in an abnormal condition
- equipment that is over duty
- equipment with an arc-hazard higher than 40 cal/cm²

4.12 **Emergency Response** Training on Emergency response requirements for electrical incidents shall be provided to affected workers including:

- Methods of release related to shock
- First Aid, CPR / AED

4.13 A device for safe release, including a Rescue Hook, Shepard Hook, or Electrical Insulated (hot) Stick, shall be available for use.

5 ELECTRICAL HAZARD IDENTIFICATION AND ASSESSMENT

5.1 The Work Flow Process illustrates the sequential flow recommended for execution of electrical work tasks, and identifies specific processes and documentation requirements and shall be followed for all electrical work.

5.2 Work Flow Process All electrical work shall follow a process similar to the workflow outlined in Figure 1.

5.3 At a minimum, the workflow shall be planned generally as follows:

- Work order generated for workers
- Pre-job planning and assessment is completed
- An electrical hazard analysis is completed
- Decision on whether the work must be done energized
- Appropriate documentation for work including any permits is completed

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- QEW completes a FLHA (always) and if applicable, an EJHA
- A safe electrical work zone is established
- Work is completed
- Energization checklist is completed
- All changes and documentation is returned for updating drawings, Maximo, etc.

5.4 Actions shall be taken to prevent exposure to an abnormal condition that increases the probability of an arc flash or shock event prior to starting work using a hazard assessment. Equipment shall be deemed abnormal if any of the following conditions exist:

- NOT properly installed
- NOT properly maintained
- NOT used in accordance with manufactures instructions
- Equipment doors are NOT closed and secured.
- Equipment covers are NOT in place and secured.
- Evidence of impending failure such as arcing, overheating, loose or bound equipment parts, visible damage, or deterioration.


5.5 Equipment deemed to be of high likelihood of catastrophic failure that would result in sever injury or death should be removed from service or barricading applied to control access to the area.

5.6 If the abnormal condition cannot be immediately corrected, then Identification by label or notice must be displayed to communicate the abnormal condition.

5.7 Electrical Job Hazard Analysis is required in addition to the site specific FLHA prior to working on and may be required for operation of the equipment.

5.8 5.7 An Energized Electric Work Permit may be required depending on the risk assessment and task.

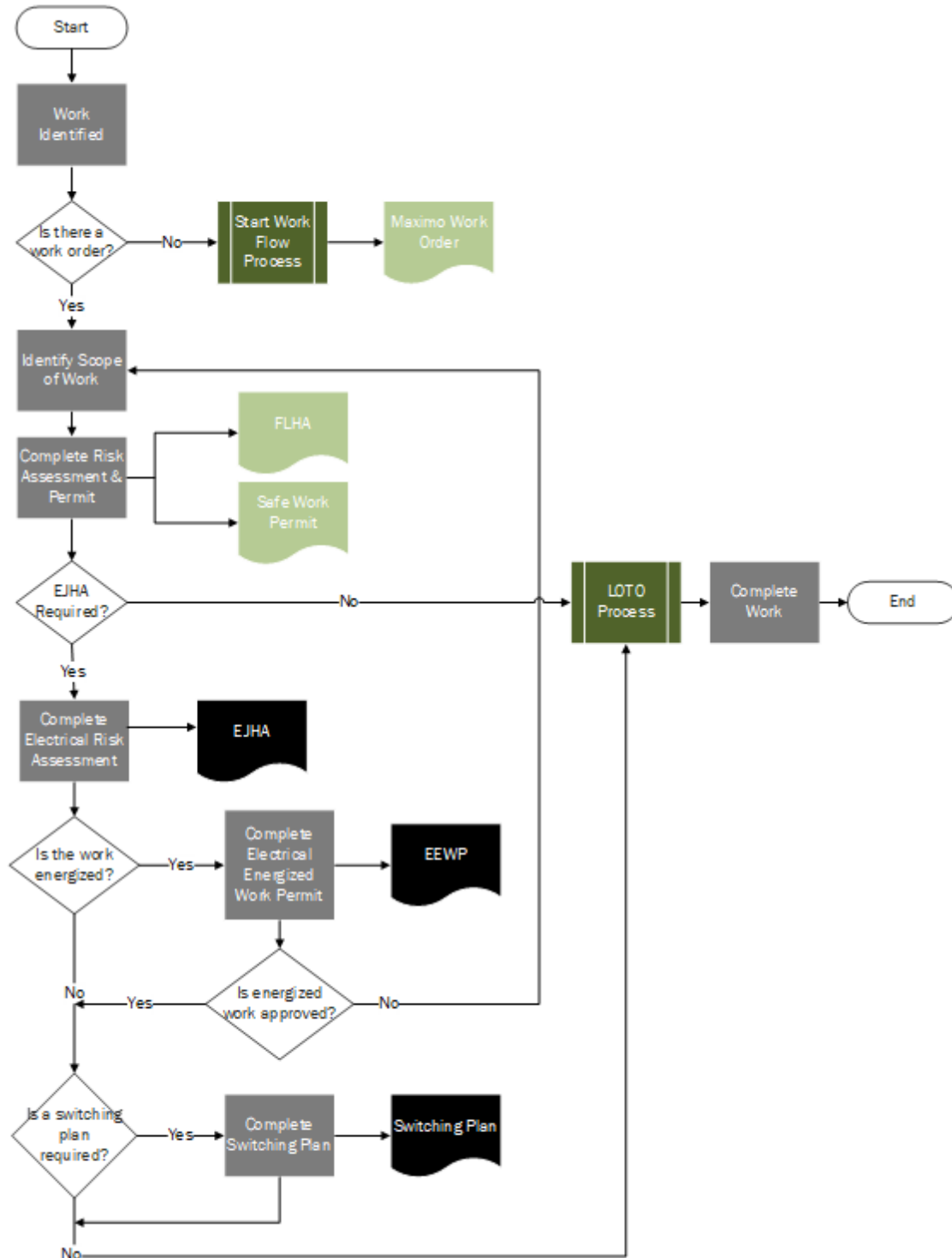
 **Reference:** *Appendix D – Electrical Job Hazard Analysis*

