C2 ELECTRICAL

Contents

Standards

Scope

The purpose of the electrical safety standards and procedures is to ensure the safety of employees while working with or around electrical sources. This standard applies to all electrical work above 24 volts DC or 32 volts AC.

Definitions

Competency Standards

Minimum level of knowledge and skill required of all employees performing electrical work.

Competent Personnel

Employees who have been trained, tested and certified to work with electrical sources.

Controlled Area

Any area designated for electrical panels, electrical enclosures, or electrical equipment, such as electrical substations.

Electrical Hazard Training

Training that covers the policies and procedures for working on or around electrical sources and in controlled areas.

Electrical Safety Devices

Electrical protection devices that interrupt or redirect electrical currents. Examples of such devices are earth leakage devices, ground fault interrupters or overload protection devices.

Isolation Procedures

The written isolation procedures associated with a specific system or piece of equipment.

MCC

Motor control center. A room containing electrical switches that by design have no exposed wiring or electrical components.

Safe Work Procedures

Procedures for doing specific work. These are normally found in Boron Electrical Safe Work Practices Manual

Single Line Diagrams

Diagrams depicting the electrical structure of systems. These diagrams include the system fault calculations, equipment details, electrical protection discrimination curves and the cable ratings.

Unfit

Any condition that would render a piece of equipment or electrical source unable to meet the electrical needs of the using department.

Unsafe

Any condition that would render a piece of equipment or electrical source dangerous to personnel.

Responsibility

This section details what job titles are responsible to perform what functions under this standard. This information could be listed as follows:

ELECTRICAL PROGRAM RESPONSIBILITY

Personnel	Responsibility
Management	▪ Ensures that the electrical procedures and program are adhered to and followed throughout the organization. ▪ Ensures that employees have the resources to properly follow safe electrical working procedures. ▪ Ensures that the Electrical Safety program and procedures are communicated and understood by affected employees. ▪ Ensures that supervisors are knowledgeable about the electrical safety procedures in their area of responsibility. ▪ Ensures that Electrical Single Line Diagrams are kept up to date and any modifications are documented. ▪ Reviews the procedure annually and updates as appropriate.
Supervisors	▪ Ensure that the Electrical Safety procedures are followed and executed in their areas of responsibility. ▪ Ensure that only certified electricians are performing electrical work in their area of responsibility. ▪ Communicate any discrepancies or faults with current line diagrams to the engineering department. ▪ Ensure that appropriate Start Work Permit documentation is completed for any contractors working in their area of responsibility.
Electricians	▪ Follow all electrical safety procedures and policies. ▪ Attend annual Electrical Safety Training. ▪ Maintain their certified "competent" status.
Employees	▪ Follow the facility's Electrical Safety Procedures ▪ Notify the supervisor if they identify any malfunctioning electrical equipment or systems. ▪ Attend annual Electrical Hazard Training as required.

Requirements

This section lists various requirements of the standards. Procedures are listed in a separate section of this document.

General Requirements

1. Competency certification or maintenance of certification is achieved by attending any training required by the company, and participating in the periodic competency review.

2. Controlled areas shall be appropriately guarded, labeled, and made inaccessible to unauthorized people.
3. Employees should be trained to recognize a controlled area and the hazards posed by electrical sources. This training shall include what employees should do in an electrical accident, injury or emergency.
4. Whenever possible equipment shall be isolated in accordance with Isolation procedures.
5. When it is necessary to work on energized electrical circuits safe work procedures will be followed.

Competency Standards Requirements

Standards Definitions and Procedures

1. All competency definitions related to Instrument/Electric (I/E) department tasks shall be listed in the I/E job analysis, which is located in the I/E shop.
2. All work procedures for the I/E department shall be contained in Boron Electrical Safe Work Practices Manual located in the I/E office.
3. Competency for mobile electricians is determined through a process of formal testing and observation of work. All new journeyman mobile electricians are required to have a current MSHA electrical card for both high and low voltage.
4. All work procedures for mobile electricians are contained in the JSAs located in Sharepoint.

Re-certification

Refreshers and re-certifications shall be completed biennially, supervised and/or instructed by an approved Borax trainer, an electrical training institute, or an approved MSHA electrical trainer.

Electrical Installation

1. All work shall be completed by individuals trained in the electrical and instrument trades. These individuals shall be trained by the Borax training program or shall come from an approved electrical contractor.
2. All work shall be done according to Borax safe work procedures.
3. All work projects shall meet standards set by The National Electric Code, local building codes, ANSI, NEMA, Underwriters' Laboratory and ISA.

