

Emergency Response Plan
Pike Solar Project
El Paso County, CO

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On behalf of:
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1 Introduction

1.1 Overview

This Emergency Response Plan provides guidance and protocol for preparing for and responding to emergency events at the Pike Solar Project (collectively referred to herein as “the Project”) located in El Paso County, Colorado. It identifies roles for site personnel, gives information for emergency responders for accessing the site, and commits to processes for responding to an emergency. The document puts forward evacuation plans, communication requirements, and training requirements. It has contact information for local hospital, police, fire, and OSHA as well as project personnel.

For entities involved with the Pike Solar Project – years of good customer service, quality work, and responsible public reputation, as well as employee confidence, can be undone in an hour if a crisis is not professionally managed. While likelihood of a crisis occurring can be minimized by proper planning and sound operational management, unforeseen events are encountered on all types of facilities. It is essential to have a system in place for emergency response.

1.2 Regulatory compliance

Pike Solar LLC and Colorado Springs Utilities will comply with applicable local, state, and federal regulations pertaining to emergency response. The overall emergency response strategy for any type of event is centered around preparation, sensibility, leadership, and communication.

1.3 Relevant personnel and qualifications

Employees and contractors will be competent and qualified with the capacity and understanding to undertake emergency response actions. Safety supervisors and site personnel tasked with emergency response roles will be verified or receive relevant training guidance as part of site orientation on topics such as electrical safety, first aid, and site-specific operations. Consultants and contractors tasked with any emergency response roles will provide contact information and updates on any changes to assignments.

1.4 Relation to Fire Prevention and Protection Plan

In addition to this Emergency Response Plan, a Fire Prevention and Protection Plan was created to specifically address threats from fire. The Plan was created with input from the Hanover Fire Protection District and will be reviewed in advance of construction and operations of the facility. The Emergency Response and Fire Prevention and Protection Plan are consistent with each other provide necessary detail for site personnel, emergency responders, and visitors to the Project site.

1.5 Health and Safety Program

Personnel will be adequately trained to perform their jobs in a safe manner. Personnel involved in energized electrical work involving a difference of potential greater than 50 volts to ground or any other conductor, must receive training in avoiding the electrical hazards associated with working on or near exposed energized parts prior to performing energized electrical work. Work and materials used for construction and operation will follow Safety and Health Standards promulgated under the Occupational Safety and Health Act. The Safe

Work Practices included for the Project is a manual for establishing and maintaining environmental, health, and safety precautions and provides issue-specific standards to ensure safety of site personnel. Each contractor entering the site for the first time needs to complete an initial orientation

1.6 Final Emergency Plan

The Emergency Response Plan will be finalized following the full permitting process with El Paso County, including 1041 Permit, Site Plan Review, and Pikes Peak Regional Building Department. Relevant outcomes and recommendations from the County's planning and permitting process will be incorporated into a final document. The final version of the Emergency Response Plan will be provided to listed emergency responders and a hard-copy will be housed on-site at the Pike Solar Project's O&M shed and a copy will be held at any O&M office monitoring the facilities remotely. The plan will be reviewed on a routine basis for potential adjustments. The following steps shall be implemented to ensure that the final Emergency Response Plan can be effectively executed:

1. All employees must be familiar with the facility Emergency Response Plan and participate in regular drills and training activities.
2. Safety observations or concerns shall be reported to the supervisor or the juwi Site Safety Representative.
3. Emergency information shall be posted in appropriate locations. The Emergency information shall include phone numbers for the ambulance, fire, and police departments. The phone numbers for the selected medical clinic and hospital will also be listed. The numbers for the key Emergency Action Plan participants will also be listed.
4. Laminated paper maps to the clinic and hospital shall be posted in the construction trailers (when onsite), substation control building, and operations and maintenance (O&M) building.
5. First aid kits and Automated external defibrillators (AEDs) will be stationed in construction trailers (when onsite), substation control building, and O&M building
6. Emergency evacuation signals shall be predefined and communicated to all.
7. Designated evacuation routes and exits shall be clearly marked, unobstructed, and used.
8. When an alarm or other notification is activated, employees must report to an assigned assembly area or proceed to a designated area of safe refuge and remain there until instructed otherwise.
9. All fires must be reported immediately, regardless of their size.
10. The instructions of all emergency response personnel must be followed.
11. In the event of an emergency, employees are instructed to practice SWIM if it is safe to do so:
 - S**ecure the scene
 - W**arn others
 - I**nforn the appropriate project personnel
 - M**onitor the situation until qualified emergency response personnel arrive

2 Project Descriptions for Emergency Responders

2.1 Location of Pike Solar Project

The Pike Solar Project is located on parts of Sections 6, 7, 18, 30, and 31 in Township 16 South, in Range 64 West of the Sixth Principal Meridian, and parts of Sections 1, 11, 12, 13, 14, 24, 25, 26, 35, and 36 in Township 16 South, in Range 65 West of the Sixth Principal Meridian in El Paso County Colorado. The footprint of the Project hosting solar arrays and ancillary equipment is approximately 1,200 acres.

The Pike Solar Project is approximately 5 miles southeast of the city of Fountain on the Colorado Front-Range east of Fountain Creek and Interstate-25. The Project is adjacent to the Colorado Springs Utilities' Williams Creek Pump Station and Palmer Solar.

- Directions to the south access point and Pike Solar Project (Birdsall Road): Heading south on I-25; take exit 122 toward Pikes Peak International Raceway; follow for 0.4 miles and turn right onto Old Pueblo road; follow for 3 miles and turn right on Birdsall Road. South access is approximately .86 miles traveling east on Birdsall Road.
- Directions to the north access point and Pike Solar Project (Squirrel Creek Road): Heading north on I-25; take Exit 132A; turn right onto State highway 16 (Mesa Ridge Parkway), follow for 3.0 miles; turn right onto Mesa Ridge Parkway, follow for 1.3 miles. Turn right onto S Marksheffel Road, follow for 0.85 miles; turn right onto C&S Road, follow for 0.28 miles; turn left onto Link Road, follow for 1.0 miles; take a left onto Squirrel Creek Road, follow for 2.47 miles to a gravel road leading to the Fountain Landfill on the right. Take a right and travel south along the gravel road for 2.1 miles to the Pike Solar entrance.

Pike Solar Project/North Entrance:

Coordinates: 38°40'00.78" N; 104°38'11.08" W

Address: TBD

Pike Solar Project/South Entrance:

Coordinates: 38°37'28.76" N; 104°39'41.18" W

Address: TBD

2.2 Pike Solar Project Overview

The Pike Solar Project consists of eight separately fenced areas containing single-axis tracker arrays with photovoltaic modules. In addition, the Pike Solar Project includes a Battery Energy Storage System (BESS) that is in a separately fenced portion of the project. The BESS consists of containerized units that house lithium-ion battery modules with the associated safety, controls, monitoring and climate control equipment. Each BESS unit will be electrically connected with a combined direct current/alternating current (DC/AC) inverter and transformer power station unit. The fenced solar areas and BESS will feed into the project substation via underground 35kV lines. The project substation will be connected to the 230kV Williams Creek Substation, which is owned by the Colorado Springs Utility.

The existing Williams Creek Substation is substantially larger (operating at a 230-kV level) than the Pike Solar Project Substation (operating at a 34.5-kV level on the low-side). The Williams Creek Substation interconnects the solar facility onto the Colorado Springs Utilities electrical grid (see site layout). Each substation will have control rooms made of non-combustible construction. The groundcover for the substations is comprised of crushed stone and provides a sizable space for safety purposes. Both substations will be designed to standards set by the NFPA and the NESC and will meet safety standards set by Colorado Springs Utilities and the Pikes Peak Regional Building Department.

The principal technological component on the Pike Solar Project site are photovoltaic (PV) modules; as many as 7700 solar rows. Solar modules are mounted onto a racking system that allows for the panels to “track” the sun. The PV module and DC cabling and combiner box technology used at the facility is designed to not be combustible and/or flammable. The technology meets national standards and material specifications pertaining to electrical design and fire prevention. PV technology does not present an increased fire risk for the site: modules are not a fire risk and the site will have minimum fuel to support a fire. Vegetation will be kept short with regular mowing and weed control, as needed. This will keep the amount of available vegetative fuel within the facility to a minimum. There is only one O&M structure within the facility and will abide by relevant building codes.

2.3 Solar Facility Electrical Considerations

Solar electric systems present the unique condition of having two electrical power sources. Electricity is supplied from both the utility and from the solar electrical system. AC Power can be shut off immediately, but DC power may still generate from the facility. Disconnecting the utility power will not shut off the electricity generated by the solar array. Voltages can be present, even in low light conditions. Emergency Responders should not undertake aggressive emergency response actions inside the facility that may result in injury from electrical system.

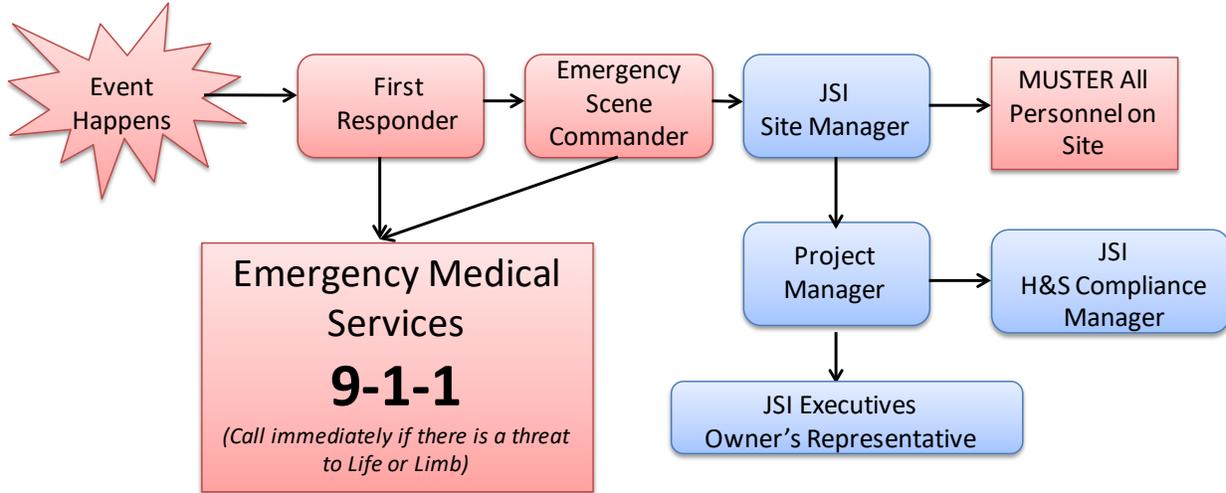
2.4 Emergency Responder Access

The Project has adequate fire access throughout the facility; designed to be consistent with El Paso County code and with coordination from Hanover Fire Protection District. Please see the separate Fire Prevention and Protection Plan for additional information. Key components for access include:

- Maintaining a 20-foot perimeter for fire access outside the fence line
- Maintaining a 20-foot perimeter for fire access within the fence line
- Internal site access roads are gravel/compacted dirt to provide access to each of the inverters and step up transforms (jointly identified as power station on the WSEO Map).
- Interior and exterior access routes provide improved fire access across property from current conditions

- Access routes have turnarounds and have adequate surface, width, turning radiance, and vertical clearance for responders
- There are three access points on the west side for each array area and one single access point on the east side. At each access point there is a 20-foot wide security gate with a Rapid Entry Box (or Knox Box). Rapid Entry Boxes are identified in the Fire Protection and Prevention Plan and the associated map.
- Between rows, there are small access aisles for operations and maintenance purposes. The space between these areas is small and is not generally suitable for emergency vehicle. Access aisles, however, could provide access via walking or with a 4x4 OHV.

3 Emergency Response Flow Chart



4 Emergency Response Overview and Processes

4.1 Detection, Notification and Communication

4.1.1 Detection

Detection may come from a direct staff observation or remote office that tracks and monitors equipment triggers. The Pike Solar Project will be monitored remotely at all hours when in service (Monday through Sunday – sunrise to sunset). As a photovoltaic facility, it produces power during the day. The facility has design elements for remote notification and automatic shutoff procedures if the facility encounters an electrical problem. Using SCADA technology, O&M staff can monitor individual segments (blocks and strings) of the facility and diagnose problems, such as electrical malfunction, underperforming modules, or even an emergency event. The bulk of direct monitoring functions by O&M specialists will take place when the facility is delivering power onto the electrical grid (daytime).

4.1.2 Notification and Communication

Use the flowchart and contact list to notify appropriate emergency responders. The contact list will be continually updated and held by Colorado Springs Utilities, local 911 dispatch, and operator of the Pike Solar Project.

The following 8 steps should be used for all emergency notifications:

- 1. Notify** 911 immediately

Give the name of the site, address, and directions (if needed) to operator. For example, provide directions on whether to access the site from Old Pueblo Road or Squirrel Creek Road. Identify yourself: name, phone number, work location, and classification.

- 2. Describe** type of situation

Categories include:

- Medical Emergency
- Fire
- Construction Emergency
- Extreme Weather Emergency
- Transport Incident
- Act of Sabotage or Vandalism

Detail numbers affected from initial assessment:

- Fatalities
- Major illness
- Major injuries
- Minor injuries
- Bites/stings

- Weather effects
- Incident types

3. Locate

Give the 911 dispatcher more specific location of the emergency, referring to the area within the solar facility. Let operator know of any unique conditions pertinent to the solar facility and safety near an electrical generation facility.

4. Notify O&M Supervisor

Notify O&M supervisor of conditions at the facility that may influence electrical generation or for additional support communicating and providing information to emergency responders. For non-urgent medical attention, O&M supervisor can help support arrangements, such as transport from site to the hospital or Urgent Care facility.