 **Reference:** *Appendix E – Electrical Hazard Risk Matrix*

 **Reference:** *EHSS North America Field Level Hazard Assessment Program*

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Figure 1 Electrical Work Flow Process



5.9 The Risk Assessment Procedure, Electrical Job Hazard Analysis, (EJHA) shall be followed, comprehensive review completed and include:

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- Identifying and analyzing electrical hazards (using document processes as outlined in this Electrical Safety Program Qualified);
- Identifying work tasks to be performed;
- Documenting electrical hazards associated with each work task;
- Estimating the risk for each hazard/task pair; and
- Determining appropriate preventive and protective measures to effectively control risk to As Low as Reasonably Practicable (ALARP).

5.10 An Electrical Hazard Analysis comprised of both a shock and arc flash hazard analysis is required in order to determine the level of risk to a worker when servicing electrical equipment and to establish Boundaries of Approach and for the selection of appropriate Electrical Specific PPE, Tools and Equipment to protect personnel from such hazards.

6 ELECTRICAL HAZARD CONTROL

6.1 Mitigation of Electrical Hazards Consistent with EHS&S Management Systems, the *Electrical Safety Program Qualified* recommends the following hierarchy of preventive and protective control measures:

- 1) Elimination: (See Section 4)
 - De-energize is always the first choice.
- 2) Administrative:
 - Maintain critical electrical equipment.
 - Increase awareness by the application of signs and the use of barriers.
 - Electrical Safety Training.
 - Electrical Safe Work Procedures.
- 3) PPE: (See section 9)
 - Electrical Specific PPE, Tools and Equipment, as the last line of defence, and ensure it is appropriately used and maintained.

The above list of control measures should be considered on a priority basis in the hierarchy as listed.

6.2 Shock Hazard Analysis and Shock Approach Boundary A Qualified Electrical Worker (QEW) shall assess the equipment to be worked on and determine based on qualifications and competency whether adequate insulation or guarding is present and if there is no shock hazard.

6.3 When a QEW performs justified energized electrical work and crosses the shock approach boundaries, the following rules, preventive and protective control measure must be applied to reduce risk of exposure:

- Limited Approach Boundary for Shock – Mosaic Standard Facility PPE requirements.
- Restricted Approach Boundary for Shock – Qualified and competent for the job, Electrical Specific PPE, Tools and Equipment as determined through application of Section 6.5, authorized work order and work plan, approved risk assessment, use of a

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procedure, Energized Electrical Work Permit may be required and no ingress to Restricted Approach Boundary. May require an EEWP and must fill out an EJHA.

- 6.4 The CSA Z462 or NFPA 70 Shock Approach Boundary Tables shall be used to determine the two shock approach boundaries (Limited and Restricted). The relationship of the Arc Flash Boundary is also indicated. The Arc Flash Boundary can be outside or inside the Limited Approach Boundary but in most cases will be outside the Limited Approach Boundary for shock.