Electrical Equipment Requirements

Electrical Safety Devices

1. Borax Engineering Standard, USB SP-19, shall specify all safety devices, such as overload protection and ground protection.
2. When the electrical system is changed, it should be understood that short circuit and coordination settings will be affected. Data must be analyzed to update and record the correct settings. Refer to the *Records* section later in this document.

Electrical Testing

1. Ground wire continuity tests shall be completed on an annual basis. Records of these tests shall be kept on file in the I/E shop office. These tests and records are required by MSHA.
2. Protective relay testing for substations shall be done every three years, as recommended by insurance underwriters. Test records shall be kept on file in the I/E shop office.

Electrical Equipment Removal

Electrical equipment, which is determined to be unsafe, will be immediately disconnected or secured and isolated to prevent injury.

A request from a user department must be made in order to remove equipment unfit for its purpose. Procedures for electrical equipment removal are outlined in the *Procedures* section of this document.

Records Requirements

1. The Boron facility single line diagrams shall be maintained in a computer database and in hard copies of these diagrams. The database and hard copy diagrams shall be kept in the I/E shop office and in the Borax Engineering office.
2. An individual (the “Standard” document officer) assigned to the I/E office shall be responsible for maintaining electrical documents related to the Electrical Equipment sections outlined earlier, and the Isolation and Access sections outlined later in this Standard.

   This document officer shall be trained in the use of the software (ETAP Power Station) that maintains these records, AutoCAD and all related software including word processing and spreadsheets.

   The ETAP Power Station software program was selected to provide items such as system fault calculations, electrical protection curves and cable ratings.

3. All changes to the Boron electrical system must be cleared through the I/E office and approval must be given before changes can be made. Upon completion of the project, an as-built drawing shall be provided to the I/E shop office. The Management of Change Procedures will be followed.
4. A switching diagram of the Boron high voltage electrical system shall be maintained at the I/E office, which will comply with the Isolation and Access section later in this Standard. Procedures for isolation related to this diagram shall also be maintained at the I/E office .
5. Records must be maintained to document all training, certification and re-certification, as described in the Competency section earlier in this Standard. Records for the I/E department will be kept in that department. Records for the mobile electricians will be kept in the Truck Shop.

Procedures

Overview

The procedures outlined in this section are basic electrical safety procedures. Specific isolation procedures and other safety procedures are documented within the electrical department.

Basic Electrical Safety Procedures

1. All Employees who must work around or near electrical equipment shall receive electrical hazard training when hired and then annually thereafter.
2. Any employee that must work on electrical systems must be certified prior to commencing work.
3. Appropriate Personal Protective equipment shall be worn for all electrical work involving greater than 24 volts DC, 32 volts AC.
4. Non-conducting or insulated tools and equipment shall be provided and used for all hot electrical work. Fiberglass ladders are an example of such equipment.
5. Contractors must follow the procedures in Contractor Safety Management Standards including the use of start work permits when working in controlled areas.

Electrical Equipment Removal Procedures

1. Electrical equipment that is unsafe will be immediately disconnected or secured and isolated to prevent injury.
2. Upon receipt of a request for equipment removal, the Electrical Planner and the area Electrical Supervisor meet with a representative of the user's group to identify the equipment to be removed.

   This identification will take place on site, marking the equipment; with all parties understanding which equipment is to be removed.
3. The Planner and Electrical Supervisor evaluate the equipment and related circuits, develop a plan, and submit it to the user's department and to the I/E team leader, or his designated representative.
4. Upon agreement, all parties lockout and tag components, following Borax Isolation - lockout/tag out procedure, making sure both ends of the circuit are tagged.

5. The removal proceeds. Upon completion of this task, all electrical panels shall be labeled to indicate that they are spare devices.

Isolation and Access Procedures

Work on Energized Electrical Circuits

When it is necessary to work on energized electrical circuits, the following procedures will be followed:

1. All voltage testing devices will be tested on a known energized source to make sure the tester is operating correctly.
2. All energized work will be performed in accordance with the Boron Electrical Safe Work Practices.

Electrical Substations

Access to electrical substations and equipment will be in accordance with the following requirements:

1. All electrical substations will be secured with an Electrical Department lock referred to as an “A” lock. Only qualified personnel are authorized to possess an "A" lock key.
2. All substations will be identified with signage indicating:

   “Danger high voltage authorized Personnel only”
3. Cleaning a substation will be in accordance with the Boron Electrical Safe Work Practices Manual.

Appropriately Trained Personnel

1. Only trained individuals are allowed in the electrical substations.
2. Individuals not trained must be escorted at all times by an I/E supervisor or his qualified designee.

Training

1. An annual electrical hazard refresher class shall be given to all employees and contractors who have access to electrical equipment.
2. The records of employee training shall be kept in the training records database. Contractors will keep their own records.