5. Notify Project Owner

The O&M supervisor will contact Project Owner supervisor who will assist as necessary in emergency response. Jointly, O&M supervisor and Project Owner supervisor will arrange for additional support and emergency responders to attend the scene of the emergency.

6. Notify Colorado Springs Utilities

The Pike Solar Project connects to the Colorado Springs Utilities grid. If there are conditions or circumstances that may change power conditions or that may harm Colorado Springs Utilities infrastructure, notify the appropriate Colorado Springs Utilities contact. If the Pike Solar Project cannot be operated consistent with agreements made to Colorado Springs Utilities, notification is required.

7. Coordinate

The supervisors (collectively, O&M Supervisor, Project Owner Supervisor, and Colorado Springs Utilities Supervisor) will assist with the situation and send necessary employees to the access point or meet-up points.

8. Accompany

Site personnel or on-site employee may be needed to escort and provide direction to emergency responders at the location of the emergency. Site Leader may also announce any necessary evacuations instructions to site personnel.

4.2 Pike Solar – Emergency Response Overview

The follow conditions apply for all emergency responses:

- PV components are always assumed to be “hot”: consider that PV systems and all their components are electrically energized.

- Never climb on top of the modules. While the racking system and glass may support the weight load, there is a potential for glass to break from uneven pressure applied to the panels. Direct exposure to the cells inside can pose an electric shock and arc flash hazard for site personnel.
- Never place a ladder on or against the modules
- Never break a PV module with an axe or tool for forced entry
- Leave solar modules in place and work around the system. Do not attempt to move them.
- Do not cut metal conduit or wires between modules or wires from combiner boxes. This may result in fatal injury from electrical shock.
- Do not spray water directly on to energized panels
- Utilize walkways and clearances on perimeter and within fence line
- Access and lock box locations are provided to Emergency Responders

The checklist provides an overview of necessary actions in addition to issue-specific protocols described thereafter:

		Initial when Completed
1.	Secure the accident scene to prevent further damage/injuries	
2.	Provide Emergency Medical Services (if appropriate)	
3.	Notify ALL appropriate Emergency Response Services (including OSHA, if applicable).	
4.	Coordinate site access for Emergency Response	
5.	Muster all personnel on site at the predetermined muster location	
6.	Notify O&M Point of Contact, Project Manager and Compliance Manager	
7.	O&M Point of Contact shall notify Management and Owner's Representative	
8.	Maintain a log of events as they unfold, including phone calls made/received	
9.	Collect witness statements as applicable	
10.	Determine if project should be shut down (work stop)	
11.	Refer all media requests to Pike Solar LLC	
12.	Cooperate with local public authorities (police, fire, federal/state OSHA, etc.)	
13.	Complete an Incident Report form	

14. Take pictures to document the incident when applicable	
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4.3 Response for an accident, injury, or medical emergency

In the event of an accident, injury, or medical emergency:

- For medical emergencies immediately contact 911 followed by O&M Point of Contact. Identify the victim and yourself.
- If it is safe to do so, provide comfort and support to the victim(s) and wait near the scene to assist or direct other responders to the scene, unless otherwise directed to wait in another safe location. Trained responders are to act according to national standards for basic first response.
- Notify Site Leader or designated Emergency Response personnel as soon as possible
- Site Leader or designee will announce necessary information to site personnel
- Site Leader or designee if necessary, will designate a person to meet the Local First Responder at the east or west entrance gate
- Site Leader or designee will proceed to the location of the accident, injury, or medical emergency to assess the situation and make any additional response or notifications as required
- Site Leader or designee will perform hazard assessment and mitigate any further risk of accident or injury including shut down of equipment and opening of breakers or switches
- Alternatively, Site Leader or designee can call operator and maintainer of Solar facility or Colorado Springs Utilities (which monitors interconnection of power on to its grid) to undertake remote shutdown of equipment

Employee/Visitor notification requirements in the event of accident, injury or medical emergency”

- Advise the person in charge/supervisor immediately or as soon as possible when
 - Experiencing illness
 - Involved in an accident, no matter the significance
 - Injured, no matter the significance
 - Unsafe conditions on site
 - Unsafe actions on site
 - Conditions that may negatively affect wellbeing of site personnel or adjacent properties
- If the accident did not result in an injury
 - Determine if an unsafe condition is evident

- Complete a near miss log
- If the accident resulted in an injury, complete a full event log
- Medical Treatment: if the injury or illness requires medical treatment,

4.4 Toxic Gas/Underground Utility

- If damage to an underground utility occurs, notify the utility operator promptly.
- If the damage results in the release of hazardous gases or liquids, both the utility operator and appropriate emergency response officials (911) shall be notified immediately.
- Obtain immediate and adequate treatment for any injured persons.
- Minimize risk of exposure to persons or property.
- Minimize disruption to the remaining portion of project.
- Make sure the area of the gas leak is properly isolated and secured. Determine prevailing wind direction and make sure ALL personnel downwind of the leak are evacuated.
- Coordinate a rescue effort if necessary.
 - No rescue effort shall be attempted except by certified personnel who are trained and equipped with PPE adequate for the type and concentration of gas hazard. Make sure the fire department or other agency rescue personnel are aware of all pertinent information before a rescue is attempted.
- Conduct a head count of all employees and subcontractors to ensure no personnel are missing.
- If necessary, close off jobsite until all subsequent investigative activities are completed by all interested or affected parties.

4.5 Response to Catastrophic Weather

- Radios, phone, or air horns will be used to alert project personnel in any emergency
- In a tornado, employees should not seek shelter in vehicles or under a bridge. If the tornado is visible, but far away, employees may be able to drive out of its path, if not in a congested area. Otherwise employees must park the vehicle and seek shelter in a safe area.
- Ensure switchgear, load center, and doors are closed and latched.
- Get to safe area
- When the storm has passed, employees should converge at the designated muster point of the project and conduct a head count.

- Even though an office trailer may be well anchored, personnel should quickly seek other shelter when warned of an approaching tornado. Even anchored trailers are NOT safe in a tornado.
- Substation and solar panels have safety mechanisms to minimize impacts to the electrical grid in the case of an electrical strike.

4.6 Response to Small/Spot Fire

Spot fires are small fires within the facility that are not located on electrical infrastructure and are not a vegetation fire. An example might be trash fire or small fire near a vehicle.

- Immediately notify O&M Point of Contact
- A call is immediately placed to 911 (likely to the Hanover Fire Protection District) with location and description
- Commence evacuation of any on-site personnel that are in immediate vicinity of fire and are non-essential for response
- Designated emergency responders or those trained in response (including subcontractors) determine whether to attempt to put out fire with extinguishers on site (see site map)
- All vehicles are to carry fire extinguishers when on site.
- If evacuation of site is necessary, notify all personnel on site and identify evacuation location
- O&M staff to begin remote shutdown of equipment and any on-site actions to de-energize site. The PV arrays shall ALWAYS be considered to be energized during daylight and twilight hours.
- Fire District will determine when reentry is safe

4.7 Response to Large Fire

- Following detection of fire, call 911 and then notify O&M Point of Contact to report the fire, including location and relevant factors
- Immediately evacuate the area and ensure safety of site personnel using radio and other communication devices: identify fire and designated meeting area
- O&M Hanover Fire District will be first responder for this type of event and will determine needs, recruitment, employee assistance, coordination with Colorado Springs Utilities, coordination with the public and property owners, and general operations for unique conditions at the site
- Hanover Fire District will coordinate any responses with adjacent property owners

- O&M will safely shut down equipment remotely and provide any intel to emergency responders on plant function and condition
- Facility personnel are not to use fire extinguishers or undertake fire management
- Do not attempt to extinguish fire near electrical equipment
- Firefighters should follow the minimum standard in NFPA, Protective Ensemble for Structural Firefighting, and NFPA 1500, Chapter 7, Personal Protective Equipment
- It is safe and appropriate for Hanover Fire District to put water and undertake measures on threatened exposures and vegetation outside of the solar facility. This is the best way to minimize spread of the fire to land outside the property or to adjacent areas.

4.8 Response to Vegetation Fires

This scenario may arise from an off-site spark or nearby piece of equipment. The vegetation of the facility will be managed to minimize fire risks, particularly larger fast-paced burns. Overall, it is anticipated that any vegetation fire would be short in duration compared to rangeland fires elsewhere in the region. This is primarily due to the lack of fuel available for a persistent burn on-site. Apply the following procedures for vegetative fires:

- Immediately notify 911 and O&M Point of Contact
- Do not attempt to put out the fire with water or chemicals if located near electrical equipment
- If fire moves away from arrays or inverters to outside area, attempt to extinguish flames if it is safe to do so
- Firefighting efforts beyond incipient stage will be performed by trained outside responders (Hanover Fire Protection District) only

4.9 Response to Emergencies at Substation

- Evacuate the area
- For emergencies at the Williams Creek Substation, notify 911 and Colorado Springs Utilities. Either entity will be immediately notified by the other in the event of a fire at or near the Williams Creek Substation
- For emergencies at the Pike Solar Collector Substation, notify 911, Colorado Springs Utilities, and the Pike O&M services provider. Each other entity will be immediately notified by the first in the event of a fire at or near the Pike Solar Collector Substation.

- Never use water on energized electrical equipment inside the substation. Proving that the system is dead and de-energized is difficult and the system should always be assumed to be energized until proven otherwise by qualified personnel as a part of the unified command process.
- For emergencies at the Pike Solar Collector Substation, emergency responders should request notification from the Colorado Springs Utilities operations center that the Pike 230kV gen-tie line is de-energized and disconnected from the Williams Creek substation. Emergency responders should request notification from the Pike O&M services provider that both the 230kV and 35kV yards of the substation are de-energized, all Pike substation breakers are in the OPEN position, and all power stations in the PV field are out of service.
- A fire or other emergency could prevent the Supervisory Control and Data Acquisition System (SCADA) from operating correctly, meaning that either the Colorado Springs Utilities operations center or the Pike O&M services provider may not be able to remotely observe whether the system is energized or not.
- Actionable proof that the electrical system is de-energized and isolated requires strict adherence to the unified command process.
- A fire in or on the substation control building does not require an electrician to verify that the system is de-energized. The highest voltage present in the substation control building is 240V_{AC}. A 125V_{DC} lead-acid battery bank exists inside the substation control building.

It is considered best practice to let burning electrical equipment continue to burn. It is safer for the emergency responder to protect the adjacent vegetation and non-electrical structures instead of attempting to extinguish the electrical equipment fire. Electrical equipment which is affected by fire is considered to be totally destroyed, and so it is not worth the risk to put it out.

- Emergency responders should not park vehicles in front of gates, beneath transmission lines, or beneath distribution lines
- Do not touch the substation fence or gate and stay away from the access point until a Colorado Springs Utilities agent has arrived
- If a conductor or other piece of equipment is lying on the fence or other equipment, do not touch anything and keep well clear of the area. If the line is still energized, or if the utility breakers reclose, then a dangerous touch potential and a dangerous step potential should be assumed to exist in the vicinity of the downed conductor. Such touch and step potentials could cause ventricular fibrillation and burns.
- Maintain a wet safety perimeter surrounding the substation facility
- Hanover Fire Protection District will be the primary responder for this event and may inform other responders of the dangers

- Fighting a fire in the substation should happen with guidance from a Colorado Springs Utilities agent
- It is safe for Hanover Fire District to put water on threatened exposures outside of the Substation
- In high voltage emergencies involving an electric substation or a generation plant, the unified command process is the only way to guarantee success and assure the safety of all responders and utility personnel at the scene. Unified command at utility emergencies provides a joint method for incident management teams to tailor response to specific conditions at the substation:
 - Determine incident priorities and identify strategic goals
 - Select tactics for achieving the strategic incident goals and priorities
 - Ensure joint planning for objectives and tactical activities
 - Allow joint tactical operations to be conducted
 - Maximize the use of all assigned resources
 - Provide a method for resolving conflicts among the stakeholders
- Common strategic goals at utility emergencies could include the following:
 - Rescue (if possible and can be done safely)
 - Public protective actions (isolate downed wires, arc safety and downwind evacuation)
 - Preventing cooling oil from impacting the environment
 - Fire suppression and control
 - Safety during restoration operations
- Ray Nixon Power Plant is identified in maps as the closest location with full-time transmission operator staff (Colorado Springs Utilities). Staff at this location may be able to provide emergency response- it is ultimately at the discretion of Colorado Springs Utilities emergency response team to identify who and if response personnel are to be deployed.

4.10 Response to Emergencies at BESS

- Immediately activate the nearest alarm
- Notify 911 and Colorado Springs Utilities. Either entity will be immediately notified by the other in the event of a fire at or near the Williams Creek Substation
- Emergency responders should not park vehicles beneath transmission lines or distribution lines
- Evacuate the area and congregate all onsite staff upwind of any venting BESS units
- Maintain a wet safety perimeter surrounding the BESS
- Do not open any BESS container until a Pike Solar LLC representative has confirmed that the fire suppressant has been deployed and dissipated the internal heat. Opening the door allows air in and drastically accelerates combustion.