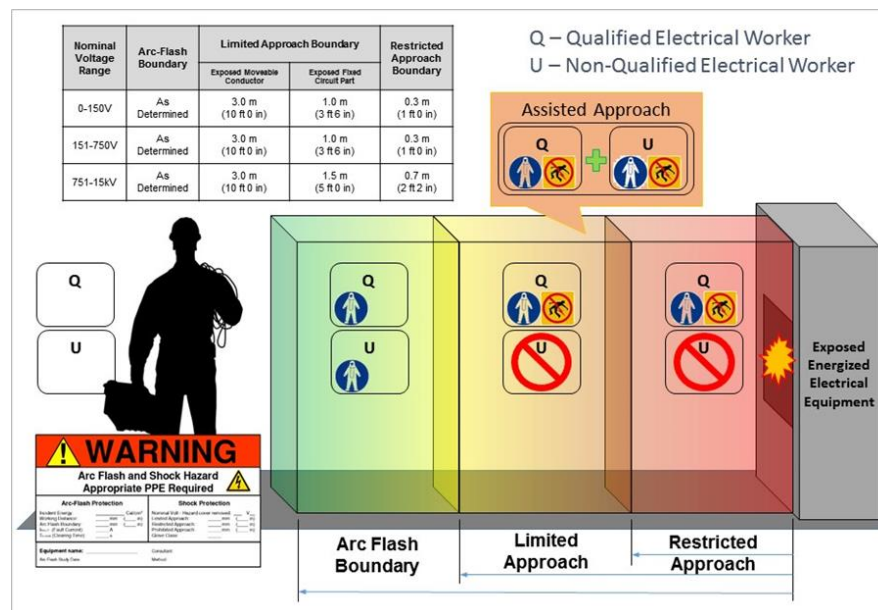


Figure 2 Approach Boundaries for Shock, Qualified Electrical Worker vs. Unqualified Personnel

- 6.5 Appropriate shock PPE, tools and equipment will be selected following the completion of shock hazard analysis establishing the Limited and Restricted Approach Boundaries.

Note: The Qualified Electrical Worker will assess the equipment that will be worked on and establish that adequate insulation and guarding is installed, and there is no requirement for shock PPE, tools and equipment.

- 6.6 When an energized electrical work task is justified and authorized, and there is a risk of an arcing fault and arc flash occurring, Boundaries of Approach and Electrical Specific PPE, Tools and Equipment must be selected appropriate to the work task and the identified hazard. Full body protection with appropriate arc rated clothing or PPE must be determined and worn while the work task is completed.
- 6.7 Where a detailed engineering-based incident energy analysis (e.g. arc flash hazard analysis (AFHA)) has been completed for a facility, detailed Arc Flash and Shock Labels shall be created and installed in appropriate locations on equipment, or the AFHA data made available in reports or on SLD's.

Reference: Appendix H Labelling Spec and Schedule

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6.8 Look Alike Equipment The risk of look alike equipment (that is of similar size, shape, construction and colour) shall be identified and mitigated to ensure that the Workers don't accidentally enter the look alike electrical equipment that would still be in an energized state.

6.9 Abnormal Equipment

- Abnormal equipment label or notification shall indicate:
 - DANGER or WARNING indication
 - Reason for abnormal condition
 - Restrictions for maintenance or operation
 - Arc Flash Hazard information if different from AFH label
 - PPE requirements if different from AFH label
 - EJHA requirements
 - EEWP requirements


 **Note:** If incident energy is $>40\text{Cal/cm}^2$ the label must indicate DANGER.

6.10 Shock Approach Boundaries Following the completion of a Shock Hazard Analysis the determined Shock Approach Boundaries related to the work task shall be applied to the work task to ensure Non-Electrical Workers and other unauthorized workers do not cross when there are exposed energized conductors and circuit parts.

6.11 An electrical work zone boundary (e.g. – a barrier with a tag applied) should be established at the Limited Approach Boundary or Arc Flash Boundary whichever is furthest away from the electrical equipment been worked on.


6.12 Electrical Work Zone An Electrical Work Zone shall be established for energized electrical work using an appropriate method of exclusion.

6.13 The Electrical Work Zone shall be established at the Limited Approach Boundary for shock or the Arc Flash Boundary, whichever is further away, by using a physical barricade and tag indicating limited access.

 **Reference:** *Potash Barricading Program*



 **Reference:** *Phosphates Walking Working Surfaces Program*

6.14 A person as an Electrical Work Zone attendant may be used if the physical barrier is not effective in communicating the hazard. If a person is used in place of a physical barricade approval shall be received from the Electrical Superintendent or equivalent.

 **Note:** A person used in this role can have no other duties.

6.15 The Electrical Work Zone can only be entered by authorized Qualified Electrical Workers. Other workers not qualified and authorized must not cross the boundary unless approved by the authorized and qualified workers.



