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I. PURPOSE / OBJECTIVE

This document identifies the Electrical Safety Program for the Wisconsin Rapids Mill (the facility). The purpose of the program is to establish minimum standards necessary to protect employees affected by the presence of electrical hazards.

This document is intended to be a supplement to the existing guidelines provided by NFPA 70E Standard for Electrical Safety in the Workplace. This Policy & Procedure document acknowledges the requirements of this standard and is written as an enhancement to provide specific guidelines regarding the unique electrical hazards found in this workplace. In instances not specifically addressed by this document the employee and employer shall conduct themselves within the guidelines of NFPA 70E and its supporting documentation.

This Policy & Procedure applies to all employees, contractors, and visitors. Personnel must be authorized by the facility management to engage in activity involving electrical hazards.

II. RESPONSIBILITIES

A. Mill Manager

Is responsible for ensuring that the facility is compliant regarding the application of safe work practices as required by local, state, and federal regulations.

B. Health & Safety Manager

Has overall program responsibility for facility-wide compliance. The Health and Safety Manager will utilize necessary engineering and maintenance electrical resources within the plant to ensure the electrical safety program meets the requirements of NFPA 70E, Standard for Electrical Safety in the Work Place.

C. E&I Maintenance Leader

Implements the electrical safety program by developing an electrical preventive maintenance program and providing qualified persons. He/She also insures that management, first line supervisors, engineers, craftsmen and their assistants complete all applicable courses of the electrical safety training. In addition, he/she ensures that the facilities are maintained in compliance with NFPA 70 (NEC) and the National Electrical Safety Code (NESC) ANSI C 2.

E&I Maintenance Leaders are responsible for implementing the electrical safety program in their departments by:

- Identifying and documenting electrical hazards.
- Familiarizing personnel with these hazards.
- Developing and implementing safe operating procedures to ensure safe electrical work practices which mitigate the risks of the electrical hazards.
- Developing and implementing an action plan for documenting and correcting electrical deficiencies.
- Conducting inspections of their workplaces and electrical equipment.
- Conducting crew safety meetings.

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- Ensuring that personnel receive electrical safety awareness training and other task specific electrical safety training as required by this program.
- Maintenance and verification of performance of the electrical system components through Electrical Preventative Maintenance including component testing and repair. Results of maintenance data will be reviewed by the Plant Electrical Engineer to ensure the component performs as expected to support the Electrical Safety Program needs.

D. Engineering Manager

Is responsible for ensuring that, when available, purchases of electrical equipment, components and appliances are listed by a Nationally Recognized Testing Laboratory (NRTL), such as FM Global or Underwriters Laboratories (UL).

E. Purchasing Manager

Is responsible for communicating facility Electrical Safety Program and Procedures to contractors.

F. Owners Representative

Will be responsible for coordinating the procedures of the contracted personnel with the procedures of our employees to assure that contractors fulfill their obligations as stated in the contractor management program and ensure that their contractors comply with the requirements of this program as applicable.

G. Line Managers (AOLs)

Are responsible for electrical safety compliance within their particular areas of responsibility. He/She will ensure that personnel receive the proper training and the necessary electrical safety PPE and equipment is available as outlined in the Electrical Safety Program.

H. Operations Superintendents (PCLs)

Are responsible for ensuring their direct reports understand how to identify electrical hazards and that proper electrical PPE and safe work procedures are always used.

Operations Superintendents are responsible for implementing the electrical safety program in their departments by:

- Identifying and documenting electrical hazards.
- Familiarizing personnel with these hazards.
- Developing and implementing safe operating procedures to ensure safe electrical work practices which mitigate the risks of the electrical hazards.
- Developing and implementing an action plan for documenting and correcting electrical deficiencies.
- Conducting inspections of their workplaces and electrical equipment.
- Conducting crew safety meetings.

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- Ensuring that personnel receive electrical safety awareness training and other task specific electrical safety training as required by this program.

I. Plant Electrical Engineers

Are responsible for technical support and maintenance of the Electrical Safety Program including the following:

- Management of the electrical distribution system with respect to load changes and performance monitoring to ensure proper operation and code compliance.
- Determination and/or clarification of issues regarding arc flash ratings and proper application of Policies, Procedures, and protective equipment.
- Maintenance and verification of performance of the electrical system components through Electrical PM's including component testing and repair. Results of maintenance data will be reviewed by the Plant Electrical Engineer to ensure the component performs as expected to support the Electrical Safety Program needs.
- Contribute to the electrical safety performance of the facility by maintaining the Electrical Safety Program, auditing the program compliance, and evaluating electrical hazards through auditing the Energized Electrical Work Permit process.