- Never puncture a battery cell
- It is safe for Hanover Fire District to put water on BESS units next to the unit with an incipient thermal event. The Pike BESS equipment will have gone through the UL9540A test procedure and demonstrated that a fire condition in one unit will not spread to neighboring units.
- In large scale battery fire tests, water has been shown to be a safe and effective secondary defensive fire suppression agent due to its cooling capacity, but do not open a battery unit to access the modules.
 - The possibility of current leakage back to the fire hose nozzle, and ultimately the fire fighter is insignificant based on testing data published in the Fire Protection Research Foundation's report *Best Practices for Emergency Response to Incidents Involving Electric Vehicles Battery Hazards: A Report on Full Scale Testing Results*.
- If the decision has been made to fight any onsite battery fire, first responders must be minimally equipped with the following PPE.
 - Fire protective turnout gear
 - Boots
 - Helmets
 - Standard structural firefighting gloves
 - Self-contained breathing apparatus (SCBA)
 - Arc flash hazard safety gear rated for 40cal/cm², or as shown on the arc flash hazard safety label, as required by NFPA 70E.
- Any battery modules that show physical signs of damage or have been through a known thermal or physical event outside of the normal operating parameters must be evaluated before any handling. For any procedure that requires handling battery modules staff must be equipped with the following minimal PPE.
 - Hardhat
 - Safety glasses
 - High visibility vest
 - Safety shoes or boots
 - 1000 V rated dielectric gloves
 - Fire rated full-sleeved shirt and pants capable of withstanding a minimum of 40 Cal/cm² arc flash, or as displayed on the arc flash hazard labels which will be conspicuously affixed to the exterior of the equipment enclosure.
- A battery fire may continue for several hours and may undergo multiple re-ignition events. It may take 24 hours or longer for the battery pack to cool.

- Hanover Fire Protection District will be the primary responder for this event and may inform other responders of the dangers
- In high voltage emergencies involving a generation plant, the unified command process is the only way to guarantee success and assure the safety of all responders and utility personnel at the scene. Unified command at utility emergencies provides a joint method for incident management teams to tailor response to specific conditions at the substation:
 - Determine incident priorities and identify strategic goals
 - Select tactics for achieving the strategic incident goals and priorities
 - Ensure joint planning for objectives and tactical activities
 - Allow joint tactical operations to be conducted
 - Maximize the use of all assigned resources
 - Provide a method for resolving conflicts among the team players
- Common strategic goals at utility emergencies could include the following:
 - Rescue (if possible and can be done safely)
 - Public protective actions (isolate downed wires, arc safety and downwind evacuation)
 - Preventing cooling oil from impacting the environment
 - Controlling the spread of oil around the substation
 - Fire suppression and control
 - Safety during restoration operations

4.11 Battery Electrolyte Exposure

Battery electrolyte can only leak from a cell if it has been punctured by a sharp object or been exposed to extreme external blunt force, extreme external heat, or an internal voltage beyond its design limit. Please refer to the final material safety datasheet for more information. If any gases are seen venting from a BESS unit, immediately evacuate the area and contact the CSU and Pike Solar LLC operations staff and the Hanover Fire District. If any staff or first responders have been exposed to electrolyte from the system or vented gas from the modules, alert emergency personnel and follow the procedures below.

- **Inhalation of vented gas from a cell, smoke, or vapor:** Immediately evacuate the contaminated area and seek medical attention. Vented gases may irritate the eyes, skin, and throat. Vented cell gases are typically hot; upon exit from a cell, vent gas temperatures can exceed 1,110°F. Contact with hot gases can cause thermal burns. Vented electrolyte is flammable and may ignite upon contact with an ignition source such as an open flame, spark, or a sufficiently heated surface. The venting system on any UL9540 certified system will be capable of limiting the concentration of vented gas inside the unit below 25% of the composition's lower flammable limit.
- **Eye contact with electrolyte:** Immediately rinse eyes with water for 15 minutes and seek medical attention.

- **Contact with skin:** Wash the contacted area thoroughly with soap and water and seek medical attention.
- **Ingestion:** Induce vomiting and seek medical attention

4.12 Chemical/Oil Spills and Releases

Spills or release of any chemical is a potentially serious event. In the case of a spill of hazardous or potentially hazardous chemicals, site personnel are to utilize services of outside personnel to respond to the release. In other words, site personnel are to not undertake any cleanup or attempted cleanup actions for spilled substances. If safe to do so, site personnel can take actions to help contain or stop spills. This should only be done by site personnel with proper training and understanding of both the spilled material and the operational functions of the Project. Undertake the following steps:

- If the spill is a result of a direct human action and continued release is preventable, personnel should take appropriate action to stop continued release
- Once a spill is discovered, move to a safe distance that still allows for observation
- Communicate and warn other personnel of site conditions
- Notify O&M personnel and Site Leaders over cellphone or radio
- Provide necessary information: type of release, location, source of the spill, injuries, boundaries, whether it is contained, quantity, environmental impacts, potential environmental impacts
- If there is a threat to safety or neighboring parcels, immediately call 911
- Site Leader makes determination on how to notify appropriate agencies and ensure consistency with Spill Prevention Control and Countermeasure Plan (SPCC).
- Site personnel should place safe boundaries and warnings to avert accidental contact with substance
- Site personnel shall add barricade and other means to prevent the spill from migrating to additional areas or systems and other direct actions as necessary
- Once barricade and preventative measures are deemed adequate, wait for direction from authorities or outside agency

5 Emergency Response Contacts

Emergency Services	Emergency	Non-Emergency	Address
Fire/EMS	911	(719) 382- 1900	Hanover Fire Protection District 13325 Old Pueblo Road Fountain, CO 80817
Police	911	(719) 390-5555	El Paso County Sheriff's Office 27 East Vermijo Avenue Colorado Springs, CO 80903
Environmental (Spill) Colorado Department of Health and Environment	1-877-518-5608	1-877-518-5608	https://www.colorado.gov/pacific/cdphe/categories/concerns-and-emergencies
ER UC Health Emergency Room - Fountain	911	(719) 390-2680	7890 Fountain Mesa Rd, Fountain, CO 80817
Urgent Care QwikCare MD Urgent Care Center	N/A	719) 471-2273	6908 Mesa Ridge Pkwy, Fountain, CO 80817
OSHA Colorado STATE OSHA (COSH)	(303) 843-4500	(303) 843-4500	Notify within 8 hours of 1 or more fatalities, or 3 or more hospitalized workers

Pike Solar Contacts	Name	Phone #
Site Manager	TBD	
Project Manager	Brian Vickers	720-838-2302
H&S Compliance Manager	Darnell Everett	303-996-4167
O&M Point of Contact	Ops Center	720-838-2323
Project Owner Site Lead	TBD	

CSU Contacts	Name	Phone #
Site Manager	TBD	
Project Manager	Warren Seese	719-668-8390
H&S Manager	Mike Pitts	719-668-7371
O&M Point of Contact	TBD	
CSU Dispatch		719-448-4800

6 Preparedness

6.1 Surveillance and Monitoring

Actions are taken to prepare for an emergency. Solar power plant needs to be monitored to detect breakdown and optimize their operation. Solar power plants’ monitoring strategies examine output of the installation and consequently, also identifies issues and potential emergencies before and as they arise. Energy metering of an inverter, for example, may determine generation and potential issues for a discrete area. Measurements also looks at temperature, loss of connection, changes in power flows, and other relevant dynamics. A responsive and attentive O&M team helps ensure the stability and success of a facility.

6.2 Emergency Response Timing Overview

<u>Access Point</u>	<u>Emergency Response Location</u>	<u>Trip Time*</u>
North	Hanover Fire Protection District - Station 2	17 minutes
North	Hanover Fire Protection District - Station 1	24 minutes
North	QwikCareMD Urgent Care Center	17 minutes
North	UC Health Emergency Room -Fountain	16 minutes
North	Ray Nixon Power Plant**	16 minutes
South/Williams Creek Substation	Hanover Fire Protection District - Station 2	8 minutes
South/Williams Creek Substation	Hanover Fire Protection District - Station 1	23 minutes
South/Williams Creek Substation	QwikCareMD Urgent Care Center	24 minutes
South	UC Health Emergency Room - Fountain	22 minutes
South/Williams Creek Substation	Ray Nixon Power Plant**	20 minutes

*Trip times are for a normal commuter based on [Google Map](#) estimations. Emergency response is expected to be faster in an emergency scenario. The average trip time for the last reporting year for Hanover Fire Protection District was 12.56 minutes.

**Ray Nixon Power Plant is identified as the closest location with full-time Colorado Springs Utilities staff and emergency response personnel. It is ultimately at the discretion of CSU on the best form of response for a particular emergency related to Williams Creek Substation.

6.3 Emergency response in the case of an obstructed Public ROW

There is a railroad that runs south-north that intersects Birdsall Road approximately .16 miles from the intersection with Old Pueblo Road (shown in figure below). From discussions with property owners, this portion of the Union Pacific/BNSS railroad occasionally obstructs vehicle traffic on the El Paso County right-of-way. This is a preexisting challenge for response to properties that are east of the railroad on Birdsall Road.

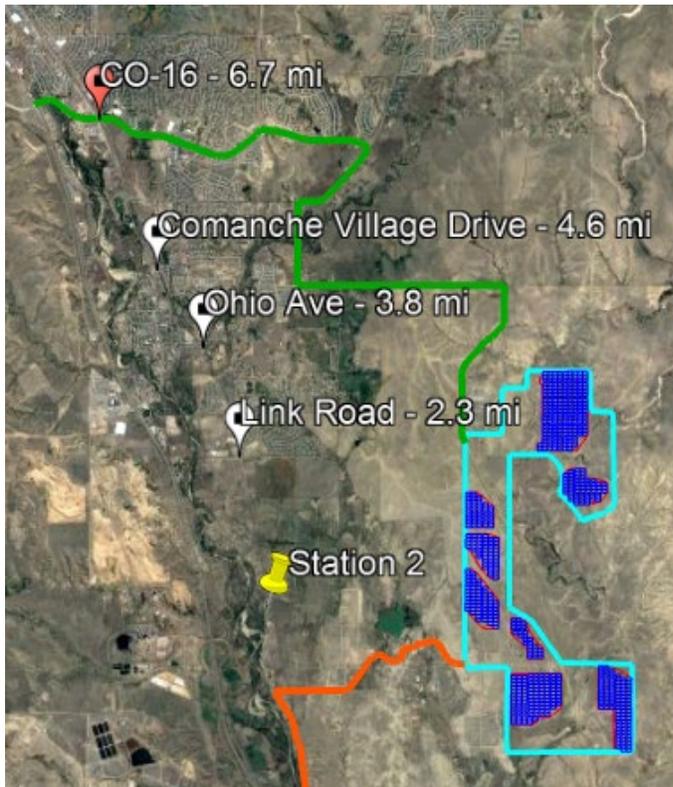
For purposes of clarity, there is not a demonstrated increase in fire risk from the Pike Solar Project. In fact, fire conditions are likely to improve. The PV facility will decrease the amount of potential fire fuel (vegetation) on the Project site and result in systematic monitoring of the site for potential emergencies. Nevertheless, Pike Solar LLC understands concerns of emergency response in the case of an obstructed public right-of-way and proposes the following access alternatives for emergency response. Figure 6.3a

depicts one of the default response routes for Hanover Fire Protection District, while Figure 6.3b depicts alternative points to cross the train tracks where a crossing may not be obstructed. The northern access to the site off of Squirrel Creek Road is not directly impacted by the railroad and may be accessed by one of many potential railroad crossings (Link Road, Ohio Ave, Comanche Village Drive) and will be accessible via the railroad overpass on CO-16..

6.3a – Railroad Crossing: railroad shown in orange and direction of emergency responder in yellow



6.3b – Alternative Crossings to the North with distances from HFPD Station 2



Hanover Fire Protection District's Station 2 is identified in yellow. If the southern, orange access route is the preferred access for the incident and is inaccessible due to a train on the tracks, the northern green access may be used instead. A train on the tracks may also block crossings at Link Road, Ohio Ave, and Comanche Village Dr (shown in white in Figure 6.3b) impacting access to the green northern access, however a train will not cause an access issue on CO-16 (shown in red). Any of these crossings to the north may be utilized if the Birdsall Road crossing is obstructed. Their respective distances from the Hanover Fire Protection District's Station 2 are also identified on the map. It is worth noting that the Hanover Fire Protection District's Station 2 is located adjacent to the railroad tracks. The fire squad will have immediate knowledge of whether there is a potential obstruction and if an alternative route should be used. The likelihood of a 5-mile or longer train obstructing all the public right of ways for a substantial amount of time does not appear likely. Nevertheless, the railroad obstruction is an existing condition for emergency response who are prepared and understand options for circumventing the logistical issue (Hanover Fire Department's average response time in 2015 was 12.56 minutes).

Finally, it is worth noting that Hanover Fire Protection District has an alternative response option for responding to an emergency. Station 1 (shown in Appendix B4) is located on the east side of the railroad tracks and could respond to an event coming from the east side of the facility.

6.4 Evacuation Planning

Site personnel are to be ready to perform two types of evacuations at the direction of the Site Leader or designated Health and Safety Leader:

6.4.1 Immediate Site Evacuation

This type of evacuation would be used only in the event of an emergency that is serious enough to warrant immediate evacuation of all personnel. Supervisors and operating personnel are to vacate the premises without regard for shutdown procedures of facility or implementing safety actions to the facility. Use this approach for immediate danger where injury or death is likely. Undertake the following steps:

- Issue evacuation notice
- Locate and obtain the visitor/contractor sign-in sheets if safe to do so. Locate and obtain all immediately accessible hand-held radios if safe to do so.
- Gather in the Administrative Building or Access Gate and determine safest muster area to proceed to, taking into consideration factors of emergency. In most cases, use the primary muster area and only select an alternative muster area if conditions require.
- Communicate the following information to outside personnel or emergency responders:
 - Muster area the employees will be proceeding to
 - Visitors or contractors that operating in the area
- Immediately head to muster area: do not delay

- Once at the muster area, take a head count and review sign-in sheet
- Identify and communicate all absent personnel to emergency responders and safety supervisors
- All personnel are to remain in the muster location until all clear signal is given

6.4.2 Delayed Site Evacuation

In this approach, non-essential personnel are to vacate the premises immediately as a precaution. Essential personnel remain in operating areas to perform shutdown and safety procedures on the Project. This is likely the primary type of evacuation for an event at the facility. If there is no immediate danger to injury or death, this is also the preferred evocation option. Undertake the following steps:

- Take necessary operating actions to place the facility in most stable condition possible based on type of emergency
- Locate and direct all non-essential personnel to proceed to designated muster area
- Locate sign-in sheet if safe to do so
- Perform additional facility shutdown instructions as directed by Site Leader
- Complete a headcount and confirm all personnel are accounted for.

