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1. Scope

This specification covers the Mosaic Best Practice for the design and application of signage and Arc-Flash and Shock labels for applicable electrical equipment.

2. Purpose

The purpose of this specification is to ensure consistent labelling on all applicable electrical equipment on Mosaic property.

Electrical hazard and warning signs are to follow current ANSI Z535 standard. This is compliant with OSHA and MSHA requirements. ANSI Z535 labels are comprised of three key elements.

2.1 Signal Word Panel or Header Panel:

The Signal Word calls attention to the safety sign and designates a degree or level of hazard seriousness. The signal words for safety signs are "DANGER", "WARNING", "CAUTION", and "NOTICE", and are often accompanied by a safety alert symbol.

DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to "NOTICE".

NOTICE: "NOTICE" is the preferred signal word to address practices not related to personal injury. The safety alert symbol shall not be used with this signal word. As an alternative to "NOTICE" the word "CAUTION" without the safety alert symbol may be used to indicate a message not related to personal injury.

Note: *The Safety Alert Symbol must be used in conjunction with the Signal Word if there is a possible personal injury hazard.*

2.2 Pictorial Panel(s):

ANSI Z535 encourages the use of a pictorial panel whenever practical to do so. Select a pictorial that clearly identifies the hazard, consequences, and/or precautions. ISO 7010 is Mosaic's preferred standard for safety symbols as it is accepted worldwide, and are easily and quickly understood.

There are four (4) types of safety symbols that communicate different messages.

2.2.1 Hazard Alert Symbol

This is the general warning symbol. It is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm. Typically the symbol should consist of a black image within a solid hazard yellow triangular shape.

2.2.2 Prohibition Symbol

This type of safety symbol conveys actions that should not be taken or should be stopped. For prohibition, use of the red circular surround shape and diagonal crossbar over a black image is mandatory.

2.2.3 Mandatory Action Symbol

This type of safety symbol conveys actions that should be taken to avoid hazards. The symbol consists of a white image within a solid safety blue circular surround shape.

2.3 Information Symbol

2.3.1 This type of safety symbol is generally used on General Safety or Fire Safety

Figure H- 1 - Examples of ISO Safety Symbols

Signs to convey equipment location, egress, permitted actions and fire equipment locations. It is typically a red or green square with a white image.

2.3.2 Figure H- 1 - Examples of ISO Safety Symbols Message Panel:

There are basically three (3) items that can or should be identified in the message panel. The items communicated through the word message are the action statement, the hazard identification, and the consequence statement.

Hazard Identification: Identifies the specific hazard with clear and simple language.

Consequence Statement: Use clear, accurate, and simple language to warn persons of potential consequences if the warning is ignored.

Action Statement: These are instructions of how to avoid hazards. The statement should be accurate, simple, direct, and relevant to the hazard.

Figure H- 2 - Examples of ANSI Z535 Safety Signage with Hazard Alert and Mandatory Action Pictorial Panels provides examples of this message panel.

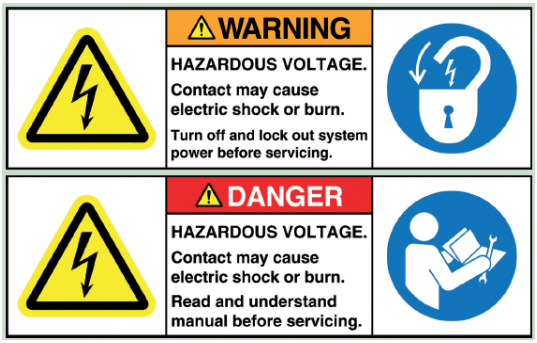


Figure H- 3 – Alternate Examples of ANSI Z535 Safety Signage Figure H- 4 - Site

Figure H- 2 - Examples of ANSI Z535 Safety Signage with Hazard Alert and Mandatory Action Pictorial Panels