J. Other Employees

Are responsible for completing the necessary training and as a result, understand how to identify electrical hazards associated with their job. Based on the electrical hazard, employees must understand and use the electrical PPE, proper tools and equipment, and safe work procedures that are required to safely perform their work. Qualified Electrical and Qualified Non-Electrical employees must follow the policies and procedures out-lined in the facility Electrical Safety Program.

K. All Employees

Are responsible for:

- Having an awareness of the electrical hazards in their workplaces.
- Reporting electrical occurrences and all recognizable hazards by work order and to their supervisor.
- Reporting electrical shocks as injuries to their supervisors.
- Reading, understanding, and following all applicable procedures having electrical requirements.
- Adopting safe electrical work practices.
- Attending appropriate electrical safety awareness training and other training as required by 29 CFR 1910.332 and NFPA70E Article 110.2.
- Using appropriate personal protective equipment.

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III. DEFINITIONS

Common definitions with respect to the facility electrical safety program can be found in NFPA 70E, Standard for Electrical Safety in the Work Place, Article 100 – Definitions. Key definitions for the facility are identified below:

Facility: The Wisconsin Rapids Mill

Qualified Electrical Person: One who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify and avoid the hazards involved. Qualified Electrical personnel in the facility will only be salary and hourly maintenance personnel who receive specific qualified electrical safety training on an annual basis. Contractor and consultants who have adequate safety and procedural background may perform qualified electrical work under the direction of the facility. The ‘Qualified’ status of an employee is subject to review by this facility at its discretion.

Qualified Non-Electrical Person: A person who is not electrically qualified to work on live electrical circuits, but has operating and lockout responsibilities that involve equipment associated with or in the proximity of potential electrical hazards. Qualified Non-Electrical personnel will receive electrical safety training to understand the facility electrical safety program, be able to recognize general electric hazards, and properly operate disconnect switches and breakers rated up to 600V.

Unqualified Person: A person who does not have the necessary background to be working on or near electrical hazards.

Job Briefing: This facility recognizes and supports the intent of the NFPA 70E 110.1(H) standard regarding a required Job Briefing by including this process in the established Work Order system. The Job Briefing will be conducted as part of the established Work Order process. In instances in which a Work Order may not be applied the Job Briefing process will be applied as specified in the Policy section of this document. The Job Briefing Policy is found in Policy A.

Low Voltage: The term “Low Voltage” at this facility will apply to any equipment operating at 600V to ground or less.

Medium Voltage: The term “Medium Voltage” at this facility will apply to any equipment operating at voltage levels between 601V and 15,000V (15kV).

High Voltage: The term “High Voltage” at this facility will apply to any equipment operating at voltage levels above 15kV. This voltage level is only used outdoors at the utility distribution level in this facility.

Routine: System operating as designed with Procedure as written

Non-Routine: System not in normal state (jammed, making strange noise, water present, abnormal heat, etc.)

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Bolted Fault: Worst case fault. Assumes zero resistance between phases

Arcing Fault: Air becomes the conductor and the fault current flowing is less than a bolted fault. This may create a larger arc flash hazard due to longer clearing times for the protective devices.

IV. ELECTRICAL SAFETY PROGRAM PRINCIPLES & CONTROLS

A. Inspect, Evaluate, and Maintain Electrical Equipment

The goal of this facility is to eliminate the exposure to an employee associated with electrical shock and arc flash hazards. In instances in which these hazards cannot be removed, facility management has taken steps to ensure the employees safety through Safe Work Policies and Procedures. Facility management recognizes that the integrity of the electrical system and its associated protective devices is critical to maintain the level of exposure assumed in these Safe Work Practices. The following principals and controls will be observed to ensure the reliability of the analysis used to determine the hazards present:

1. Need to protect employees from shock and arc flash hazards associated with electrical equipment.
2. Accurate documentation will be maintained in order to provide information to affected employees regarding the degree of electrical hazards present.
3. Substation and MCC rooms will be inspected periodically for housekeeping and ensuring electrical equipment enclosure doors are properly secured and proper notification is in place warning of electrical hazards inside.
4. A ground survey of the electrical distribution system will be conducted periodically to verify the integrity of the existing ground grid. Random testing and inspection of the infrastructure wiring will be conducted annually to ensure the presence of an effective ground path where a grounded distribution system has been established.
5. Electrical distribution equipment maintenance will be performed on a periodic basis as identified in Policy V – Electrical Distribution Equipment Testing Intervals
6. Protective device settings and trip times will be reviewed and compared against the established arc flash analysis to determine any need to adjust arc flash levels and affected policies / procedures.