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- 6.16 If required, non-QEW personnel must be 100% supervised by the authorized and Qualified Electrical Worker when inside the Electrical Work Zone.
- 6.17 When non-QEW personnel are inside the Electrical Work Zone they must be wearing the same PPE as the Qualified Electrical Worker.
- 6.18 Non-QEW personnel shall not cross the Restricted Approach Boundary for shock at any time.
- 6.19 **Arc Flash Boundary** The Arc Flash Boundary (AFB) is the approach limit at a distance from the prospective arcing fault source within which a person could receive the onset of a 2nd Degree Burn (Distance at which the incident energy equals 1.2 cal/cm) OR Boundary as stated on the equipment arc flash label
- Note: If no arc flash equipment label is present, then the Arc Flash Boundary shall be determined by an Arc Flash Incident Energy calculation
-  **Note:** Mosaic has adopted the Incident Energy Analysis Method for determining arc flash exposures levels. 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
- 6.20 When a worker (e.g. QEW) crosses inside the Arc Flash Boundary, appropriate Electrical Specific PPE is required to protect the worker (e.g. QEW) from the arc flash hazard.
- 6.21 Arc Flash Maintenance Mode Switches shall be used when available to minimize available incident energy when working within the Arc Flash Boundary.
- 6.22 Operation of Arc Flash Maintenance Mode Switches shall be coordinated and communicated with Operations.
- 6.23 Arc Flash Maintenance Mode Switches shall be returned to normal once work within the Arc Flash boundary has completed.
- 6.24 **Maximum Allowed Working Incident Energy Level** As identified in this *Electrical Safety Program*, no energized electrical work task will be performed when the incident energy is greater than 40 cal/cm² without appropriate approvals and planning. If a work task is required to be completed where the incident energy is greater than 40 cal/cm², the Energized Electrical Work Permit is required.
-  **Reference:** *Appendix C Energized Electrical Work Permit*

Safe work is completed by identifying Risks and planning accordingly. Work-plans cannot be based on Consequence alone – the Probability (likelihood) of a consequence occurring must be a factor in determining overall risk.

7 ELECTRICAL SWITCHING


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- 7.1 The electrical switching plan shall provide a detailed sequence of steps when operating multiple electrical devices such as disconnect switches or circuit breakers in a particular order for the purpose of isolating a source(s) or energizing a load(s).
-  **Reference:** *Appendix G HV Electrical Switching Plan*
- 7.2 The sequence should also include steps for installing/removing temporary protective grounds, inserting, or removing ground and test devices, or operating internal grounding switches as well as any non-typical event or step requirement.
- 7.3 Reference drawings must be included and shall contain:
- Isolation points marked,
 - lock sequence numbers,
 - grounding locations, and
 - outline of the isolation zone.
- 7.4 **Switching Plan Preparation:** The plan must be prepared by a competent individual who is familiar with the power system. It must then be checked by a second competent individual who is also familiar with the power system. At least one of the individuals must be a worker who is responsible for and has direct knowledge of the isolation zone required.
- 7.5 **Switching Plan Verification:** The Switching Plan must be verified by the person dedicated to directing or supervising the switching. This person is responsible for overseeing the completion of and documenting the time of each step of the switching plan in the field.
-  **Note:** The verifier can be the preparer or second competent person checking the switching plan.
- 7.6 Switching shall not start until all workers involved in switching activities have reviewed and signed the plan.
- 7.7 Following switching and appropriate LOTO, relevant work within the isolation zone shall not start until the supervisor (or designate) responsible for the work within the isolation zone has signed the plan and reviewed the plan with all the workers involved.
- 7.8 Any change in work scope that may result in a change to the isolation zone requires pausing work until it is communicated to the relevant workers.
- If there is any change in work scope it must be revalidated against the isolation zone and temporary grounding requirements.
 - Any change to the switching sequence must be revalidated by the Switching Plan Preparer and Verifier.
 - When multiple work groups or contractors are working on the same scope the requesting party is responsible for contacting the Mosaic POC and confirming isolation zone changes are appropriate and in place before executing the scope change.

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- Any associated permits / plans shall be updated and new signatures received before proceeding with work again. (i.e. Safe Work Permit and Lock Out Tag Out plan, Switching Plan, etc.)

7.9 When the work or switching is finished, the completed plan form must be forwarded to the designated person for document retention.


 **Note:** The designated person will typically be Electrical Supervisor, Electrical Superintendent, or Electrical Engineer as determined by the site management team.


7.10 An electrical switching plan shall be required before starting work on any permanently wired equipment where/when:

- Lockout requires more than one voltage source greater than 750V to be locked out to render the system safe for the planned work to commence,
- a LOTO that has a single source, with multiple temporary protective grounds installed,
- temporary generator(s) will be connected to permanent equipment,
- tie feeders will be placed into service that are not normally energized,
- temporary protective grounds will be placed at a location or by method that would allow the source(s) to be re-energized without physical removal of the temporary protective ground (example: temporary protective ground installed at the back of a 15kV breaker cubical opposite to the breaker insertion/removal location on the front),
- lockout utilizes electrical isolating devices and/or temporary protective grounds that are owned/operated/installed by a third party (example: Electrical Utility owned switch), or
- a LOTO when the re-energizing sequence differs from simple reversal of the LOTO sequence.

7.11 Examples of a non-typical event or step requiring a switching plan is when the work or testing requires the temporary alteration of equipment:

- Removal of the ground straps on 145kV or 245kV Gas Insulated Switchgear to convert access to internal connections as a test point(s),
- installing ground straps across isolation links to perform work in a normally isolated area, or
- removing switchgear bus links to sectionalize bus.