Example of ANSI Z535 Safety Signage With Location

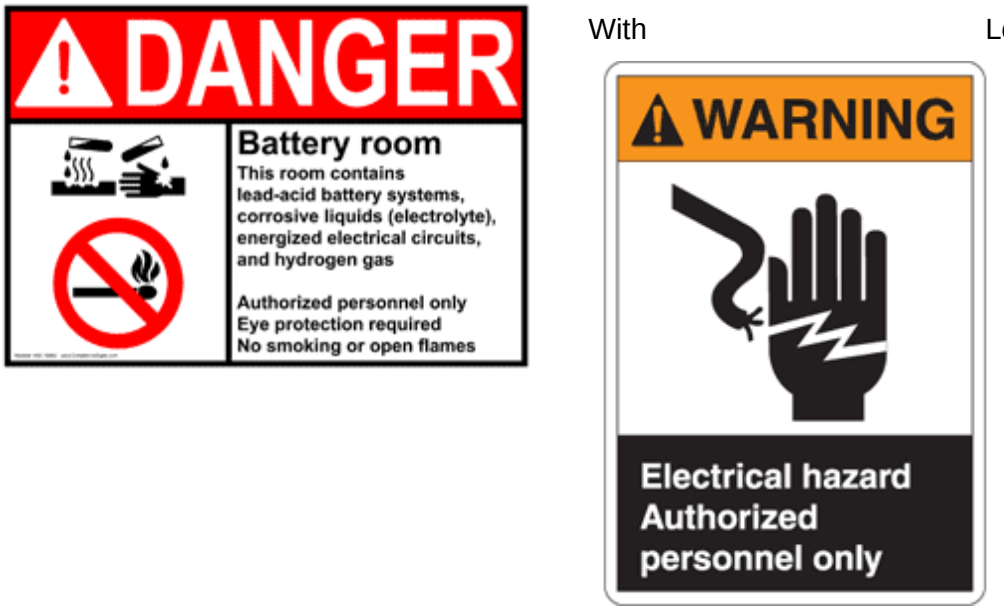


Figure H- 3 – Alternate Examples of ANSI Z535 Safety Signage

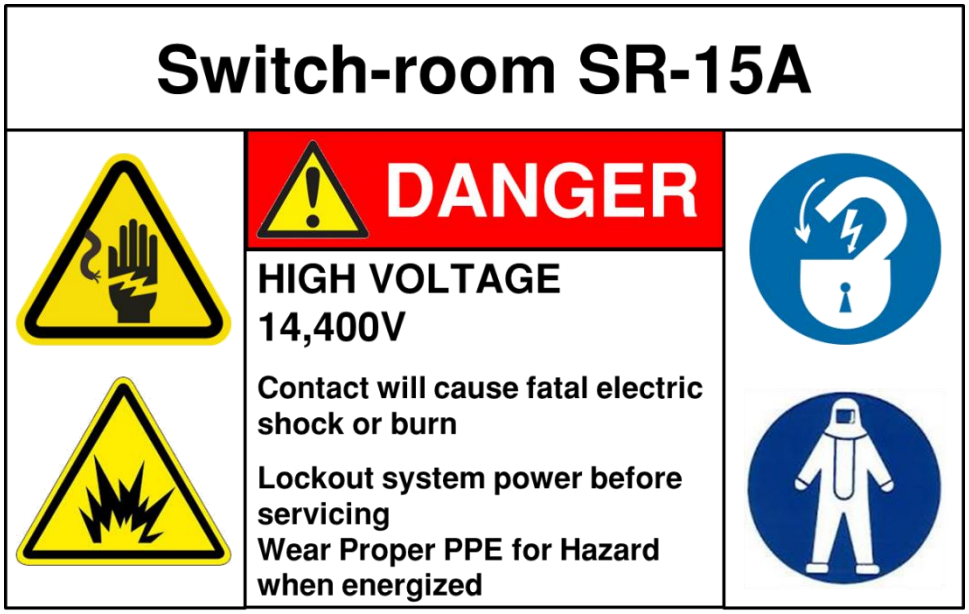


Figure H- 4 - Site Example of ANSI Z535 Safety Signage With Location

3. Arc-Flash and Shock Label

3.1 Labels must be placed and sized so they are visible to personnel before beginning maintenance or inspection work.

3.2 Mosaic Basic Arc-Flash and Shock Labels

Mosaic standard Arc-Flash and Shock labels may carry additional information beyond the minimum requirements of CSA Z462 or NFPA 70E. Workers are able to use this additional information to make informed decisions for work planning, work/job task hazard analysis, electrical safe work procedures, establishing the Electrical Work Zone and defining appropriate electrical PPE, tools and equipment for a specific work task.