B. Plan Electrical Work / Document Procedures When Applicable

1. Plan work when possible - identify necessary tools, equipment, and PPE. Affected employees and contract employees performing work with the potential of electrical hazards will perform a Job Briefing as defined in the facilities Safe Work Permit Program prior to the start of the job.
2. Utilize existing electrical safe work procedures as documented and trained in the facilities Electrical Safety Program.
3. Document procedures when possible, especially for non-routine tasks.

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4. Electrical Energized Work Permits are required for energized electrical work on circuits greater than 50 volts, with the exception of testing, troubleshooting, voltage measuring, etc. on circuits 750 volts or less provided that appropriate safe work procedures and PPE are used.

C. De-Energize Equipment If Possible

1. De-energizing a circuit in itself is a potentially hazardous task.
2. Every effort should be made to perform electrical work when equipment is de-energized.
3. Verify that the electrical load has been removed from the circuit prior de-energizing. Not all equipment is capable of interrupting the electric current associated with a running load.
4. Work on energized electrical equipment will be allowed when it has been deemed infeasible to de-energize, but properly insulated tools, equipment, and PPE **MUST** be used. An authorized Electrical Energized Work Permit must also be used when applicable.
5. The absence of 'foreign voltage' / induced voltage will be verified as part of the de-energization process. Typical sources of foreign voltage would include control voltage and DC voltage in exciter circuits or battery supply voltage.

D. Consider Every Electrical Conductor or Circuit Energized

1. Every electrical conductor and circuit will be considered energized until proven to be at zero energy.
2. Re-testing is required when the employee leaves the job site – prior to continuing work.
3. Bare hand contact with any exposed energized conductor or circuit greater than 50 volts is prohibited. Voltage rated gloves and insulated tools / equipment are to be used at all times until the circuit has been confirmed de-energized.
4. Work on any energized circuit greater than 600 volts is prohibited.

E. Use Existing Safety Principals and Procedures

1. Identify and minimize hazards – try to anticipate unexpected events.
2. Communicate as necessary with both production and maintenance personnel.
3. Utilize adequate resources and properly insulated tools and equipment.
4. Utilize proper PPE for the particular task.
5. Follow the facility lockout program and procedures and review applicable lockouts prior to beginning any work.
6. Ensure work area is clean and organized prior to beginning any work.
7. Ensure work area is clear and clean after work is completed.

F. Personnel Will Receive Proper Training

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1. Prior to performing electrical work, personnel expected to work on or near energized conductors will be qualified to perform job-related electrical tasks as required by 29 CFR 1910.332 and NFPA-70E Article 110.2
2. Employees of this facility will receive electrical safety training to the extent of the job function may expose the employee to electrical hazards. Employees job functions will fall into one of three categories based on exposure:
 - Electrically Unqualified: An employee with little or no knowledge of electricity or electrical hazards. This employee may operate minor electrical apparatus and is not qualified to be near energized electrical conductors or circuit parts. Minor Electrical apparatus includes hand tools, computers, etc. that are designed for safe use.
 - Qualified Non-Electrical: An employee who works among electrical hazards but is trained to avoid contact. This employee may operate disconnect switches and circuit breakers up to 600V as the equipment was designed. Examples include lighting panel circuit breakers, welding disconnects, motor starter disconnects.
 - Qualified Electrical: An employee who operates and maintains electrical equipment and has demonstrated knowledge and skills. This employee works on or near exposed energized electrical conductors or circuit parts.
 - Electrically Unqualified employees will not be considered at this facility. All employees have the potential of exposure to significant electrical hazards due to the nature of the industrial operation. At a minimum, all employees will be trained to the level of Qualified Non-Electrical as an awareness level of training.
 - Employees who have the potential to experience live electrical hazards will be provided additional training on an exception basis. Additional job functions determined to be electrically high risk include but are not limited to:
 - Mobile Equipment Operators
 - Welders
 - Painters
 - Industrial Machine Operators
 - Employee training will be conducted in two stages. Qualified Non-Electrical training will be inclusive of the Qualified Electrical training requirements. All employees will receive common training up to the Qualified Non-Electrical status. Employees identified as requiring Qualified Electrical training will build on this initial training to reach the Qualified Electrical status.
 - The basic training components necessary for an employee to possess the background for Qualified Non-Electrical and Qualified Electrical specific to this facility are listed below. Additional training may be required based on the specific job functions or the degree of exposure.