 **Note:** The Mosaic NAB standard switching plan template is included as Appendix G HV Electrical Switching Plan.

 **Note:** Modification of the template for site specific adoption can add to but must not remove content from the form.

8 ENERGIZED ELECTRICAL WORK PERMIT (EEWP)


- 8.1 Before working on energized electrical conductors or circuit parts:
- A documented electrical hazard analysis shall be completed (e.g. arc flash and shock hazard analysis).
 - Energized electrical work may require the use of an Energized Electrical Work Permit (EEWP). In most cases these work tasks are non-routine and/or high-risk work tasks.
- 8.2 Energized electrical work must be justified and appropriate Preventive and Protective Control Measures shall be required to be implemented before work is authorized to reduce risk to as low as reasonably practicable.
- 8.3 Energized Electrical Work Permit must be completed when an energized electrical work task is justified.
- 8.4 An Energized Electrical Work Permit (EEWP) shall be required and documented when:
- Work is performed within the Restricted Approach Boundary OR
 - an increased likelihood of injury from an exposure to an arc flash hazard exists.




Reference: *Appendix C Energized Electrical Work Permit*

- 8.5 Electrical work (limited to routine diagnostic tasks) shall be permitted without an Energized Electrical Work Permit (EEWP) as long as the Qualified person is utilizing safe work procedures, wearing required PPE, and is performing any of the below work:
- Routine testing, troubleshooting, or voltage measuring (up to 600 volts) using standard testing instruments to determine voltage, amperage, wattage, testing, etc.
 - Performing thermography, ultrasound, or visual inspections if the Restricted Approach Boundary is not crossed
 - Accessing to / from an area with energized electrical equipment as long as no electrical work is performed and the Restricted Approach Boundary is not crossed
 - Performing general housekeeping and miscellaneous non-electrical tasks if the Restricted Approach Boundary is not crossed
 - Opening a hinged cover on an enclosure to perform a visual or IR inspection to verify a zero-energy state
 - Connecting an I/O device to a PLC or variable frequency drive
 - Removing fuses with an approved fuse puller and/or appropriate voltage rated gloves thereby de-energizing (completing LOTO procedures) the circuit
 - General repairs of electrical equipment like lighting (illumination) and control relays
 - Other frequently performed tasks which local site management has approved

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 **Note:** An Energized Electrical Work Permit (EEWP) shall be required if a planned diagnostic task changes to a repair task

 **Note:** Removing bolted covers from energized equipment or inserting / removing circuit breakers or motor control units from energized cubicles shall never be considered routine work

9 ELECTRICAL SPECIFIC PPE, TOOLS AND EQUIPMENT

GENERAL REQUIREMENTS

9.1 General company guidelines for PPE as per the applicable Business Unit Program shall be followed for routine work.

 **Reference:** *EHSS-Phos Program Personal Protective Equipment (PPE)*

 **Reference:** *Potash Personal Protective Equipment*

9.2 Employees shall use personal protective equipment (provided by Mosaic) that is designed and constructed for the specific part of the body to be protected and for the work to be performed.

9.3 For specific PPE regarding working on or around energized electrical equipment, refer to Appendix F.

9.4 All Electrical Specific PPE, Tools and Equipment shall be of a safe design. It must be CSA, UL, ANSI, IEEE or ASTM or equivalently approved and suitably marked indicating approval ratings, and test dates if applicable.

9.5 Manufacturers' written instructions must be followed for the care, use, and maintenance of Electrical Specific PPE, Tools and Equipment. Failure to do so may result in compromising the integrity and safety performance of this specialized PPE.

9.6 Proper storage of electrical PPE, tools and equipment is essential. The manufacturer's provided individual storage bag or case should be procured to store and protect this equipment and PPE.

9.7 All available Electrical Specific PPE, Tools and Equipment shall be manufactured to appropriate applicable Canadian, United States, and/or International Standards at a minimum.


9.8 Approved specifications should be quoted for Electrical Specific PPE, Tools and Equipment when it is ordered and evidence should be provided by the supplier that the requirements of these Standards has been complied with (e.g. arc flash testing of arc rated clothing to ASTM F1959 Standard with arc ratings provided as an ATPV or EBT).

9.9 Only Mosaic procured Electrical Specific PPE, Tools and Equipment shall be used for tasks performed by Mosaic employees at Mosaic facilities. Contractors shall not use Mosaic PPE unless specifically authorized to do so.

9.10 All available Electrical Specific PPE, Tools and Equipment used for any work task must be checked and inspected prior to starting the work task


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- 9.11 An Electrical Specific PPE, Tools and Equipment inventory management system and Preventative Maintenance (PM) program shall be established in order to track what Electrical Specific PPE, Tools and Equipment has been procured at Mosaic Sites and in order to implement required preventive maintenance.
- 9.12 The worker using Electrical Specific PPE, Tools and Equipment must ensure that it functions as intended when completing the work task. The worker is responsible to identify and report deficiencies to their supervisor.
- 9.13 PPE, tools or equipment that fails a pre-use check (e.g. is damaged, has not been tested within its scheduled test cycle, etc.) must:
- not be used for the work task,
 - be taken out of service,
 - tagged as “Not For Use”,
 - the Supervisor must be informed to take appropriate action with the respective PPE, tools and equipment to have it repaired, tested or replaced, and the
 - Equipment that has been repaired or modified shall be tested prior to being returned to service.