It is recommended that Mosaic standard Arc-Flash and Shock labels be standardized with the following:

- Label Size: Minimum 100 mm x 150 mm (4” x 6”).
- Letter Size and Font: “**WARNING**” or “**DANGER**”, are prominent in top section and in upper case. Font to be Sans Serif, and text to include upper and lower case letters.
- Colour: All black lettering in the “**WARNING**” section on orange background with remaining sections having white background. For “**DANGER**” section, all

white lettering on red background with remaining sections having white background and black lettering.

- Placement: Conspicuously and readily apparent on electrical equipment. Should be placed at eye level on the electrical equipment where practical.

3.3 At a minimum, the information supplied on a Mosaic arc flash label shall be as outlined in CSA Z462 and NFPA 70E**.**

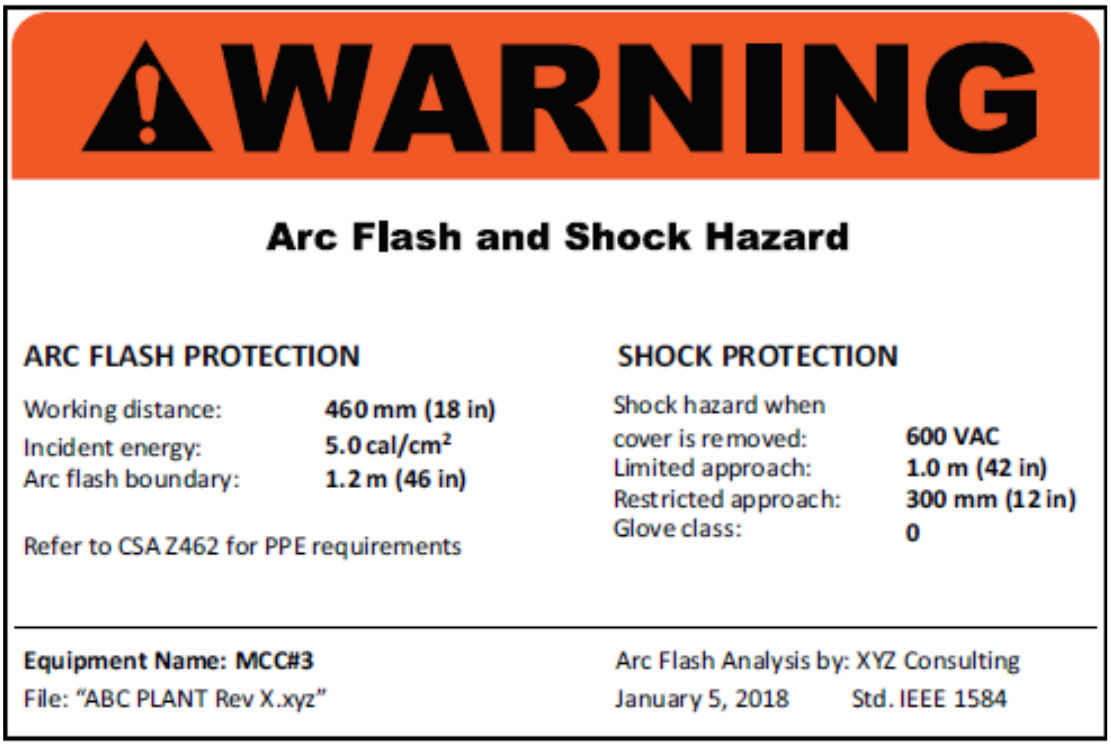


Figure H- 5 - CSA Z462 and NFPA 70E Detailed Electrical Hazard Information Label

3.4 Mosaic Detailed Arc-Flash and Shock Labels

As a best practice detailed arc flash labels can be used to display engineering, maintenance, and other relevant information about an electrical asset. An example of a detailed arc flash label is shown in Figure H-6.