○ Hazards of Electricity	Qualified Non-Electrical
○ Safe to Touch / Not Touch	Qualified Non-Electrical

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- Job-specific safe electrical work practices.
- Electrical requirements of safe operating procedures and maintenance procedures.

H. Qualified Electrical Employee Training Criteria

A Qualified Electrical employee is formally trained, is knowledgeable, and has demonstrated proficiency to perform specific work tasks on or near exposed energized electrical conductors or circuit parts energized at 50 volts or more. In addition to the requirements of the Qualified Non-Electrical employee training the Qualified Electrical employee will be provided with training in:

- Awareness of regulations / standards
- Basic electrical knowledge
- Identification of shock and arc flash hazards
- Identification of incident energy levels
- Concept and implementation of approach boundaries
- Concept of flash protection boundaries
- Application of electrical documentation
- Concept and application of electrical precautions
- Concept of fault current
- Concept of fault current vs. time in arc flash value
- Electrical personal protective equipment characteristics
- Application of PPE
- Concept of current limiting
- Visual indication of electrical hazards
- Existence and content of site Procedures
- Existence and content of facility Policies

Additional training requirements may be acquired through separate training classes. Examples include: CPR, Equipment Operation and Maintenance, Lockout, Electrical Energized Work Permit training, etc.

Personnel working with voltage greater than 751 volts will have specialized electrical awareness training. This training will emphasize the planning and procedural processes necessary to safely work on energized circuits.

1. Periodic retraining is required to maintain and update skills and code requirements.
 - Facility management is responsible for developing the training program.
 - Employees are responsible to apply the training.

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- Qualified Non-Electrical employees will receive basic electrical safety training that will allow them to enter electrical equipment rooms, identify potential electrical hazards, and proceed to properly operate 750 volt and below disconnect switches if the area is clear of electrical hazards.
 - E&I personnel will receive Qualified Electrical Safety Training that will allow them to safely work on electrical equipment in accordance with NFPA 70E.
 - All training will be verified by testing for basic understanding (written and/or demonstration). Additional training may be required if the employee fails to demonstrate proficiency through on-the-job performance or if the employees job changes to present potential electrical hazards that would be unfamiliar to the employee.
 - Training will be conducted on an annual basis with additional training required if the employee is unable to demonstrate safe work procedures.
2. Facility management shall document that each employee has received the training required by NFPA-70E Article 110.2(E)
 3. Training records will be maintained in the DMS system.

J. Electrical Distribution Equipment Will Be Properly Labeled

1. Equipment will be labeled with respect to voltage levels – 120/240, 480V, 2400V, 4160V, or 13.8kV. High Voltage distribution and DC Voltages will include additional warning labels as these are considered ‘non-typical’.
2. Equipment will be numbered to positively identify equipment in the field with the electrical circuit and disconnecting means.
3. Equipment will be labeled to warn personnel of potential electrical shock and arc flash hazards.
4. Electrical rooms will be marked to indicate the presence of potential electrical hazards inside. Electrical equipment room will have detailed arc flash information for the equipment located in that particular room. This information will be posted on the associated equipment or available in close proximity of the equipment in either label form or arc flash database format.

K. Limited, Restricted, and Prohibited Approach Boundaries for Shock Protection

A default approach boundary of 10 feet shall be observed for all employees either working on, or in the area of the electrical hazard. In instances in which a 10 foot boundary is not possible due to physical space limitations access to the area within the physical boundary will be restricted until the work is complete and the electrical hazard has been removed.

Areas with a high concentration of electrical hazards such as Substation Rooms or Electrical Rooms have restricted access due to the higher probability of an employee encountering an electrical hazard in these areas. Access to these areas will be restricted as defined in the Electrical Room Access Policy of this document.