6.5 Defensible Space and Vegetation Management

The Project provides defensible space by establishing setbacks from PV trackers to property lines: a minimum of 50 feet (30 outside the fence and 20 feet inside the fence). It also modifies any natural fuels by removing and replacing vegetation with low growing grasses and/or drivable surfaces. In the event of a fire, it is likely that emergency responders will focus on defensible space and preventing any spread outside the fence line of the facility.

Appendix A – Emergency Response Maps

A1: Fire Prevention and Emergency Response Plan



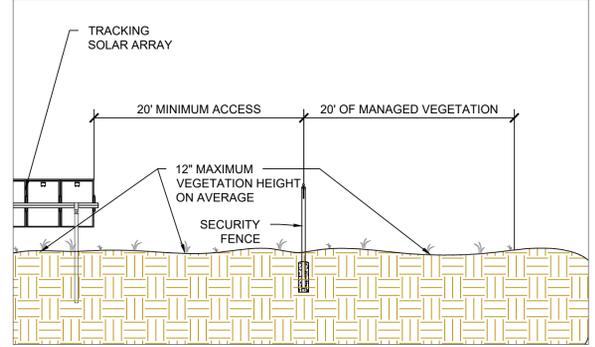
1 SITE PLAN
G106 SCALE: 1"=1200'

GENERAL NOTES	
1	COORDINATES ARE IN NAD83 COLORADO STATE PLANE, CENTRAL ZONE, US FT.
2	PROPERTY DESCRIPTION: 1162 ACRES INSIDE PROJECT FENCE, SECTIONS 6, 7, 18, 30 AND 31 T16S, R64W, AND SECTIONS 1, 11-14, 23-26, 35 AND 36 T16S, R65W
3	FIRE EXTINGUISHERS, FIRST AID KIDS, AND AUTOMATED EXTERNAL DEFIBRILLATORS (AEDs) WILL BE STATIONED IN CONSTRUCTION TRAILERS (WHEN ONSITE), SUBSTATION CONTROL BUILDING, AND O&M BUILDING

LEGEND	
[Symbol]	CSU PARCEL BOUNDARY
[Symbol]	PROJECT FENCE
[Symbol]	PROJECT ROAD
[Symbol]	EXISTING CSU ROAD
[Symbol]	STAGING/PARKING AREA EXTENTS
[Symbol]	TRACKER ARRAY OUTLINE
[Symbol]	EXISTING OH UTILITY LINE
[Symbol]	EXISTING UG FIBER OPTIC LINE
[Symbol]	EXISTING UG WATER LINE
[Symbol]	EXISTING NATURAL GAS LINE
[Symbol]	POWER STATION
[Symbol]	TRACKING ARRAY BLOCK

FIRE PREVENTION AND PROTECTION MEASURES LEGEND	
[Symbol]	PRELIMINARY MUSTER LOCATION
[Symbol]	50' X 50' DESIGNATED SMOKING AREA
[Symbol]	FIRE EXTINGUISHER (FIRE EXTINGUISHERS ARE ALSO LOCATED IN ALL JUWI SITE VEHICLES)
[Symbol]	FIRE DEPARTMENT RAPID ENTRY BOX
[Symbol]	20' MANAGED VEGETATION FOR EXTERIOR PERIMETER EMERGENCY ACCESS
[Symbol]	INTERIOR PERIMETER EMERGENCY ACCESS

KEYNOTES	
##	
1	PRELIMINARY MUSTER LOCATION
2	50' X 50' DESIGNATED SMOKING AREA
3	FIRE EXTINGUISHER (FIRE EXTINGUISHERS ARE ALSO LOCATED IN ALL JUWI SITE VEHICLES)
4	FIRE DEPARTMENT RAPID ENTRY BOX



2 SITE PERIMETER ACCESS DETAIL
G106 SCALE: NTS

juwi
juwi inc.
1710 29th St. Suite 1068
Boulder, CO 80301
www.juwienergy.com

PIKE SOLAR
219.46 MW PV, 25 MW BESS, 175.00 MW POI
EL PASO COUNTY, CO

REVISION NOTES

REV.	DATE	DESCRIPTION
A		

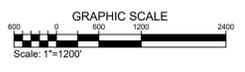
DRAWN BY: RMC LATEST REV: A

50% DRAFT

PROPRIETARY AND CONFIDENTIAL
DO NOT REPRODUCE OR DISTRIBUTE
PRINT SIZE: ARCHD
SUBJECT: PV
SCALE: 1/8"=1'-0"
SCALE: AS SHOWN
DWG.#

G106

DWG TITLE:
FIRE PREVENTION AND EMERGENCY RESPONSE PLAN



Appendix B - Reference Maps

- B1: Hanover Fire Protection District service territory
- B2: Directions from Hanover Fire Protection District Station 2 to north access
- B3: Directions from Hanover Fire Protection District Station 2 to south access
- B4: Directions from Hanover Fire Protection District Station 1 to north access
- B5: Directions from Hanover Fire Protection District Station 1 to south access
- B6: Directions to urgent care from south access
- B7: Directions to urgent care from north access
- B8: Directions to emergency room from south access
- B9: Directions to emergency room from north access

Appendix B2 – Directions from Hanover Fire Protection District Station 2 to north access

Directions from Hanover Fire Protection District Station 2 to north access

Start: Fountain, Colorado 80817

Destination: Hanover Fire Protection District, 13325

Options: Leave now

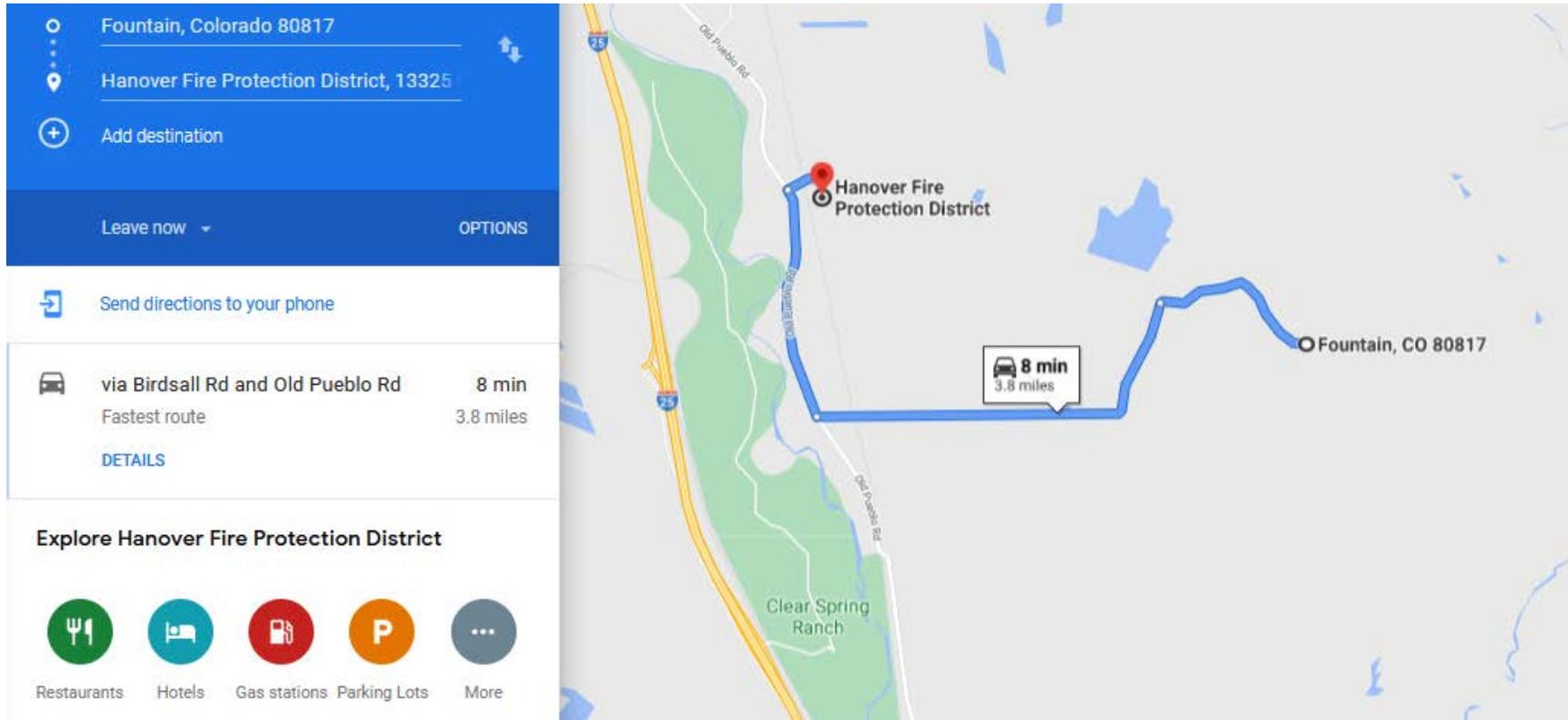
Send directions to your phone

Route	Time	Distance
via Birdsell Rd Fastest route	15 min	6.9 miles
via Squirrel Creek Rd and Link Rd	17 min	9.7 miles

Explore Hanover Fire Protection District

- Restaurants
- Hotels
- Gas stations
- Parking Lots
- More

Appendix B3 – Directions from Hanover Fire Protection District Station 2 to south access



Appendix B4 – Directions from Hanover Fire Protection District Station 1 to north access

Directions Summary:

Route	Time	Distance
via Squirrel Creek Rd and S Peyton Hwy	24 min	19.4 miles
via Hanover Rd	29 min	19.6 miles

Explore Hanover Fire Department

- Restaurants
- Hotels
- Gas stations
- Parking Lots
- More

Appendix B5 – Directions from Hanover Fire Protection District Station 1 to south access

Directions from Fountain, Colorado 80817 to Hanover Fire Department, 17550 S Peyton Hwy

Route 1: via Hanover Rd
Fastest route, the usual traffic
23 min
16.4 miles

Route 2: via Squirrel Creek Rd and S Peyton Hwy
31 min
22.6 miles

Explore Hanover Fire Department

- Restaurants
- Hotels
- Gas stations
- Parking Lots
- More

Map labels: Fountain, Clear Spring Ranch, GingerSnap Ranch, Hanover Junior/Senior High School, Hanover Fire Department.

Appendix B6 – Directions to urgent care from south access

Directions Summary:

- Start: Fountain, Colorado 80817
- Destination: QwikCareMD Urgent Care Center, 6908
- Leave now
- Options: Send directions to your phone

Route	Distance	Time
via Squirrel Creek Rd (Fastest route)	11.1 miles	24 min
via Old Pueblo Rd and S Santa Fe Ave	11.6 miles	24 min
via I-25 N	17.9 miles	25 min

[Explore QwikCareMD Urgent Care Center](#)

Appendix B7 – Directions to urgent care from north access

Fountain, Colorado 80817

QwikCareMD Urgent Care Center, 6908

Add destination

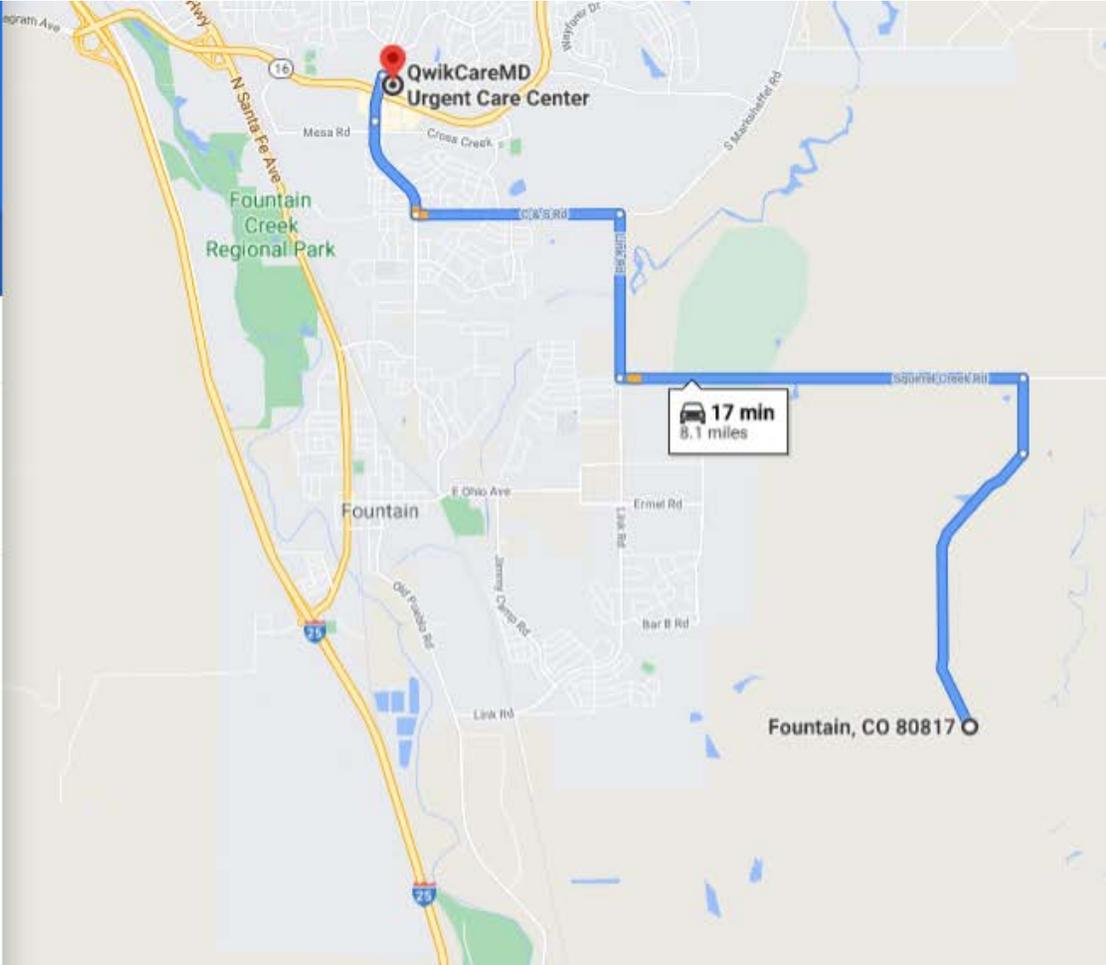
Leave now ▼ OPTIONS

Send directions to your phone

via Squirrel Creek Rd 17 min
Fastest route 8.1 miles
[DETAILS](#)