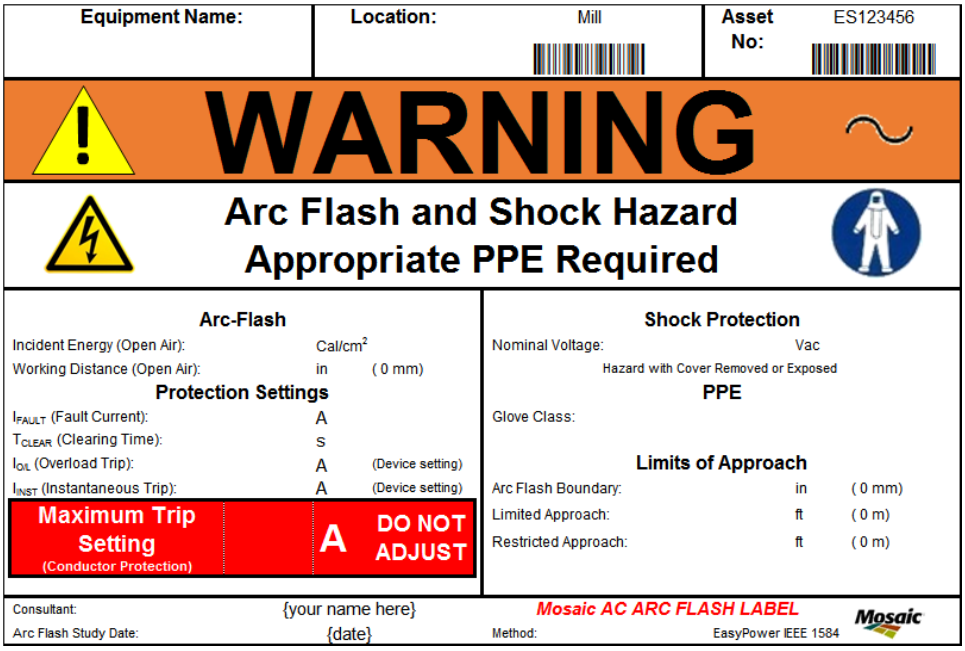


Figure H- 6 - Mosaic Detailed Arc-Flash and Shock Label

The Mosaic standard Arc-Flash and Shock labels can be broken down into four main areas that provide information. These are:

- General Information Panels: equipment Asset number, location, bar-code, calculation method, date of study, and name of consultant.
- Header Panel: **DANGER** or **WARNING** banner
- Pictorial Panel: Arc-flash and Shock hazard with symbol
- Message Panel(s):
  - Technical and Engineering Data
  - Equipment and Analysis Information

3.4.1 General Information Panel

General information is contained in the top horizontal bar and the bottom bar of the label.

The top bar has the equipment name, asset number and location – see *Figure H- 7 - Top Bar of a Mosaic Detailed Arc-Flash Label*. The asset number and location are

shown in bar-code format

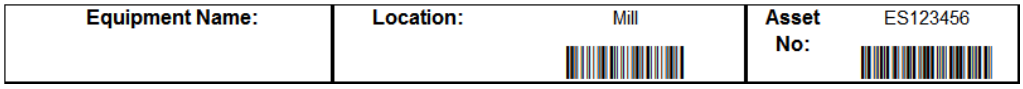


Figure H- 7 - Top Bar of a Mosaic Detailed Arc-Flash Label

The bottom bar contains the equipment name, date the study or analysis was completed, the consultant, or engineer completing the calculations, and the method used to determine the arc-flash information – see *Figure H- 8 - Bottom Bar of a Mosaic Detailed Arc-Flash Label*. The method also indicates if this is method is a temporary label, how this rating was determined, and by whom.

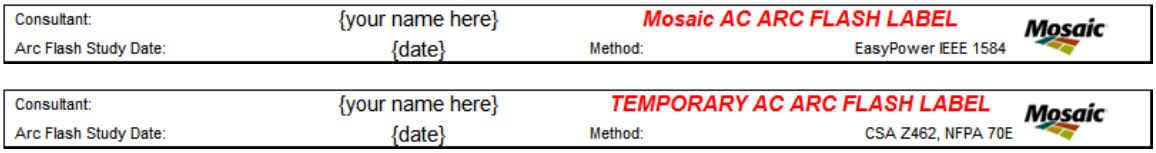


Figure H- 8 - Bottom Bar of a Mosaic Detailed Arc-Flash Label

3.4.2 Header Panel

The second bar (Signal Word Panel or Header Panel) indicates an electrical WARNING and will be ORANGE in colour if the Arc Hazard is less than or equal to 40 Cal/cm^2. If the Arc Hazard is greater than 40 Cal/cm^2, then the bar will indicate DANGER, and be RED in colour.