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Refer to NFPA70E 130.4(D)(a) for AC System Boundaries and 130.4(D)(b) for DC System Boundaries

L. Auditing of Electrical Safety Program

The Electrical Safety Program will be audited not to exceed once every 3 years per NFPA 70E Article 110.1(l)

V. ELECTRICAL SAFETY PROCEDURES

Detailed procedures regarding common electrical tasks are individually specified with regards to the arc flash hazards as identified through computer modeling. The individual procedures are based on the following fundamentals.

A. PPE Requirements

Facility management will provide and require the use of adequate personal protective equipment and establish documented procedures for its use, care, maintenance, and testing.

Use of PPE is required in accordance with NFPA 70E Chapter 1.

The following will be completed at this facility:

- Personnel will be trained in its use in accordance with documented procedures.
- Procedures will be established and implemented for documented controls of protective equipment such as inventory, storage, maintenance, and testing.
- Protective equipment requirements and usage are specified in the safe operating procedures and maintenance procedures.
- Protective equipment is inspected prior to each use.
- PPE will be tested in accordance with OSHA 1910.137, NFPA-70E table 130.7(C)(7)(c) or NFPA-70E 130.7(F) as applicable

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- Arc Rated(AR) PPE Matrix NFPA70E Table 130.7(C)(16). Blue shaded areas indicate facility PPE levels

REQUIRED PPE PPE CATEGORY	MIN	1	2	3	4
Untreated Natural Fiber or Non-Melting Long Sleeve Shirt and Pant	X				
Safety Glasses / Hearing Protection	X	X	X	X	X
Hard Hat – Class E (20,000V)		X	X	X	X
Leather Shoes / Boots (EH Rated)		X	X	X	X
8 Cal/cm ² Arc-rated (AR) Shirt / Pants or Coveralls		X	X	X	
8 Cal/cm ² Arc-rated (AR) Face Shield / Hard Hat or equivalent rated Flash Hood		X	X		
Leather Gloves	AN	X	X	X	X
Arc-rated (AR) Balaclava (head and face) worn with Face shield or 8 cal/cm ² switching hood		X	X		
Arc-rated (AR) Coveralls minimum 31 cal/cm ²				X	
Arc-rated (AR) Hood rated at a minimum of 31 cal/cm ²				X	
Arc-rated(AR) Blast Suit minimum 65 cal/cm ²					X
Arc-rated (AR) Hood rated at a minimum of 65 cal/cm ²					X
Arc-rated (AR) Rain Gear, Parka, Jacket	AN	AN	AN	AN	AN

AN = As Needed

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2. The Arc Resistant (AR) PPE for Arc Flash Hazard Risk Categories Matrix represents the PPE necessary to protect employees from the electrical hazards at this facility as determined by computer modeling. Facility management has determined the PPE applied in this matrix meets the minimum requirements of the NFPA guideline and provides for a practical application of PPE for employees in situations in which electrical hazards are present.
3. All personnel are required to wear natural fiber under-garments when performing tasks that require arc flash protection
4. All Qualified Non-Electrical personnel who operate electrical equipment are required to wear 100%, non-melting, long sleeved shirts and pants or available arc rated clothing and leather gloves.
5. Any type of non-natural (i.e. plastic) picture or wording larger than 16 square inches (4" x 4") is **NOT** allowed on natural fiber under-garments, pants, or shirts. In the event of an actual arc flash incident, the non-natural material will have a tendency to melt into the skin and cause addition injuries. Material of this nature may be worn under general plant guidelines but must be removed when in the presence of potential electrical hazards.
6. Non – arc-rated rain gear, fall protection gear, and high visibility safety vests that are made of meltable fiber cannot be worn when any electrical work is being performed. This includes the operation of electrical disconnects for lockout purposes. Look for an Arc Thermal Performance Value (ATPV) rating on the PPE.
7. Voltage Rated Insulated Tools, Gloves, and Test Equipment
 - All electrical test equipment must be certified at a minimum of 1000 volts.
 - Meters must be rated at a Minimum of Category III (Meter overvoltage category)
 - 1000 volt rated insulated tools and gloves are required when working on any energized electrical circuit between 50 and 1000 volts. All employees are prohibited from working on any energized electrical circuit greater than 750 volts without an Electrical Energized Work Permit
 - In instances in which improved dexterity is required, voltage rated gloves may be worn without the leather covers provided the work is 150 volts or less and there is no potential for puncturing the voltage rated glove material. Only Qualified Electrical personnel are allowed to work on these circuits and they have the proper skills and training to safely perform this work. The facility has numerous control panels located throughout all areas. The use of the 1000V rated insulated gloves with protectors can create other hazards due to their cumbersome nature.
8. All Qualified Electrical personnel are required to wear electrical hazard (EH) rated safety footwear in addition to the established footwear requirements of the operating area.
9. All personnel who enter MCC rooms with energized equipment or are within 36" of energized equipment on the floor are required to wear long-sleeves and long pants made of 100% non-melting fiber (cotton, rayon, AR).