Explore QwikCareMD Urgent Care Center

- Restaurants
- Hotels
- Gas stations
- Parking Lots
- More



Appendix B8 – Directions to emergency room from south access

Directions to UCHealth Emergency Room - Fountain

Start: Fountain, Colorado 80817
Destination: UCHealth Emergency Room - Fountain

Leave now OPTIONS

[Send directions to your phone](#)

Route	Time	Distance
via Squirrel Creek Rd Best route	23 min	11.0 miles
via Old Pueblo Rd and S Santa Fe Ave	22 min	11.5 miles
via I-25 N	24 min	17.9 miles

Explore UCHealth Emergency Room - Fountain

- Restaurants
- Hotels
- Gas stations
- Parking Lots
- More

Appendix B9 – Directions to emergency room from north access

The image displays a Google Maps interface with a route from Fountain, Colorado to the UCHealth Emergency Room. The left sidebar contains the following information:

- Origin: Fountain, Colorado 80817
- Destination: UCHealth Emergency Room - Fountain
- Buttons: Add destination, Leave now, OPTIONS
- Action: Send directions to your phone
- Route Summary: via Squirrel Creek Rd, 16 min, Fastest route, 7.8 miles, DETAILS
- Explore UCHealth Emergency Room - Fountain: Restaurants, Hotels, Gas stations, Parking Lots, More

The map on the right shows a blue route starting from a point labeled 'Fountain, CO 80817' and ending at 'UCHealth Emergency Room - Fountain'. A callout box indicates a 16-minute drive for 7.8 miles. The route follows Squirrel Creek Rd north from the starting point, then turns east and then north again to reach the emergency room. Major roads like I-25 and N Santa Fe Ave are also visible.



SAFE WORK PRACTICES

May 2018

Issued by:

juwi Inc.

and

JSI Construction Group LLC

and

JSI O&M Group LLC

(collectively referred to herein as "juwi")

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I. PREFACE

A. Purpose

This Safe Work Practices Manual has been prepared to provide the employees and contractors of juwi a manual that contains instructions, safety rules, best practices and regulations necessary to perform work safely and productively. This manual is a general guide. Additional rules and regulations may apply to particular customers. Where governing safety rules conflict in any way with the information in this manual, the rule providing the safest approach for the job being performed shall apply. Industry safety best practices shall also be followed where identified and applicable. juwi shall follow all consensus standards that are enforceable under the Occupational Safety and Health Administration (OSHA) General Duty Clause, 29 CFR 1926 OSHA Construction Industry Standards, 29 CFR 1910 OSHA General Industry Standards, NFPA 70E Standard for Electrical Safety in the Workplace, (and any standards referenced therein, where applicable). All subcontractors of juwi are required to comply with this Safe Work Practices Manual unless a subcontractor's safety processes are agreed to be more stringent, in which case the more stringent practice shall be followed.

OSHA General Duty Clause Section 5 (a) (1) states, "Each employer shall furnish to each of its employees employment and a place of employment which is free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."

B. Mission

juwi believes that working safely creates great quality and productivity. There is no job that is so urgent that an employee cannot take the time to perform it safely. juwi must ensure that all employees and contractors comply with all aspects of the Occupational Safety and Health (OSH) Act of 1970. juwi shall meet or exceed all statutory safety, health and environmental requirements.

C. Safety Vision

juwi employees and contractors at every level demonstrate personal commitment to continuous safety improvement, resulting in a zero injury and zero work-related illness culture. The company's goal and expectation is that no one will suffer an injury in the execution of work. Each colleague and subcontractor is considered a member of the juwi team. Being a team member means taking the responsibility to work in a safe and thoughtful manner at all times.

D. Review Policy

The Safe Work Practices Manual shall be reviewed and updated as required on an annual basis. Any employee may suggest changes to the Director, Human Resources or a member of the Safety Committee.

Safety: We are all in this together.

II. INTRODUCTION

A. Safety Principles

1. The health and safety of juwi team members, contractors and the general public is the most important part of juwi's work.
2. juwi expects all employees, at every level of the business, to lead by example and take responsibility for safety.
3. Management leads the way by providing a safe work environment, creating a zero-tolerance safety culture and encouraging the continuous improvement of safety.
4. Working safely is a condition of employment.
5. All injuries and work-related illnesses are preventable.
6. All juwi employees and contractors have a responsibility and obligation to identify and correct unsafe acts or conditions.
7. Personal ownership of safety and support of all project team members' safety is a never-ending obligation during and after work.
8. All employees will receive the training necessary to safely perform their work.
9. Great safety is great business and an essential component of the excellent quality and high productivity of all great organizations.
10. juwi will never compromise safety for production or any other reason.

B. Site Safety Committee

To achieve an objective review on all projects, juwi shall form a Site Safety Committee for each project. The Site Safety Committee is comprised of juwi site personnel and subcontractor supervisors and foremen. The juwi site manager will chair the Site Safety Committee. The ultimate objective of the Site Safety Committee is to work toward continued improvement, identify hazards, review incidents and conduct "lessons learned" discussions.

The Site Safety Committee meetings shall be held weekly. The objective of each Site Safety Committee meeting is to provide timely recommendations for task and general project improvements as they pertain to safety.

C. juwi Safety Committee

The juwi Safety Committee is appointed by juwi's senior management and meets quarterly and on an as-needed basis. The committee will review all potential policy or procedure changes, and OSHA recordable incidents that occur, to which lessons learned can be applied to prevent future occurrences. The juwi Executive Safety Committee is charged with instilling and maintaining a strong safety culture within the company.

III. SITE SAFETY PROCEDURES

A. Site Orientation

It is the responsibility of the Site Manager to create a site-specific project safety orientation presentation. Each site orientation presentation should address important site features and conditions and owner requirements. The orientation should be reviewed and approved by the Site Manager and Project Manager. The Site Manager is responsible for ensuring all personnel assigned to the project (including all employees of juwi, and of subcontractors and all visitors) view the orientation and sign an acknowledgement prior to starting work, or visiting or inspecting the site.

B. Site Safety Communication & Documentation

Timely and accurate communications are keys to implementing an effective safety plan. Documentation may be required for both contractual compliance and for OSHA recordkeeping purposes.

	Immediate	8 hours	24 hours	2 business days	3 business days	Weekly	Monthly
Direct employer to OSHA		Fatality	Hospitalization of 1 employee, amputation, loss of eye				
juwi to Owner		Hospitalization of 1 employee, amputation, loss of eye	Accident or injury notification		Incident report		Safety statistics
Subcontractor to juwi	Hospitalization of 1 employee, amputation, loss of eye	Accident or injury notification (same day)	Safety forms	Incident report			

Submit			
Form	Audit	Per Task	As Req.
Daily Tailboard	x		
Equip Inspection	x		
Equip Operator			x
JHA		x	
Qual. Person			x
Comp. Person			x
Lift Plans		x	
Hot Work Permit	x		
Electrical Permit	x		
Incident Report			x

C. Safety Forms (29 CFR 1926.32(f)(m), NFPA 70E 110(D)(1))

All safety forms used on site are located in the appendices to this manual.

1. Daily Tailboard:

A Daily Tailboard is a job briefing held by the supervisor or crew leader, given to all crew members. The briefing shall cover task procedures, physical or chemical hazards associated with the task, special precautions, energy source controls, and PPE. Daily Tailboards must be performed at the start of each work shift and must include the use or review of the applicable JHA form(s).

The crew leader is responsible for conducting these briefings: at the beginning of work shifts; after a job has been interrupted for any reason; when personnel are added to or removed from the job; or when any conditions change that could affect employee safety. A brief Tailboard is sufficient if the work is routine and the employees,

through training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. If the work is complicated or especially hazardous, a more detailed Tailboard is required. A juwi Daily Tailboard form is to be used by the crew leader and signed by all crew members. This form will be kept on the work site and must be available for periodic auditing.

2. Equipment Inspection:

The equipment inspection form is to be completed each day, by the operator, before operation of any heavy equipment. Maintenance items shall be addressed in a timely manner.

3. Equipment Operator:

All heavy equipment operators shall have documentation identifying the equipment they are trained and qualified to operate.

4. Job Hazard Analysis:

A Job Hazard Analysis (JHA) is an organized and systematic approach to informing, educating and empowering all employees about the hazards of the specific task or job they are employed to perform. An understanding of the hazards allows each individual at all levels in the organization to make decisions that are in the best interest of a safe and productive project. juwi stresses the importance of a well-planned, high-quality JHA. A JHA must be prepared and submitted for each task. JHAs may be completed by the supervisor and then reviewed with the crew performing the work; however, the preferred method is to involve the crew in completing the form. Input from each member of the crew benefits the process and allows everyone to actively participate, thereby empowering each member to become personally responsible for safety. Factors to be considered are experience, crew make up, work environment including weather, tools, equipment to be used, PPE, duration of the task, body movement, etc.

5. Competent/Qualified Person Designations

juwi requires that personnel engaged in specific tasks requiring Qualified or Competent persons, according to OSHA regulations, must submit to juwi a Qualified or Competent Person Form prior to that individual executing work. This is a required process by OSHA that ensures that all persons performing certain work meet specific criteria. Qualified or Competent Forms are available from the juwi Site Safety Representative.

OSHA defines a competent person in CFR 1926.32(f): one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and has the authorization to take prompt corrective measures to eliminate them.

OSHA defines a qualified person in 1926.32(m): one who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work or the project.

Competent and qualified persons are required for work identified in the table below. This is not an exhaustive list.

Task Category	Competent Person	Qualified Person
General safety & health provisions - 29 CFR 1926.20	X	X
Ionizing radiation - 29 CFR 1926.53	X	X
Nonionizing radiation - 29 CFR 1926.54		X
Gases, vapors, fumes, dusts and mists – 29 CFR 1926.55		X
Lead - 29 CFR 1926.62	X	X
Material handling (Rigging) -29 CFR 1926.251	X	X
Electrical – Subpart K		X
Scaffolds - 29 CFR 1926.451	X	X
Fall protection – Subpart M	X	X
Material hoists, personnel hoists and elevators - 29 CFR 1926.552	X	X
Excavations – Subpart P	X	X
Concrete and masonry construction / requirements for lift-slab operations - 29 CFR 1926.705	X	
Operations - 29 CFR 1926.705	X	
Steel erection – Subpart R	X	X
Demolition – Subpart T	X	
Ladder inspections - 29 CFR 1926.1053	X	
Substance specific standards in Subpart Z	X	
Blasting and the use of explosives – Subpart U		X
Electric power transmission and distribution – Subpart V		X
Confined spaces – Subpart AA	X	X
Cranes & derricks – Subpart CC	X	X
Respiratory protection - 29 CFR 1910.134	X	X
Powered industrial trucks - 29 CFR 1910.178	X	
Hazard communication - 29 CFR 1910.1200	X	

6. Lift Plan:

A Lift Plan shall be prepared for any crane lifts that occur during a juwi project. The subcontractor responsible for the lift shall present the lift plan to juwi no later than **14 days** before the planned lift. The plan shall be completed by a qualified person, and shall include at a minimum:

- a. Diagram of the location for the crane, truck and set down point, including designated roped off area
- b. Crane information
- c. Load information
- d. Rigging information (include diagram)
- e. Documentation of crane operator certification
- f. Copy of crane annual inspection
- g. Document designating by name all participants including (as req.) crane operator, rigger, flagger, lift supervisor.

A pre-lift meeting shall occur on the day of the lift with all the participants.

A pre-lift safety checklist shall be completed to verify the following:

- a. crane inspection
- b. rigging inspection
- c. ground conditions
- d. crane setup
- e. employee roles and qualifications

- f. clearance
- g. load and rigging weight
- h. public protection
- i. emergency action plan

7. Welding/Hot Work Permit:

To be completed by the Subcontractor and reviewed with the Site Manager.

8. Energized Electrical Work Permit:

Completed, signed and approved form shall be submitted by a qualified electrical person prior to commencing energized electrical work.

9. Incident Report Form:

To be completed and submitted to juwi within 24 hours of an incident (Near Miss, Injury, Illness, to include First Aid, or Property Damage).

10. Dig Permit:

Subcontractors are required to obtain and maintain a utility location permit for the scope of their work. This may be referred to as an "811 call" or a "blue stake" permit. The Subcontractor must comply with the local requirements for utilities and underground locating prior to disturbing any earth. A record of the locate must be made available for periodic auditing. A juwi Dig Permit, with an associated drawing, is required for more complex excavations, unforeseen digging operations or digging operations near known underground utilities.