An AC current symbol, or DC current symbol can also be displayed depending on if the equipment utilizes AC or DC power.

Figure H- 9 - Header Panel of a Mosaic Detailed Arc-Flash Label

3.4.3 Pictorial Panel

The third bar (Pictorial Panel) identifies this equipment as having an Arc-Flash and Shock Hazard and that appropriate Arc-Flash PPE is required – see *Figure H- 10 - Pictorial Panel of a Mosaic Detailed Arc-Flash Label*. The ANSI Z535 hazard alert

symbol for electrical hazard and the mandatory action symbol for appropriate arc-flash PPE are typically included.

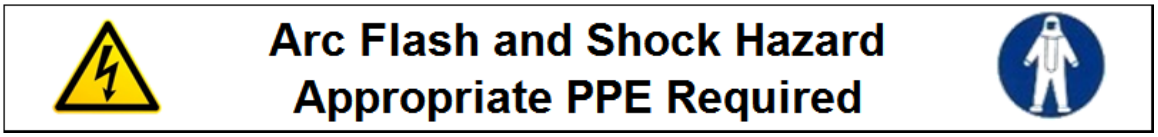


Figure H- 10 - Pictorial Panel of a Mosaic Detailed Arc-Flash Label

3.4.4 Message Panel

This section provides technical information and is broken into two halves with different information categories – see *Figure H- 11 - Message Panel of a Mosaic Detailed Arc-Flash Label*.

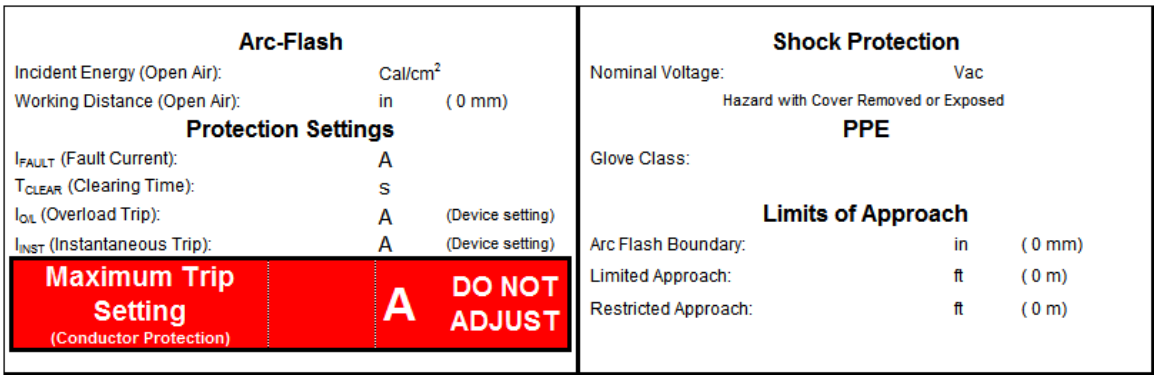


Figure H- 11 - Message Panel of a Mosaic Detailed Arc-Flash Label

3.4.4.1 Arc-Flash Section

The Arc-Flash section has technical information related to the incident energy available as determined by the engineering study or CSA Z462 or NFPA 70E Hazard/risk Category Table Method, and the working distance used for determining the calculations.

3.4.4.2 Protection Section – Optional

The Protection section has technical information related to the fault current, clearing times, overload trip setting, and instantaneous trip settings if known. If the breaker has an adjustable trip, the maximum setting allowed for downstream feeder cable protection can also be displayed (Breaker Maximum Continuous Load setting).