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B. Performing Lockouts / Operating Electrical Disconnects

1. Before any Qualified Non-Electrical person operates an electrical disconnect, enclosure doors must be properly closed and secured in all cases. Physical condition of the enclosure and the ability to secure the enclosure are necessary for use. The physical enclosure in itself is not considered a safety barrier but it is recognized that the risks associated with an electrical fault are reduced by having the enclosure intact and the door secured.
2. Qualified Electrical personnel can operate electrical disconnects with enclosure doors open as long as the appropriate PPE is worn based on the equipment incident energy level. Predetermined physical problems with the equipment may require that additional PPE be applied. 'Anticipating failure' must be considered when utilizing equipment that is suspect.
3. All motors must be in a de-energized state (i.e. off) before any electrical disconnect is operated for that motor. Control circuit interlocks may not be depended upon as the motor 'stop' function.
4. Qualified Non-Electrical employees are allowed to enter electrical equipment rooms to perform lockouts as long as electrical equipment enclosure doors are properly closed and secured or the proper barricades are in place (arc flash boundary or limited approach boundary). Entering an electrical room is allowed for the purpose involving the associated electrical gear only. Casual entry is not permitted.
5. If energized electrical equipment enclosures are not properly closed and secured, the Qualified Non-Electrical employee must leave the room immediately and contact a Qualified Electrical employee to properly close the enclosure doors or barricade off the area.
6. Employees must stand to the side with their face turned away and their body positioned to minimize the effect of an electrical fault when operating any type of electrical disconnect.
7. Qualified Non-Electrical employees are allowed to operate electrical equipment that has a potential of 750 volts to ground or less.
8. Qualified Non-Electrical employees are not allowed to operate any type of equipment that has potential of more than 750V to ground. (i.e. Medium Voltage Starters or disconnects)

C. Electrical Energized Work Permits

Energized Work Permits are required as indicated by the procedures. Refer to Policy M for the complete guideline and Energize Work Permit.

D. Illumination for Electrical Work

1. Employees may not reach blindly into areas which may contain energized parts.

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2. Employees may not place their hands or any part of their body inside enclosures containing exposed energized parts unless illumination is adequate to perform the work safely.

E. Verification of Zero Energy

1. Employees will never directly touch an un-insulated current carrying conductor or component without first accomplishing the following steps:
 - All circuits are considered live until the zero energy state has been verified.
 - Understand the hazards of the equipment being maintained.
 - Think about the task and how it can be accomplished safely.
 - Utilize the proper PPE.
 - Isolate applicable circuits, unless already isolated via an established plant lockout.
 - Lockout all applicable circuits.
 - Test meters and equipment that will be used to verify zero energy. Testing must be completed on a known, energized source before and after the zero energy has been verified. (Can also use either self-test or external source on hotsticks)
 - Test for positive proof of zero energy state of the applicable circuits.
 - Use additional means such as fuse removal or grounding straps to ensure zero energy state, if necessary.

F. Electrical System Analysis – Determination of Shock and Burn Risk

This facility maintains a computer model of the electrical distribution system in accordance with IEEE 1584 for the purpose of incident energy determination. This model is the basis for compliance with specific requirements of OSHA and NFPA electrical safety standards related to the determination of the shock hazard and incident energy exposure to employees. Data derived from this model has been used to develop specific Policies and Procedures necessary for employee safety while working on or around these hazards.

1. Electrical installations in this facility have been designed and installed with the primary concern being compliance with the NFPA 70 – National Electric Code.
2. Load Flow, Short Circuit / Equipment Duty, and Coordination data is available to confirm the compliance with equipment installation standards.
3. In understanding the potential hazards associated with electrical fault conditions this facility has made the priority of ‘people protection’ its first concern. Protective device settings will be manipulated to reduce or remove electrical hazards while maintaining proper operation and compliance of the electrical systems.
4. A priority has been given to future design and installations to include physical devices with the ability to limit employee exposure or to direct the effects of an electrical fault away from the employee.
5. Specific Policies and Procedures have been developed to address the situations in which the employee exposure to an electrical hazard could not feasibly be reduced or

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eliminated through a modification to the electrical system. These Safe Work Practices are based on the performance of the electrical distribution system as calculated by the computer model. The documentation will be reviewed periodically to ensure that changes to the performance of the electrical system are reflected in the Safe Work Practices.