 **Note:** Repairs must be made at certified shops.

- 9.14 Electrical Specific PPE, Tools and Equipment shall be maintained in a safe and reliable condition for use. The PPE, Tools and Equipment shall be visually inspected before use.
- 9.15 Follow the minimum requirements of the arc rated cloth manufacturer’s instructions for care and maintenance

Insulated tools shall be:

- rated for the voltages on which they are used
 - designed and constructed for the environment to which they are exposed to and purpose for which they are used
 - inspected for damage before each day’s use and immediately following any incident that can reasonably be suspected of having caused damage.
- 9.16 Insulating capability of the tool’s insulation material shall be verified by the appropriate test and visual inspection at a maximum interval not to exceed 3 years.
-  **Note:** Visual inspections will consist of examining for holes, tears, punctures or cuts; ozone checking; embedded foreign objects, textural defects such as swelling, softening, hardening or stickiness any other defect that results in the degradation of the insulating quality

- 9.17 New insulating equipment is not permitted to be placed into service unless it has been electrically tested within the previous 12 months.

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9.18 Insulating equipment that has been issued for service (i.e. is not new) must be retested per Appendix F.

 **Reference:** *Appendix F Electrical Specific PPE, Tools and Equipment*

9.19 In close-clearance, low-voltage cubicles, it may be necessary to apply the grounds without an insulating handle but would require rubber insulating gloves with leather protectors such as lineman gloves.

9.20 All ladders used must be non-conductive.

ARC RATED CLOTHING

9.21 Mosaic requires that both the minimum 8 cal/cm² and minimum 40 cal/cm² arc rated clothing is available which is consistent with both the CSA Z62 Table 6C or NFPA 70E Table 130.7(C)(15)(b).

9.22 The PPE rating will always be considered the outermost layer worn and will be indicated by an ATPV or EBT on a tag located on the garment (e.g. typically on the collar for shirt, coverall or jacket).

A summary of the arc rated clothing is provided below.

Mosaic Standard PPE (POTASH):

- To be worn as everyday wear clothing as a best practice.
- Minimum 8 cal/cm² arc rating.
- Provides both flash fire protection and arc flash protection.

Full body protection required for an arcing fault and arc flash hazard that does not exceed 8 cal/cm² ATPV or E_{BT} is:

- Minimum standard PPE arc rating of 8 cal/cm² coveralls or shirt and pant ensemble.
- Minimum arc rating of 12 cal/cm² arc rated face shield complete with Class E hard hat, or 12 cal/cm² ATPV minimum arc flash hood.
- Minimum arc rated balaclava of 12 cal/cm² to be worn with arc rated face shield. Not required if wearing an arc flash hood.
- UV rated safety glasses, clear.
- Approved dielectric footwear.
- Minimum rated hearing protection.
- Class 0 (or other Class number as required) Rubber Insulating Gloves complete with Leather Protectors. See Table 1 for specific requirements.

Additional full body protection required for an arcing fault and arc flash hazard that does not exceed 40 cal/cm² ATPV or E_{BT} is:

- Minimum arc rating of 40 cal/cm² Arc Flash Suit.

Other Electrical Specific PPE, Tools and Equipment *may* include:

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- Personal locks, tags, multiple lockout hasps or lock out box.
- Temporary Protective Grounds.
- Hot sticks (e.g. telescopic, shotgun, or fixed length).
- Insulated Rescue Hot stick(s).
- Class 1 – 4 Rubber Insulating Gloves complete with Leather Protectors and storage bags. See Table 1 for specific requirements.
- Glove dust powder or glove liners.
- Storage bag for Rubber Insulating Gloves complete and Leather Protectors
- Rubber insulating blankets.
- Digital Multi-meter with rating approved for intended use.
- High Voltage proximity detector and test source.
- A selection of insulated hand tools.
- Barricading materials.
- Other specialized tools and equipment as required (e.g. arc flash suppression blankets, arc flash shields for use with shotgun style hot sticks).

Table 1: Maximum use voltage for rubber insulating gloves

Class designation of glove or sleeve	Maximum AC used Voltage rms, V	Maximum DC use Voltage avg, V	Distances between gauntlet and cuff, min
00	250	750	13mm (0.5in)
0	1000	1500	13mm (0.5in)
1	7500	11 250	25mm (1in)
2	17 000	25 500	51mm (2in)
3	26 500	39 750	76mm (3in)
4	36 000	54 000	102mm (4in)



Note: Class 00 gloves rating for "Maximum AC used voltage RMS V" is a Mosaic requirement and is more stringent than NFPA 70E or Z462 requirements.