If the equipment has Instantaneous Trip or Overload settings, these will be indicated as well. The information available within this box is:

I_{INST} (Instantaneous Trip): **$I_{O/L}$ (Overload Trip)**:**Breaker Maximum Continuous Load**:

Note: The Protection section is optional; however may be required by the local regulatory authority

4. Arc-Flash Boundary: Limited Approach: Restricted Approach: Label Placement and Maintenance

The label should be placed in a conspicuous location that is visible by a qualified worker before they open or approach the electrical equipment (e.g. recommend label is installed at eye level on the electrical equipment if at all possible), or as directed by the Mosaic site engineer (or designate). The label is to be placed on the outside of the specific panel or enclosure door of the MCC/Electrical Equipment/SWGR that the label applies to.

4.1 Temporary Arc and Shock Labels for Electrical Equipment

4.2 Temporary labels may be applied that supersede the main label. If a temporary label is applied, the main label is to be removed or obstructed such that it is obvious that an alternate label is to be followed.

4.3 Location of Labels for Multiple Scenarios

Frequently, a specific electrical device or equipment may operate under different incident energy levels depending upon the energy source, switching options, and protection device settings. For example, a switch gear lineup might have one arc-flash hazard level when energized from the utility, and another when energized from an emergency generator. Other common scenarios are:

- Changing protective relay settings through a maintenance switch – Arc Reduction Maintenance Switch (ARMS)
- Source of upstream energy (utility, generator, protective device settings, etc.)
- Changes in switchgear configuration through tie-switches, transfer switches, etc.
- Different sources for energy (Generator or Utility)

In these cases, multiple labels may be required and placed on the electrical equipment. The requirement and location for the second label will be determined by the Mosaic site engineer (or designate). Care must be taken to clearly indicate the equipment portion that the labels apply to, and which scenario the label is applicable to. This should be indicated in the Equipment Name field. Using a generator and transfer

switch as an example, one label should indicate "*#1234 – Utility*", and the second "*#1234 – Generator*".

4.4 Maintenance of Arc-Flash and Shock Warning Labels and Building signs

Damage, illegible or missing labels, or signs are to be corrected as soon as practical.

Labels are to be kept legible and up-to-date. It is suggested to audit labels at scheduled intervals, however it is recommended this interval not exceed three (3) years. Arc-Flash incident energy levels can change when the electrical distribution system is modified, including changing settings on circuit breakers or protective relays. New labels are to be created accordingly.

4.5 Preventative Maintenance

If the abnormal condition increases the risk such that operation or maintenance practices are to be modified; the equipment requires an Abnormal Condition Label

The abnormal condition label must include:

-Cause on abnormal condition

-Restrictions and/or additional requirements

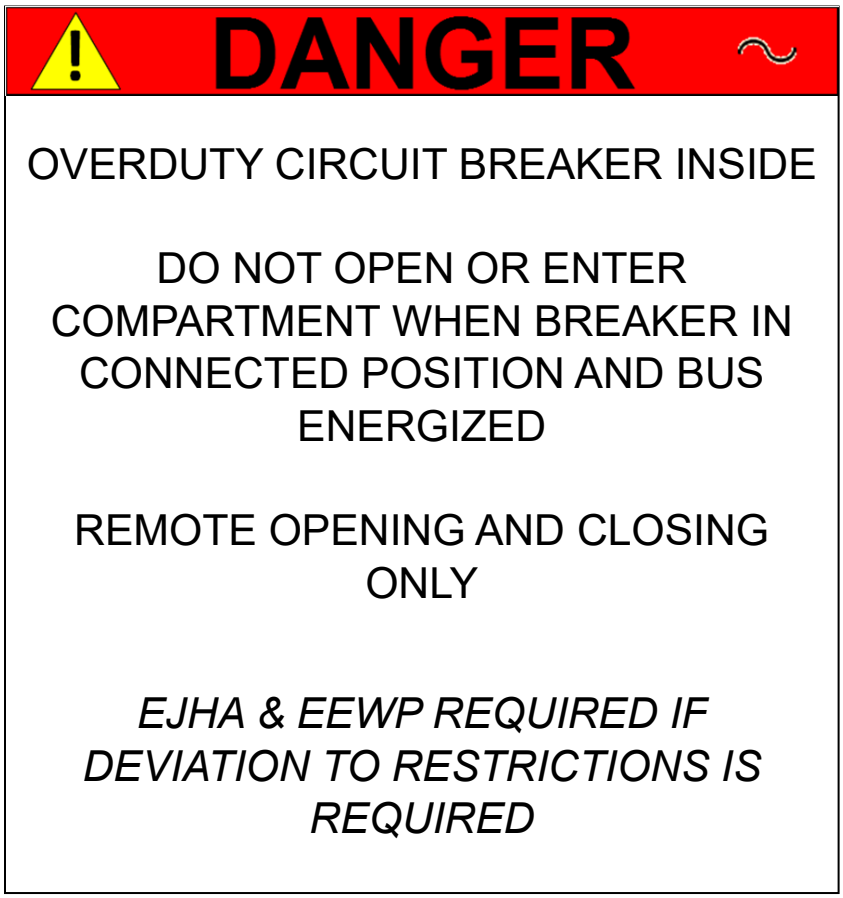
-Temporary Arc Flash information if applicable.