11. Energy Control (Lock Out/ Tag Out):

- a. The LOTO log—to be maintained by the LOTO supervisor
- b. Authorized Personnel training roster—to be completed for each project, in order to identify those individuals who have been trained and are authorized LOTO personnel.
- c. Procedure for when an Authorized Employee is absent
- d. Example of LOTO tag

12. Safety Orientation Acknowledgement:

All site personnel shall sign the acknowledgement after viewing the orientation, to acknowledge the training, policies and procedures explained therein.

13. Site Safety Audit:

To be completed monthly by a juwi representative.

14. Site Safety Inspection:

To be completed weekly by a juwi representative.

D. Personal Protective Equipment (29 CFR 1926.95)

Prior to performing work, all personnel must receive training on personal protective equipment (PPE). Training during site orientation for all site personnel will be provided on the following items:

- What is appropriate PPE?
- How to correctly use PPE?

- What are the limits of PPE?
- Care and maintenance of PPE

1. General Requirements

Personal protective equipment provides essential protection against injury and illness and as such it must be kept in a clean and reliable condition, free of defects or damage and be capable of providing the necessary protection. Any PPE that is damaged, worn out or otherwise in disrepair shall be turned in to be disposed of and replaced with new PPE.

A job hazard analysis (JHA) must be performed before PPE is used to ensure that the prescribed PPE is appropriate for the hazard(s) present.

The following is the prescribed PPE for all juwi work sites:

Hard Hats	ANSI Z89.1 approved, Class E or Class G Worn by all workers and visitors except in office or other desig. areas Metal hard hats prohibited Inspect daily for hairline cracks, damage
Safety Glasses	ANSI Z87.1 approved, with side shields Prescription lenses must be covered by over-safety glasses Worn by all workers and visitors except in the trailer or other desig. areas Additional face shield required for welders or when operating demo saws or solid grinding/cutoff wheels
Hearing Protection	In accordance with OSHA Permissible Noise Exposures Table (1926.52, Table D-2) Mandatory for all work on or around energized electrical equipment. 2015 NFPA 70E 130.7(C)(5) & (16) Typically required around loud machinery (post installer, inside operating power stations, heavy equipment operators) Hearing Conservation Program required under certain exposure limits
Respiratory Protection	Voluntary dust mask – Employee must sign Appendix D from OSHA 1910.134 Additional protection required when air contaminants are outside prescribed limit (Refer to 1926.55 Appx. A Threshold Limit Values of Airborne Contaminants for Construction) When respirators are required employee must be medically cleared, fit tested and trained prior to use When respirators are required facial hair is not permitted
High Visibility Clothing	ANSI Class 2 high visibility safety vest or equivalent high visibility clothing Worn by all workers and visitors* <i>*Exception—When performing specific electrical tasks, other PPE required in accordance with Arc Flash Analysis & NFPA 70E, high visibility clothing/ vests not required.</i>
Clothing	100% natural fiber or arc rated long pants required, shorts are not authorized 100% natural fiber or arc rated long or short sleeve shirts*, no tank tops <i>*Exception—When exposed to flame or electrical arc, arc rated or if less than 1.2 cal/cm², 100% cotton long sleeves ONLY</i>

Boots	ANSI Z41.1 approved, Safety Toe, over the ankle, EH rated Worn by all workers and visitors performing work* <i>*Exception—Visitors NOT performing work may wear closed-toe shoes</i>
Electrical Work	Refer to juwi Safe Work Practices Electrical Safety section and refer to NFPA 70E for appropriate PPE based on job specific work conditions
Gloves	Abrasion-resistant
Other	Where other approved PPE can prevent injury or illness, it shall be used

E. Safety Signs (29 CFR 1926.200)

All regulatory signs shall be visible at all times when work is being performed and meet the specifications of ANSI Z53.1-1967 and the Manual on Uniform Traffic Control Devices for Streets and Highways. Below are the standard juwi construction safety signs:



1. Safety signs must be readily visible at all times when a hazard exists. Signs must be promptly removed (or covered) when the hazard no longer exists.
2. Safety signs must be able to withstand the environment.
3. Red "Danger" tape shall be used to warn of immediate hazards. The tape shall be located at such distance from the hazard that persons cannot accidentally come into contact with the hazard.
4. Yellow "Caution" tape shall be used to designate potential hazard areas. The tape shall be located so as to restrict access into the area.
5. If a hazard is not obvious despite the use of warning tape, specific information about the hazard and the name of a contact person shall be added to the tape.
6. When working within a posted area, personnel shall use the necessary PPE to avoid injury.
7. Warning tape shall be neatly installed and kept intact as long as the hazard exists.
8. Warning tape shall be removed promptly when the condition is corrected.
9. Warning tape shall never be used as a barrier to prevent a fall or in place of a required guardrail. If warning tape is used to warn of a floor opening or hole, a person must be continuously stationed at the opening to prevent accidental entry.

10. In energized areas, red danger tape shall be used to designate energized areas next to work areas. Red tape or red flags shall be attached to designate safe heights on structures, columns, or poles above which workers may not climb because of energized equipment or circuits.

F. First Aid Supplies and Location

All juwi site personnel will be trained in First Aid and CPR. First Aid supplies will be located in the juwi trailer (first aid kit, eye wash and automatic external defibrillator), and all juwi ATVs (small first aid kit). First Aid supplies should be easily accessible, marked and in a visible location. Subcontractor first aid supplies and location should be indicated in the site orientation to all workers.

G. Ergonomics

1. Stretch and Flex

A daily stretch and flex routine shall be implemented on all juwi construction sites. All workers shall participate in the morning stretch and flex. This program has been recognized to reduce strains and sprains in the construction industry. Corporate and management employees are expected to participate when they are in an area that stretch and flex is being performed.

2. Required two-person lifts

The following items must be lifted by two people (minimum) or appropriate material handling equipment:

- Combiner boxes
- Torque tubes
- Solar modules
- Posts (when removing them from a forklift)
- Fence fabric rolls

3. Proper Lifting techniques

When lifting, holding, or pushing, employees can avoid strains and sprains caused by incorrect posture, lack of proper assistance, and/or lifting aids. For repetitive lifting involving persons, a JHA shall be filled out and reviewed before moving materials. Employees shall know their route and clear any slip, trip, or other hazards on the determined route. Employees must know the weight of the materials to be moved and seek help if the weight is beyond their limitations.

Workers lifting PV modules must always wear proper PPE. Gloves and steel-toed boots or another reinforced toed boot are required when handling PV modules. Depending on the manufacturer, the modules may come stacked one on top of another or may come stacked standing on their end. Lifting may require two persons for the safe handling of the modules, especially if the modules are being handed over a rack or crossbeam.

When handling materials, the following techniques shall be used if mechanical equipment is not available:

- a. Lifting
 - i. The load must be kept close to the body
 - ii. Employees shall bend the knees and hips.
 - iii. Employees shall lift with the legs.
 - iv. Employees shall avoid twisting while lifting.
 - v. Employees shall seek help when needed.
- b. Bending
 - i. Employees shall kneel on one knee.

- ii. Employees shall bend the knees and hips, not the back.
- iii. When leaning forward, the whole body should be moved, not just the arms.
- c. Repetitive motions
 - i. The load must be kept small.
 - ii. Instead of twisting, employees shall turn the whole body.
 - iii. Employees shall get close to the load rather than reaching and lifting.
 - iv. Employees shall lift with the arms and legs, not the back.
 - v. Employees shall change positions frequently.
- d. Reaching
 - i. Employees shall reach only as high as is comfortable and refrain from stretching.
 - ii. Instead of reaching beyond their comfort level, employees shall use a ladder.
 - iii. The weight of the load must be tested before lifting. The arms and legs should do the work, not the back.
- e. Pushing and pulling
 - i. Employees shall stay close to the load and refrain from leaning forward.
 - ii. Employees shall push the load (rather than pull) using both arms
 - iii. Employees shall seek help when needed.
- f. Workers must avoid:
 - i. Overstretching
 - ii. Using awkward positions
 - iii. Pinch points
 - iv. Excessive repetition

H. Disciplinary Policy

Failure to abide by site rules and regulations will result in the suspension or permanent removal of the offending party depending on nature of offense.

I. Visitor Policy

Visitors must contact juwi site personnel to request a site visit. Visitors shall be instructed to wear closed-toe shoes. Once on the site:

1. All visitors will receive a site orientation regarding the rules and hazards of the site.
2. All visitors will be issued the appropriate personal protective equipment (PPE) for the site visit and are required to wear the PPE while on site.
3. Visitors will have a designated escort in order to ensure the safety of both the visitors and project workers.
4. If the visitor will be entering specific work zones, the JHA for that area must be discussed for the safety of workers and visitors. Safety of all site visitors is a priority.
5. Any visitor that reports to the site after hours shall obtain clearance from the site manager in order to enter the facility unescorted.

J. Weather Policy

1. Lightning/ Thunder
 - a. If lightning/thunder occurs within a 10-mile radius (based upon local weather data) of the site, work will STOP for 30 minutes from the last occurrence. All personnel will proceed to nearest shelter or enter an enclosed vehicle (with rubber tires) and move the vehicle away from any potential conductor (e.g. a metal fence or tree) by at least 150 feet.
 - b. Air horns will be utilized for **3-consecutive-second blasts 5 times** to alert project personnel in any emergency situation.
 - c. The all-clear signal should be conveyed verbally through the chain of command on the project site, starting with the juwi Site Manager.

2. Severe Weather/Tornado Warning

With respect to any project with potential for high winds, the site manager must assess the potential risks and understand the means required to make a reasonable attempt to secure project materials that have a high potential for becoming airborne. Flying debris is the greatest danger in a tornado.

- a. In the event of severe forecasted weather, the site manager shall monitor the weather for frequent updates. The National Oceanic and Atmospheric Administration (NOAA) and National Weather Service are good sources of weather data, located on line at www.nws.noaa.gov.
 - b. Once a warning is issued, employees who are on site in an open area should stay aware of the changing weather conditions. Early detection can be useful in the safety of all project members.
 - c. In the event of a tornado, employees should not seek shelter in vehicles or under a bridge. If the tornado is visible, but far away, employees may be able to drive out of its path, if not in a congested area. Otherwise employees must park the vehicle and seek shelter in a sturdy building. If in the open country, employees should run to low ground away from the vehicle, lie flat face down on the ground and protect the back of their heads with their arms.
 - d. When the storm has passed, employees should converge at the designated muster point of the project and conduct a head count.
 - e. Even though the office trailer may be well anchored, personnel should quickly seek OTHER SHELTER when warned of an approaching tornado. Even anchored trailers are NOT safe in a tornado.
3. Working in Severe Temperatures
 - a. When working (or preparing the work) in areas of extreme heat, drink liquids to avoid heat-related illnesses and dehydration.
 - b. Take precautions to prevent overexposure to the sun (e.g., light clothing, eye protection, sun screen).
 - c. It is important for personnel to build up a tolerance for heat exposure slowly.
 - d. When working in cold environments, employees shall dress to stay warm and dry and use rain gear or layered, insulated clothing, as appropriate.
 - e. Maintaining good physical condition and fitness can help minimize and/or eliminate injuries/illnesses from exposure to heat or cold.

K. Language Policy

For the purposes of safety and hazard related communications, emergency response, and similar issues, all written and verbal safety training, hazard communications, and work rules will be made available by the hiring employer in the appropriate language for non-English speaking workers.

L. Substance Abuse Policy

Purpose

In an effort to create and maintain a work environment that promotes excellent work product and minimizes safety and health hazards, juwi has adopted a policy prohibiting the use or possession of alcohol, drugs or drug paraphernalia

during working hours. This policy will be enforced in compliance with all applicable federal and state laws.

juwi explicitly prohibits:

- The use, possession, solicitation for or sale of narcotics or other controlled substances, alcohol or prescription medication without a prescription on job site premises or while performing work;
- The possession, use, solicitation for or sale of legal or controlled substances or alcohol away from the job site, if such activity or involvement adversely affects work performance, the safety of the employee or of others, or puts juwi's reputation or integrity at risk;
- Being impaired or under the influence of legal or controlled substances or alcohol away from juwi or customer premises, if such impairment or influence adversely affects work performance, the safety of employees, contractors or others, or puts juwi's reputation or integrity at risk; and
- The presence of any detectible amount of prohibited substances in one's system while at work, while on the premises of juwi or its customers, or while on juwi business.

Prohibited substances include federally controlled substances, alcohol, and prescription drugs not taken in accordance to their prescription. The provisions of this policy are subject to any federal, state or local laws that may prohibit or restrict their applicability, and testing for substances shall be conducted in accordance with and limited by such laws notwithstanding any terms of this policy to the contrary.

Responsibilities

Responsibilities under this policy include (i) reporting any known use, possession, sale or distribution of drugs or alcohol by anyone who violates this policy to his or her supervisor, and (ii) informing one's supervisor if one is using any prescribed medicine that could affect the one's ability to safely perform any job-related duties. Anyone convicted of controlled substance related violations must inform juwi within five (5) days of such conviction or plea.

Searches

juwi reserves the right, at all times, to have authorized personnel conduct searches or inspections of personal effects, belongings, vehicles, quarters, rooms, lockers, baggage, offices and desks of employees or contractors for the purpose of determining if they are in possession of any drugs, alcohol, or other items prohibited under this policy. These searches may be conducted from time to time without prior announcement.

Drug/Alcohol Testing

Contractors shall pre-screen and perform preliminary testing of all contractor employees and subcontractors having access to the juwi job site. In addition to any supplemental testing requirements imposed by contract, eligible juwi employees and contractor employees/agents shall be subject to random drug testing, which will be performed on site by a third-party entity retained by juwi. Full names and individual ID numbers will be required to be submitted to the drug testing company. Random testing will be performed in accordance with five (5) panel drug screens. The consequence of a positive test result will be removal from the site.