6. The results of the system model are dependant upon the performance of the system components. Periodic maintenance of the components of the electrical system will be necessary to ensure the reaction time of each individual component is accurately represented in the system model database.
7. The system model will be periodically reviewed to ensure that any changes to the electrical system or the utility supply are reflected in the system model. These changes may require changes or additions to the Safe Work Practices to ensure the safety of the employee working on or near electrical hazards.

G. Work On or Near Exposed Energized Parts

1. Conductive material and equipment (such as long pipes) that an employee is handling will be used or carried in a manner to avoid an energized contact. Work practices and/or insulating material will be used as necessary
2. Portable ladders which could contact energized parts will have nonconductive side rails.
3. Conductive articles of jewelry and clothing will not be worn if they might contact an energized part, unless they're rendered nonconductive by covering, wrapping, or other insulating means.
4. Housekeeping or cleaning duties may not be performed at such distances as to permit contact with energized parts, unless safeguards such as barriers or insulating equipment are utilized. Electrically-conductive cleaning materials such as steel wool, silicon carbide, and conductive liquids, etc., may not be used in proximity to energized electrical conductors or circuit parts, unless procedures are used to prevent contact.
5. When flammable gas, vapors or liquids, combustible dust, or ignitable fibers are present, electrical equipment capable of igniting them will not be used.
6. Vehicular and Mechanical Equipment
 - a. Any vehicle or mechanical equipment capable of having part of its structure elevated near energized lines will be operated so that a 10' clearance is maintained. If the line voltage is over 50 KV, the clearance will be increased by 4" for every 10 KV over 50 KV. The clearance may be reduced if any of the following conditions are met:
 - If vehicle is in transit with its structure lowered, the clearance may be reduced to 4'. Voltages over 50 KV require an additional 4" for every 10KV over 50 KV.
 - If voltage-rated insulating barriers are used, clearances may be reduced to the designed working dimensions of the insulating barrier.
 - If the equipment is an aerial lift insulated for the voltage involved, and the worker is a qualified person, the clearance between the un-insulated portion of the lift and the power line may be reduced to the clearances listed in Section 4.8 above.

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- b. Employees standing on the ground may not contact the vehicle or equipment, or any attachments, unless:
 - The employee is using protective equipment rated for the voltage
 - The equipment is located so no un-insulated part of its structure can come closer to the line than the distances specified in Section 4.8 above.
- c. If any vehicle or mechanical equipment is intentionally grounded, employees working on the ground will be kept well back from the grounding point, dependent upon earth resistivity and fault currents.

VI. Electrical Design and Installation

A. Code Compliance

Facility management will ensure compliance with applicable electrical requirements of the National Fire Protection Association (NFPA), ANSI C 2, and respective parts of 29 CFR 1910 and 29 CFR 1926.

All electrical installations and equipment are subject to inspection and the approval of the Authority Having Jurisdiction (AHJ).

Facility Management will ensure that resources are available to provide for compliance with applicable codes and standards. In addition, they will ensure that:

- Inspections are performed by qualified personnel on electrical work and equipment, including utilization equipment. These inspections will be in accordance with 29 CFR 1910 Subpart “S”.
- Inspections will be documented. Inspection records, deficiencies, and corrective actions will be maintained in a department file.
- Examinations are performed on equipment that is not listed or labeled by a Nationally Recognized Testing Laboratory (NRTL).
- Record drawings of electrical systems and equipment are maintained and a system exists for recording changes and correcting the drawings to reflect those changes.

B. Equipment and Materials Approval

Electrical equipment and materials for facilities wiring, as defined by NFPA 70 will be approved in accordance with Article 90-7, Examination of Equipment for Safety, and with Article 110-3, Examination, Identification, and Use of Equipment.

C. Utilization Equipment

Utilization equipment (includes laboratory and shop equipment, appliances, tools, extension cords or other devices that operate from an electrical source) is addressed in 29 CFR 1910.302 and .303. The document makes it clear that utilization equipment is subject to the same approval and acceptance requirements as above.