4.6 Examples of Abnormal Condition Labels

Examples of various abnormal condition labels are included below as reference for common abnormal conditions identified:

Concept: If abnormal condition and >PPE available, then Danger and EEWP required if deviation to restriction is required.

Overduty 15kV CB, >40cal/cm^2



Concept: If abnormal condition and >PPE available, then Danger and EEWP required if deviation to restriction is required.

Overduty 15kV CB, Overduty Bus, >40cal/cm^2

OVERDUTY CIRCUIT BREAKER INSIDE

DO NOT OPEN OR ENTER COMPARTMENT WHEN BREAKER IN CONNECTED POSITION AND BUS ENERGIZED

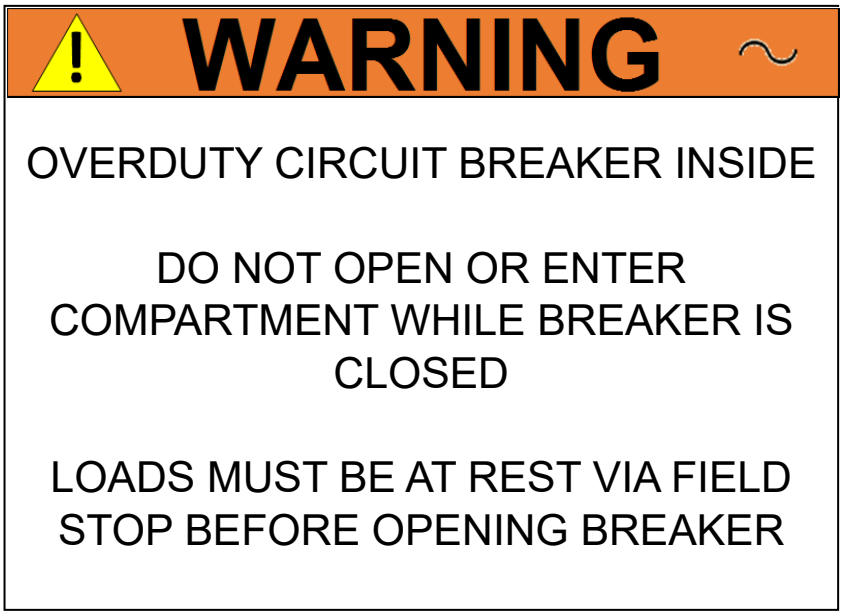
REMOTE OPENING AND CLOSING ONLY

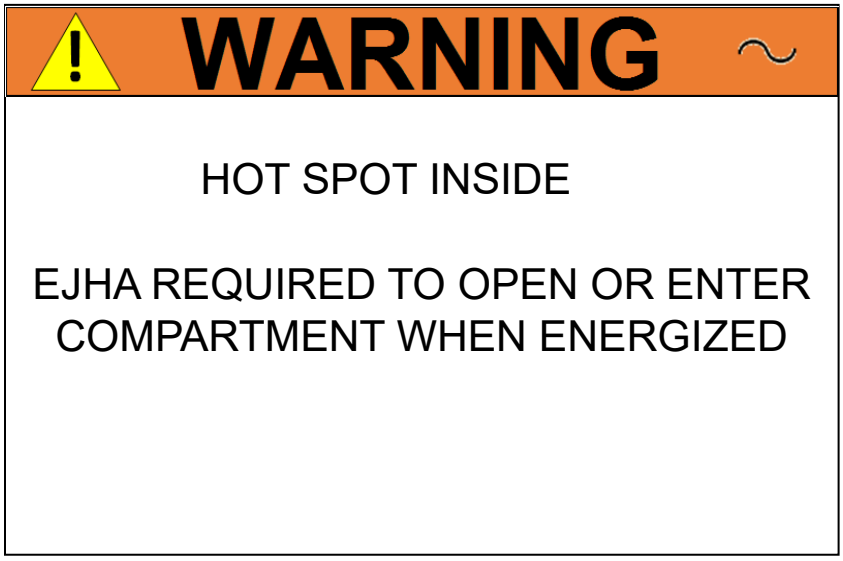
USE REMOTE RACKING SYSTEM FOR BREAKER REMOVAL OR INSERTION IF BUS ENERGIZED