Whenever illegal substances are found on site, juwi will conduct a site-wide drug test as soon as practicable. Any worker on the job site who tests positive will be removed from the job site if they cannot provide a valid prescription excusing the positive test result. If a worker tests positive and wishes to provide a relevant prescription, but cannot at the time of the test, that worker shall be removed until such time that the worker's prescription is verified as excusing the positive test result.

Applicability to juwi Employees and Contractors

For the avoidance of doubt, this policy shall be applicable to all individuals performing work on a juwi job site, including eligible juwi employees, contractors and their agents.

G. Security

Site access is controlled by juwi personnel or its designee (security). Access to control enclosures or the interconnection point shall be permitted with a juwi escort only. Personnel that report to the site after hours shall call the site manager for clearance to enter the site.

H. Operations and Maintenance

A separate juwi safety plan is applicable for work performed in the operations phase of a project. While many policies of this plan are relevant in the operations phase, it is required to follow the Safe Work Practices for Operations & Maintenance during the operations phase.

IV. SAFETY TRAINING

A. Training Policy

All juwi personnel will be adequately trained in order to perform their jobs in a safe manner. Training certificates and documentation shall be submitted to the juwi Director, Human Resources for recordkeeping purposes.

B. Training Requirements

The following training topics (which may be incorporated in the site orientation) shall be provided to the appropriate personnel on all juwi project sites:

1. Hazard Communication / Safety Data Sheet (SDS)
 - a. Understanding how to read a SDS
 - b. Why Hazard Communication/SDS is important
 - c. The location of SDS list
 - d. Safe storage, handling, use and disposal of hazardous materials on site
2. Electrical Safety
 - a. Importance of electrical safety process
 - b. The differences between DC and AC safety measures
 - c. Lockout/Tagout (LOTO) Policy
 - d. Arc flash
 - e. Shock hazards
3. Personal Protective Equipment (PPE)
 - a. Site-required PPE
 - b. Care and maintenance of PPE
4. Hand and Power Tool Policy
 - a. Policy for inspection of tool condition and safe use requirements
5. Proper Lifting Procedures and "Stretch and Flex" Program
 - a. Importance of correct technique for repetitive lifting
 - b. Why and how a "Stretch and Flex" program is important
 - c. Manual lifting or mechanical lifting
6. Safety and Good Housekeeping policy

7. Stay Aware of Surroundings

Additional training may be required based on project specifics.

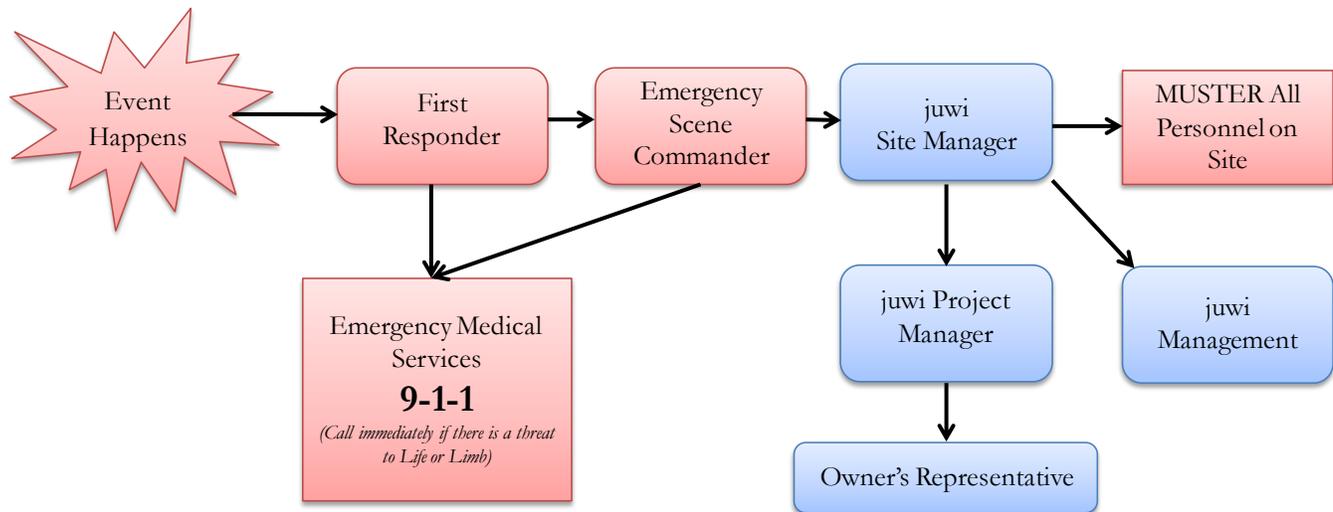
V. INCIDENT PREVENTION AND RESPONSE

A. Emergency Action Plan (29 CFR 1926.35)

In an effort to ensure a timely response in the event of an emergency, the following flow diagram outlines the generalities of the Emergency Action Plan (EAP). Each site and office shall identify the appropriate individuals in the EAP and post these in appropriate locations.

All incidents require immediate notification of the Emergency Scene Commander.

- The reporting party shall provide his/her name, exact location, emergency classification, the name of injured person(s), a brief description of the accident and the nature or type of injury.
- The reporting party must **NOT** leave the injured unless it is necessary in order to notify the Emergency Scene Commander.
- Workers on scene must **NOT** move the injured unless he/she is in immediate danger of further injury.
- The project will have an AED and first-aid kit on site for use by trained personnel. In serious situations, an ambulance or emergency helicopter may be dispatched to the site.



Emergency Classifications:

1. Bodily Injury or Fatality
 - b. Examples: worker injury, heart attack
 - c. All injured persons shall receive immediate and adequate treatment.
 - d. The accident site must be secured in order to prevent risk of further injury.
 - e. Disruption to the project area shall be minimized.
 - f. The event must be documented properly.
2. Property Damage
 - a. Investigate the damaged property and determine a corrective action for repair or replacement.
3. Fire
 - a. Alert the fire department
 - b. If safe to do so, suppress the fire and prevent re-ignition
4. Environmental Damage
 - a. Examples: Chemical storage spill, ruptured hydraulic line
 - b. The nature or type of contamination must be defined.
 - c. On-site equipment must be evaluated to determine whether it is sufficient to handle the emergency.

- d. If on-site equipment is sufficient, workers may attempt use only if doing so presents no exposure or risk of danger to anyone else.
 - e. All workers must report to the muster point so everyone can be accounted for.
5. Catastrophic (Weather Event)
- a. Examples: Earthquake, tornado, hurricane or other serious weather event
 - b. Workers shall evaluate the immediate situation without endangering themselves.
 - c. All personnel must be alerted.
 - d. If necessary, all personnel shall evacuate.
 - e. Employees shall gather at predetermined muster areas where everyone can be accounted for.
 - f. Secure the work area as appropriate.
 - g. Incidents must be reported to appropriate supervision.

Implementing the Emergency Action Plan:

The following steps shall be implemented to ensure that the EAP can be effectively executed:

1. All employees must be familiar with the facility EAP and participate in regular drills and training activities.
2. Safety observations or concerns shall be reported to the supervisor or the juwi Site Safety Representative.
3. Emergency information shall be posted in appropriate locations. The Emergency information shall include phone numbers for the ambulance, fire and police departments. The phone numbers for the selected medical clinic and hospital will also be listed. The numbers for the key Emergency Action Plan participants will also be listed.
4. Maps to the clinic and hospital shall be posted at key locations.
5. Emergency evacuation signals shall be predefined and communicated to all.
6. Designated evacuation routes and exits shall be clearly marked and used.
7. When an alarm or other notification is activated, employees must report to an assigned assembly area or proceed to a designated area of safe refuge and remain there until instructed otherwise.
8. All fires must be reported immediately, regardless of their size.
9. The instructions of all emergency response personnel must be followed.
10. In the event of an emergency, employees are instructed to practice SWIM if it is safe to do so:

Secure the scene

Warn others

Inform the appropriate project personnel

Monitor the situation until qualified emergency response personnel arrive

B. Incident Reporting and Investigation (29 CFR 1926.22)

1. Purpose

Incidents are investigated in order to determine the direct, contributing and root causes of the incident, and to determine what new processes, equipment or amended procedures are necessary to prevent the investigated incident or similar incidents from occurring again.

The following incidents will always be investigated:

- ALL reported injuries and illnesses
- ALL reported equipment damage (site/private)

- ALL reports of a near miss

After a work-related recordable injury or preventable vehicle crash and prior to the injured returning to work, the employee must pass a fitness-for-duty test certified by the appropriate medical professional. The employee must also be retrained in the operation of the motor vehicle involved.

2. Process for Incident Investigation

If an incident occurs, a completed incident report shall be provided to the site manager within 24 hours, and forwarded to the juwi Safety Committee. Any identified corrective actions that may be completed immediately shall be implemented. Corrective actions that require additional resources or coordination beyond the scope of a single entity shall be referred to the Site Safety Committee for prioritization and completion. All corrective actions shall be reviewed immediately after implementation and on a periodic basis thereafter for verification of effectiveness.

Safety professionals are available to assist investigators in almost all aspects of the investigation. They must not, however, conduct employee or witness interviews and their work product cannot be used in the determination of disciplinary action.

There are four essential steps to the incident investigation process: providing medical treatment; securing the scene; fact gathering; and root cause analysis.

a. Medical treatment

The immediate concern in an injury incident is the rapid provision of the appropriate level of medical treatment to the injured. All field personnel shall be trained by their supervisors in emergency communications. Employees exposed to the bodily fluids of another employee must be identified for future treatment. Employees witnessing the serious injury or death of a co-worker shall be offered professional counseling at the employer's expense.

b. Securing the scene

Physically securing the scene is not required for first-aid injuries or minor equipment damage (e.g., cosmetic damage only and no damage to the functionality of the machine, vehicle or equipment). It is mandatory to secure the scene in the event of an injury that requires off-site medical treatment, equipment damage other than cosmetic and whenever the investigator deems it necessary to complete the investigation.

Securing the scene entails removing everyone, except first responders and essential employees, from the immediate vicinity of the incident site or sites, in order to preserve evidence and prevent site contamination. Rolls of caution or danger tape may be of use but their absence shall not delay efforts to secure the scene. Employees shall be directed away from all incident scenes.

c. Fact Gathering

The supervisor or manager that "owns" the incident shall complete the investigation. "Ownership" is determined by who the majority of affected employees work for, who is responsible for the work process, or who owns the equipment damaged, or caused the damage. If ownership is unclear, the senior manager at the site shall make the determination.

Fact gathering follows the journalist's guidelines of *who, what, when, where, why and how*.

Note that all investigators shall comply with all applicable safety guidelines, regulations and standards during the fact gathering process.

i. Who:

Identify: The investigator shall identify all involved employees and their employers and all foremen and their supervisors. If first responders arrive on scene, the investigator shall record their names and contact information. If law enforcement arrives on the scene, the investigator must ask if they intend to take control of the scene and if so, the investigator shall relinquish control and provide support. The

investigator must advise law enforcement of any actions taken prior to their arrival and any actions needed to protect employees or equipment. The investigator shall ask permission to continue the investigation.

Training records: As soon as feasible, the investigator shall ask the Site Safety Coordinator (or site construction manager, in his absence) to secure the training records of all employees involved, including the foreman (if assigned).

ii. What:

Physical evidence: Physical evidence consists of the equipment and materials in use and in the vicinity at the time of the incident. It is important to capture the status and location of all relevant artifacts. The investigator shall document—through digital photographs—all relevant items as well as the scene itself. Item photographs shall detail their positioning and any relevant defect or operating condition. Scene photographs shall be framed to demonstrate the relationship of the various relevant items as well as to provide a sense of scale. The JHA, tailboard and any other relevant documents shall be collected. If equipment was involved, the investigator shall obtain a copy of the manufacturer's instructions as well as any company standard operating procedure (SOP) regarding its use. The investigator shall obtain daily equipment inspection records and/or recent preventative maintenance records as applicable.

Note: Artifacts must not be disturbed or removed prior to their documentation. Human organic matter must not be touched or removed—that is the job of first responders or the medical examiner's or coroner's office. Visually disturbing items may be covered with clothing or a tarp. In the event of a serious injury or fatality, anything within the radius of the scene shall not be disturbed or removed until permitted by law enforcement. No attempts shall be made to capture or kill any insect or animal; instead their involvement shall be documented through photographs or witness statements.

A recommended best practice is to draw the scene to scale on graph paper, annotating the location of significant items as well as depicting the location and direction of photographs.

Physical Conditions: The investigator shall document weather and other environmental conditions, such as sky condition, temperature, wind direction and velocity, footing and its condition (muddy, dry, rocky, etc.).

Employee Conditions: The investigator shall make note of the physical condition of the employee and co-workers. Were they wearing proper PPE? Were they dressed appropriately for the weather? Were they fit for duty (or did they show any physical sign of impairment)?

iii. Where:

Location: The investigator must document the location of the incident and location of all personnel involved at the time of the incident. It's important to document the locations and relationships of all items of interest to the investigation; the best way to do this is with digital photography.

iv. When:

Sequence of Events: The investigator shall document the time of his/her arrival at the scene and the approximate time of the incident as well as the time of any events that occur after arrival on scene. The investigator shall work backwards through witness statements to the occurrence of earlier events.

Time log: In the event of incidents that have not concluded at the time of the investigator's arrival (e.g., fires not yet extinguished, injured not yet transported, equipment not yet secured), the investigator shall ask an employee to keep a log of the time of relevant events, with clear instructions to record only what the investigator provides.

v. Why:

The "why" portion of fact gathering pertains to what caused persons involved to perform whatever actions they were engaged in leading up to and at the time of the incident. The investigation and interview processes are not the time to correct misunderstandings of work or operating procedures. It is critical to understand why those involved behaved as they did; however, the correctness of that behavior will be determined later.