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- To be acceptable for installation and use, utilization equipment will be listed or labeled by NRTL. Modification or repair to the listed or labeled equipment will be performed by UL shops or the equivalent.
- Utilization equipment that is not listed or labeled will meet one of the requirements of 29 CFR 1910.339, Acceptable, (I), (ii), or (iii).
- Utilization equipment that is not listed or labeled will be examined, accepted, and documented by a qualified person.
- Utilization equipment will be used in accordance with its listing and labeling requirement.

Ground Fault Circuit Interrupters (GFCI's) must be used anytime extension cords are used or when using portable electric tools or charging systems (i.e.: drill motors, skillsaws, die grinders, elec. carts, etc...) with or without an extension cord. NFPA70E 110.4(C)(2)

- Equipment will be handled carefully to avoid damage. Flexible cords may not be used to raise or lower equipment. Cords may not be fastened with staples or hung in a fashion which could damage the insulation.
- Before use on each shift, equipment and cord sets will be inspected for external defects or possible internal damage (e.g., loose parts, deformed or missing pins, or damage to outer jacket or insulation). Equipment and cord sets which remain in place once connected, and are not exposed to damage, need not be visually inspected until they are relocated.
- Defective or damaged equipment will be removed from service until repaired.
- Attachment plugs and receptacle contacts will be checked for proper mating configurations before attempting connection.
- Flexible cords used with grounding-type equipment will contain an equipment-grounding conductor.
- Attachment plugs and receptacles may not be connected or altered in a manner which would prevent proper grounding.
- Adapters which interrupt the continuity of the grounding connection may not be used.
- Equipment used in conductive or wet locations will be approved for those locations.
- Locking-type connectors shall be properly secured after connection.
- Do not use electrical equipment, activate circuits, plug or unplug equipment if your hands are wet or if you are standing in water.
- All power tools shall have electrical cords with the grounded, three-prong type of plug. If the tool does not have this type of plug, it should be reported and immediately repaired. (Exception: Double-insulated type power tools do not need three-pronged plugs.)
- All extension cords are to be of the three-wire type. Extension cords should not be run across aisles, doorways, or through windows, wall openings, oil, or water.

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- Low voltage cords, air-powered equipment, or ground fault interrupters must be used in all pits, chests, tanks, and boiler drums when electric shock potential exists.
- For potential explosive conditions such as the use of a flammable liquid or gas, explosion proof electrical equipment must be used.

D. Test Instruments and Equipment

Test instruments and equipment are intended only for use by qualified personnel and shall be used in accordance with 29 CFR 1910.334 (c). In addition, a qualified person will inspect and test equipment to ensure that it is safe to use as intended by the manufacturer. If found to be unsafe, the equipment will not be used until it has been repaired.

- Test instruments and equipment will be visually inspected before each use.
- Test instruments and their accessories shall be electrically rated for their intended use.

All appliances for personal use in the workplace such as coffee pots, refrigerators, and radios will be listed and exhibit the label of a NRTL.

E. Engineering and Inspection

Facility management will provide electrical safety engineering and inspection resources to ensure that this electrical safety program and mandatory codes / regulations are implemented.

Facility management will ensure that the electrical systems are constructed and maintained as necessary to ensure safety of personnel. Installation or modification of existing installations that constitute ‘significant change’ of the operation of the electrical system will follow the local inspection process. Local engineering or licensed electricians are responsible for the installation of electrical system in compliance with the National Electrical Code. The personnel responsible for the electrical installation will correct any deficiencies in the installation found in the inspection process to ensure the safety of plant personnel.

F. Electrical Occurrence Reporting

All electrical occurrences, including electrical shock, shall be reported and investigated. Employees will report incidents to their Supervisor. Supervisors will report all incidents to the Safety Department. Reference Electrical Shock Protocol (SAF_GEN_W026-01) in the DMS system.

Defective or damaged equipment will be “tagged” out of service until repaired. Hazards will be immediately abated by repairs or by temporary guarding to prevent unqualified persons from being exposed to the hazard.

In the event of overheating, sparking or smoking motors, wiring and other electrical equipment, de-energize the unit and report the condition to supervision.

VII References:

- A. **NFPA 70 (National Electrical Code)**
- B. **NFPA 70E (Electrical Safety in the Workplace)**
- C. **OSHA 1910.331**