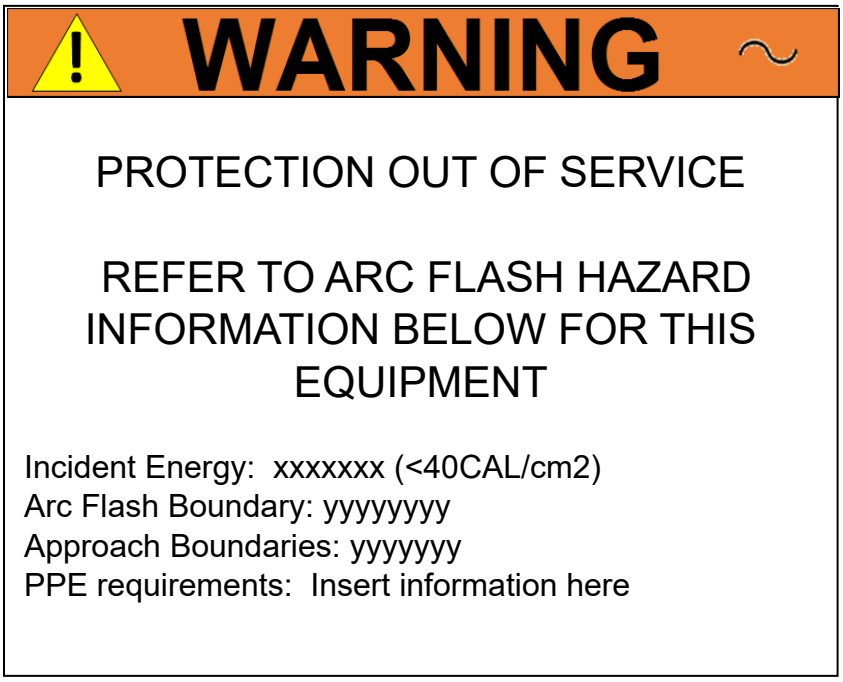
EJHA & EEWP REQUIRED IF DEVIATION TO RESTRICTIONS IS REQUIRED

Concept: If abnormal condition and <PPE available, then Warning and EEWP NOT required if deviation to restriction is required.

Overduty 480V Molded case CB in an MCC (no UV release, no SH trip), <40cal/cm^2


WARNING
OVERDUTY CIRCUIT BREAKER INSIDE
DO NOT OPEN OR ENTER COMPARTMENT WHILE BREAKER IS CLOSED
LOADS MUST BE AT REST VIA FIELD STOP BEFORE OPENING BREAKER


WARNING
HOT SPOT INSIDE
EJHA REQUIRED TO OPEN OR ENTER COMPARTMENT WHEN ENERGIZED


WARNING
PROTECTION OUT OF SERVICE
REFER TO ARC FLASH HAZARD INFORMATION BELOW FOR THIS EQUIPMENT
Incident Energy: xxxxxxx (<40CAL/cm2)
Arc Flash Boundary: yyyyyyyy
Approach Boundaries: yyyyyyy
PPE requirements: Insert information here