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PRE-USE CHECKS

Electrical Specific PPE, Tools and Equipment Pre-Use Inspection and Checks	
ES PPE, Tools & Equipment	Pre-use Checks
Arc Rated Clothing	<ul style="list-style-type: none">• Must be clean, no dirt, no contamination due to chemicals, hydrocarbon stains, NO tears, rips punctures, or frays of material. All zippers, buttons, snap and Velcro must function properly and be covered by fabric.
Rubber Insulating Gloves	<ul style="list-style-type: none">• Ensure hands are clean before inspecting and finger nails are cut short. Store in a dry, cool, location out of the direct sunlight. Do not store them inside out. Store flat in the original manufacturers storage bag with the glove openings pointing into the bag.• Keep the rubber insulating gloves and leather protectors clean.• First check for a date stamp for testing to ensure current within the last 6 months, visual checks for contamination, cracking, tears punctures and perform an air test to check for any leaks• After the glove is full of air listen for any leaks, check finger joints for cracks or wear, check for tears, punctures, cuts, ozone cutting or checking, embedded foreign objects and texture changes in the rubber such as swelling, softening, hardening, sticky or inelastic.
Leather Protectors	<ul style="list-style-type: none">• Must be clean with no oil, chemicals, mud, dirt stains, or damage.• Should not be used if ripped or torn.• Check inside of gloves to ensure no foreign material has entered which could cause damage to the rubber insulating glove. Ensure that the gap between the cuff of the leather protectors and the rubber insulating glove is adequate.• Ensure leather protector is for the right Class and Size of rubber insulating gloves.
Balaclava	<ul style="list-style-type: none">• Clean, no rips or tears.

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Electrical Specific PPE, Tools and Equipment Pre-Use Inspection and Checks	
ES PPE, Tools & Equipment	Pre-use Checks
Hot Sticks (Live-Line Tools)	<ul style="list-style-type: none"> • First, check for a date stamp for testing to ensure current within the last 24 months. • Check for any cracks, splinters, worn gloss, no mechanical damage. • Check that it is clean and dry. • Check mechanical functions and ensure working properly.
High and Low Voltage Proximity Detectors and Indicators	<ul style="list-style-type: none"> • Ensure the detector is clean, no visible damage to case, such as cracks. Where a separate adapter is provided for connection to hot stick ensure you have it and it isn't damaged. • Ensure self test visible and audible indicators are working. • Test function on a known voltage source before and after use (e.g. Test-Before-Touch).
Digital Multi-Meter	<ul style="list-style-type: none"> • Ensure meter is clean, no visible damage to case, such as cracks. • Completely inspect test leads for any damage to plugs, cable insulation and if fused leads correct fuse installed. • Test function on a known voltage source before and after use • Ensure meter is suitably rated based on Category for transient overvoltage protection.

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Electrical Specific PPE, Tools and Equipment Pre-Use Inspection and Checks	
ES PPE, Tools & Equipment	Pre-use Checks
Temporary Protective Grounds (and Ground & Test Devices)	<ul style="list-style-type: none"> • <u>First check for a date stamp for testing to ensure current within the last 36 months.</u> • Check all mechanical items for proper functionality. • Clamps, screw connectors, cable terminations to clamps, ferrules and cable covering to be checked for any damage. • Ensure that the conductor size is suitable for the available three phase bolted fault current level at the assumed clearing time. • Clean the temporary protective grounds as required. • Ensure conductors to be used for configuration are not damaged. • Check stabs on ground and test devices to ensure clean and not damaged, dielectric grease may be required. • Ensure correct configuration for ground and test devices.
Arc Rated Face Shields and Arc Flash Suit Hoods	<ul style="list-style-type: none"> • Check inside of face shield is clean and no damage to lens (e.g. cracked or excessively scratched), arc flash suit hood has no rips, tears etc. • Ensure all plastic components (e.g. used to secure the lens or extensions on the sides of the face shield) and plastic mechanical components (that allow shield to move up from the face) are not damaged and work properly. • Ensure face shield or arc flash suit hood is properly secured in hard hat. • If a cooling fan is used in the arc flash hood ensure is it working and connected properly. • Ensure correct rating of suit/hood is selected.
Insulated Hand Tools	<ul style="list-style-type: none"> • Check to ensure no damage to insulation and tools are clean. • Check for double triangle certification, and 1000V rated. If you observe yellow insulation through outer orange insulation DO NOT USE the tool.
Test Instruments and Equipment	<ul style="list-style-type: none"> • Test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects or damage before they are used. • Ensure the case for the test equipment isn't damaged (e.g. cracks).

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Electrical Specific PPE, Tools and Equipment Pre-Use Inspection and Checks	
ES PPE, Tools & Equipment	Pre-use Checks
Rubber Insulating Mats / Sleeves / Blankets	<ul style="list-style-type: none">• First check for a date stamp for testing to ensure current within the approved frequency if specified as required.• Ensure clean and inspect for any signs of damage before they are used.
Remote Cable Cutting Tool	<ul style="list-style-type: none">• Check for misalignment or binding of moving parts, breakage of parts, and any other condition that may affect the power tool's operation.• Check cutter tool sharpness.• Check function of remote control before each use.

10 TRAINING

10.1 Training in safety related work practices and applicable requirements in this Program shall be performed per Appendix B Roles and Responsibility and Training.

10.2 Training Frequency:

- Training in safety related work practices and applicable requirements in this Program shall be given initially to all new Mosaic employees as outlined in Appendix B.
- Retraining in safety related work practices and applicable requirements in this Program shall be performed at intervals not to exceed 3 years.
- In addition, an employee shall receive additional training (or retraining) if any of the following conditions exist:
 - Program requirements change;
 - Changes in the workplace render previous training obsolete;
 - Inadequacies in the employee's knowledge is of concern

 **Reference:** *Appendix B Roles and Responsibility and Training*

10.3 Training records:

- Training records shall be maintained by the Learning Management System (LMS).
- Training records shall be maintained as per ***Mosaic Document and Record Control*** policy.

 **Reference:** *Mosaic Document and Record Control policy*

11 SELF-ASSESSMENTS

11.1 Site self-assessment shall be conducted in accordance with the MMS requirements.


11.2 The following should be included as part of the self-assessment:

- A review of this document for accuracy and applicability
- An evaluation of site compliance through field observations / audits

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- A review of the Risk Register for any entries related to the Program
- A review of recent site and / or BU related incidents
- A review of compliance with training requirements as per the Training Matrix

11.3 Document results of self-assessment and corresponding corrective actions.


 **Note:** Recommend any changes to the Program EHS Project Management Office (PMO)

12 PROGRAM REVIEW

12.1 Phosphates EHS team will review this program annually and update as required.

13 RECORD RETENTION

13.1 Refer to the ***Mosaic Document and Record Control*** policy for record retention requirements.


 **Reference:** *Mosaic Document and Record Control policy*

14 REFERENCES

In all cases the most current and latest editions of Jurisdictional Acts, Codes, Regulations, and Standards that are recognized by the Authority Having Jurisdiction (AHJ) shall be referenced. Mosaic interpretations of these documents as applicable are generally defined herein.

This ESP does not exempt or pre-empt the use and adherence to existing and future EHS&S policies. All approved safety policies and standards shall be followed when performing electrical work at Mosaic. The EHS&S Director will make available all EHS&S policies and standards for worker reference.

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References (Number and title)
<ul style="list-style-type: none"> • Canada: <ul style="list-style-type: none"> ○ S-15.1 The Saskatchewan Employment Act ○ O-1.1 Reg 1 The Occupational Health and Safety Regulations ○ O-1.1 Reg 2 The Mines Regulations ○ E-6.3 Reg 9 The Use of Electricity in Mines Regulations ○ CAN/CSA-C22.1 Canadian Electrical Code (CEC) Part 1 ○ CSA M421 Use of Electricity in Mines ○ CSA Z462 Workplace Electrical Safety ○ CAN/CSA-Z460 Control of Hazardous Energy – Lockout and other Methods ○ CAN/CSA-Z1000 Occupational Health and Safety Management ○ CSA Z463 Guideline on Maintenance of Electrical Systems ○ CAN/CSA-Z195 Protective Footwear ○ CAN/CSA-Z94.3 Eye and Face Protectors ○ CAN/CSA-Z94.1 Industrial Protective Headwear ○ CAN/CSA-Z11 Portable Ladders
<ul style="list-style-type: none"> • United States <ul style="list-style-type: none"> ○ MSHA Act and Standards, and any State specific requirement ○ NFPA 70, National Electrical Code ○ NFPA 70B Recommended Practice for Maintenance of Electrical Equipment ○ NFPA 70E Standard for Electrical Safety in the Workplace ○ ANSI Z10 Occupational Health and Safety Management Systems ○ ANSI Z89.1 Requirements for Protective Headwear for Industrial Workers
<p>14.1 International Standards</p> <ul style="list-style-type: none"> • Other international Standards: <ul style="list-style-type: none"> ○ OHSAS 18001 Occupational health and safety management systems - Requirements ○ IEEE 1584 Guide for Performing Arc Flash Hazard Calculations ○ American Society for Testing and Materials (ASTM) Standards <p> Note: Refer to CSA Z462 or NFPA 70E for other specifically referenced CSA, UL, NFPA, AIHA, ANSI, ASC, ASTM, ON IHSA EUSA, Health Canada, ICRP, IEC, IEEE, ILO, ISO, NEMA, NETA, OHSAS.</p>
EHSS North America Electrical Safety All Personnel
Mosaic Document and Record Control Policy

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15 REVISION LOG

Rev. No.	Rev. Date	Revised By	Reason for Revision
0	12/14/2023	Electrical Asset Integrity Team	Initial release
1	2/15/2024	Electrical Asset Integrity Team	Addition of Table 1: Maximum use voltage for rubber insulating gloves