Witness Statements: Witnesses must be identified immediately upon arrival of the investigator to the scene. Each person that was at the scene of the incident shall provide a brief description of what they saw. Those that had direct involvement or actually witnessed the incident shall be noted. If possible, witnesses shall be physically separated prior to interview.

Note: Interviews must not be conducted at the scene and written statements are not to be requested. After documenting and gathering physical evidence, the investigator shall arrange for one-on-one interviews with each witness as well as any injured parties, if possible.

Interviews: Based upon the physical evidence, a list of questions shall be prepared for each witness. The questions shall identify the employee's role at the scene and his/her actions and the actions of others prior to and at the time of the incident. The investigator must ask WHEN the witness thought identified actions took place and/or their duration. The investigator shall ask open-ended questions that require explanation beyond simple yes/no answers. For example, it is better to ask, "What was your job on the site?" rather than "Was it your job to unload widgets at the site?" The witnesses' understanding of their roles and those of others are keys to identifying flawed processes and incomplete communication.

If the interviewee will grant permission, it is always best to record witness interviews and transcribe them, this eliminates any confusion later about exactly what the interviewee said. The interviewer will transcribe the interview verbatim and present it to the witness for review and correction. Any attempt to correct significant facts upon review will require additional questioning to relate how these changes mesh with the rest of the statement. Any obvious efforts to change or obscure actions or responsibilities must be noted, for the record, on the transcribed statement. Once an employee completely agrees with the accuracy of the transcription, he/she shall sign it, signifying that it is an accurate transcript of their interview. If an employee requests minor corrections, they shall initial the corrections after they are made.

Note that in the event of a serious injury or illness, the investigation may be performed or directed by members of juwi's corporate offices. All notes and work products, including interview recordings shall be provided. Interviews with members of the public, land-owners or first responders shall be requested through appropriate liaisons and will not be recorded. The answers to questions shall be transcribed as accurately as possible, and a copy provided to the interviewee.

d. Root Cause Analysis

Once all relevant facts have been gathered, the analysis may be performed using the "Five Why" Root Cause Analysis Procedure described below. Simple incidents that do not involve multiple employees or employers may be analyzed by the supervisor, working alone. A safety professional shall be provided to assist, if desired. If, in the opinion of the supervisor or safety professional, more expertise is required to complete the investigation, the professional shall ask the site manager to establish an investigating committee. This committee shall be made up of any level of expertise identified as necessary to completely analyze the incident, including engineers, employees, supervisors and additional safety professionals. They will make the investigation their top priority until complete.

i. FIVE "WHY?" ROOT CAUSE ANALYSIS PROCESS FOR INCIDENT INVESTIGATION

Incident Statement (Why are you performing this investigation? (Equipment damage, employee injury or illness, "near miss"?)?)

Direct cause (What event immediately preceded the incident stated above?)

Use as many of the contributing causes as necessary. (Five is a guideline not a rule.)

Contributing cause #1 (What event or activity most directly contributed to the direct cause?):

Contributing cause #2 (Why did the above contributing cause occur?):

Contributing cause #3 (Why did the above contributing cause occur?):

Contributing cause #4 (Why did the above contributing cause occur?):

Contributing cause #5 (Why did the above contributing cause occur?):

Root cause (The last contributing cause that can be attributed to behaviors, processes or people within the employer's scope of control. The root cause is not always first in a timeline of events. Do not confuse a timeline of events with the Why's of a root cause analysis):

Correctable opportunities: The direct cause, as well as each contributing cause, shall be scrutinized for correctable opportunities (e.g., identified hazards or flawed processes that can be fixed). A list shall be maintained outlining identified correctable opportunities that are beyond the scope of the current problem statement.

Note on contributing causes: It is possible that a contributing cause will have a cause due to the "environment" (things such as work procedures, equipment malfunctions, lack of training, lack of supervision, etc.) and a behavior-based cause. For example, if it appears that an employee failed to follow established rules, this failure shall be identified as a contributing cause, but the failure to follow the rule shall also be identified as a co-contributing cause. In other words, the reason that the employee had an opportunity to disobey the rule shall be addressed, in addition to the fact that the rule was not followed.

C. Near Miss Reporting

The purpose and goal of Near Miss reporting is to track and trend potential areas where additional or modified training can correct a potential problem before it results in an incident or injury. It is important for the company to track near misses on each project in order to determine whether company policy, procedures and training are effective. The idea is that the eyes of many can see much more than just the eyes of a few. Near misses may be reported with or without a name. Near miss causes and potential solutions should be discussed at Safety Committee meetings.

VI. FIRE SAFETY

A. Fire Prevention (29 CFR 1926.24)

The employer shall be responsible for the development and maintenance of an effective fire protection and prevention program at the job site throughout all phases of the construction.

1. Employees must know how to recognize and report hazardous conditions and fire hazards associated with the materials and processes to which employees are exposed.
2. Good housekeeping must be practiced in all buildings and vehicles to prevent the accumulation of flammable and/or combustible material.
3. Welding operations must include a fire extinguisher, fire watch and a shovel.
4. Flammable liquids must be stored in properly labeled approved containers in designated cabinets or storage areas away from sources of ignition.
5. Smoking shall be prohibited at or in the vicinity of operations that constitute a fire hazard and shall be conspicuously posted "No Smoking or Open Flame". The sign shall be placed at least 20 feet from the fire hazard.
6. Oily rags should be placed in outside dumpsters, never in indoor trash cans (e.g. trashcans in an office trailer).

7. Unused wooden pallets must be taken to the designated outside storage area.
8. Flammable liquids must not be transferred into containers unless the nozzle and container are electrically interconnected (bonded).
9. Flammable liquids must not be dispensed by gravity from tanks, drums, barrels, or similar containers except through a listed self-closing valve or self-closing faucet. (Listed means tested and listed by a recognized testing laboratory, such as UL or FM).
10. Flammable or combustible liquids are not to be used for general cleaning purposes.
11. Compressed gas cylinders must not be stored with flammable or combustible liquids.
12. No objects or materials that restrict clear access shall be placed in front of electrical panels or disconnects.
13. Electric control panel covers must remain in place and/or with the doors closed and secured.
14. Portable space heaters may not be used without prior approval from a supervisor and site management.

B. Fire Protection (*29 CFR 1926.150(c)(1)(i)*)

Fire extinguishers shall be present in all site vehicles and trailers and must be nearby when there is any potential for fire ignition.

1. Any damaged or spent portable fire extinguishers must be reported to a supervisor or local safety personnel.
2. Access to fire extinguishers or other fire protection equipment must not be blocked or restricted.
3. Employees shall not use fire extinguishers or other fire protection equipment unless they are trained and designated to do so.
4. Fire or smoke detection devices may contain radioactive parts. Employees must contact the local Site Safety Representative before disposing of any used or damaged fire or smoke detection device.

C. Fueling Operations and Storage

Refer to the site specific juwi Spill Prevention Control and Countermeasure Plan & Oil Spill Contingency Plan.

VII. ELECTRICAL SAFETY

A. Electrical Safety Program Overview (*29 CFR 1926.416*)

The electrical safety program establishes minimum standards for preventing hazardous electrical exposure and to ensure electrical work is performed safely by qualified electrical workers who are trained and provided with the appropriate safe work procedures, protective equipment and controls. The following resources shall be referenced concerning regulatory compliance, electrical codes, safety requirements and "Best Practices".

- **NFPA 70E** Standard for Electrical Safety in the Workplace
- **NESC** National Electrical Safety Code
- **NEC** National Electrical Code
- The Lineman's and Cableman's Handbook
- OSHA Electrical Safety Standards (*29 CFR 1926 Subpart V, 29 CFR 1910.269, 29 CFR 1910 Subpart S, and 29 CFR 1926 Subpart K*)

General Requirements:

Electrical equipment and lines shall be considered energized until determined to be de-energized by tests or other appropriate method or means.

Safety related work practices shall be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits which are or may be energized. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards.

If a condition is encountered that is not covered in this manual, completely understood or if there are any safety concerns, an employee must STOP work and get clarification before proceeding.

1. Definitions

- a. *Buddy System*: Qualified electrical workers shall not be assigned to work alone except (1) for operations that do not require the employee to contact or be exposed to energized equipment or (2) in emergencies involving hazard to life or property.
- b. *Exposed Energized (Live) Parts*: Electrically energized components that can be inadvertently touched or approached nearer than a safe distance by a person; parts not suitably guarded, isolated, or insulated. Examples include exposed non-insulated terminal contacts or lugs, and bare wiring.

2. General Safety Principles

- a. Only qualified persons shall be allowed to work on or near exposed, energized electrical equipment.
- b. **A JHA will be completed before any work is performed.** Emergencies are an exception. However, it is ALWAYS best to evaluate hazards first. Personnel shall discuss hazards, work procedures, special precautions, protective equipment, energy source controls, and switching procedures.
- c. Personnel shall know the voltage and plan the work.
- d. **Equipment or circuits must be de-energized according to appropriate Lockout/Tagout (LOTO) procedures before employees work on or near them,** unless:
 - i. De-energizing increases hazards
 - ii. De-energizing is infeasible because of equipment design or operational limitations
- e. If work must be performed on energized equipment/circuits, personnel shall determine:
 - i. The exposed live parts from other electrical equipment
 - ii. The nominal voltage of exposed live/energized parts
 - iii. The minimum approach distances corresponding to the voltages to be worked
 - iv. The proper PPE needed, as well as insulated tools to be used, for working on exposed or energized parts as determined by the arc flash energy risk assessment and NFPA 70E
 - v. Record this information in an Energized Electrical Work Permit form (Appendix E)
 - vi. Received all required approval signatures on the "Energized Work Permit" form prior to commencing energized electrical work.
- f. Unqualified persons shall not open enclosures or panels that contain exposed energized electrical parts or equipment.
- g. When opening and closing disconnects, employees shall use the nondominant-hand rule when possible, which means standing to the off side of the equipment and operating the disconnect switch with the non-

nondominant hand. Employees shall not stand directly in front of equipment when operating the disconnect switch.

- h. Employees who are performing electrical work must alert others of potential hazards.
- i. Job briefings will be performed before any tasks involving energized work are performed.
- j. If conditions affecting safety or personnel change, the JHA must be updated and additional job briefings with everyone involved must be conducted.

B. Electrical Training Requirements

1. Energy Control (Lockout/Tagout)

All individuals potentially involved in or affected by Lockout/Tagout (LOTO) will receive sufficient training to understand their responsibilities under the procedure.

Qualified Electrical Worker

Employees involved in energized electrical work involving 50 V to ground or greater must receive training in avoiding the electrical hazards associated with working on or near exposed energized parts prior to performing energized electrical work. Such training will be provided when the employee is initially assigned to the job and refresher training will be provided every three years or when conditions change.

The following items are to be included in the training of qualified electrical workers:

- a. The LOTO Training Program, including safe work practices required to safely de-energize electrical equipment.
- b. Skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
- c. Skills and techniques necessary to determine the nominal voltage of exposed live parts.
- d. The approach distances and the corresponding voltages to which the qualified electrical worker will be exposed.
- e. Selection and use of proper work practices, PPE, tools, insulating and shielding materials and equipment for working on or near energized parts.

Qualified employees will also be trained and certified in First Aid/CPR/AED as required when working in the field. For work involving two or more employees, at least two will be First Aid/CPR/AED trained.

Documentation

Documentation of training and experience received by qualified electrical workers must be maintained for all personnel covered by this program for duration of the employee's employment. Documentation is necessary to demonstrate that individuals have met the training and experience requirements for the types of work being performed. Employment records that indicate an employee has received the required training meet this requirement.

C. Work on Energized Electrical Equipment

1. Personal Protective Equipment

Employees working in areas where there are potential arc flash and electrical shock hazards must be provided with and use PPE that is appropriate for the specific work to be performed. The electrical tools and protective equipment must be specifically approved, rated, and tested for the levels of voltage (and/or arc flash category, if known) to which an employee may be exposed.

Shock Hazards

The National Fire Protection Association (NFPA) 70E-2015 standard defines two approach distances for shock hazards:

- a. The **limited approach boundary** is an approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.
- b. The **restricted approach boundary** is an approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased risk of shock, due to electrical arc-over combined with inadvertent movement, for personnel working in close proximity to the energized electrical conductor or circuit part. Requirements to work within the restricted boundary are as follows:
 - i. Have an energized work permit that is approved by the supervisor or manager responsible and General Manager, ~~or~~ as well as a safe work procedure
 - ii. Use PPE suitable for working near exposed live parts and rated for the voltage and incident energy level involved
 - iii. Minimize the risk from unintended movement, by keeping as much of the body as possible out of the restricted space. Body parts in the restricted space shall be protected

Refer to the *Approach Boundaries* tables (AC and DC) in NFPA 70E to determine the actual approach boundary distances to energized electrical conductors or circuit parts for shock protection.

Note: When performing voltage testing, workers shall assess the hazards and wear appropriately rated, tested and inspected insulating rubber gloves with leather protectors if there is a hazard of contact with exposed energized parts.

Electrical Protective Equipment

The maximum-use voltage for electrical protective equipment (e.g., rubber gloves, rubber sleeves, rubber blankets, matting, and line hose) is as follows: *29 CFR 1910.137(a)(2)(i)*

- Class 0 - 1000 volts
 - Class 1 - 7,500 volts
 - Class 2 - 17,000 volts
 - Class 3 - 26,500 volts
 - Class 4 - 36,000 volts
- a. Electrical protective equipment shall be tested before first issue and re-tested every **six months**, as required by *NFPA 70E Table 130.7(C)(7)(c)*.
 - b. Rubber gloves shall be visually inspected and air-tested before each day's use.
 - c. Rubber blankets and sleeves shall be visually checked for flaws before each day's use.
 - d. Leather protectors must always be worn over rubber gloves. Protectors must not be used for any other purpose. *Exception:* Class 0 rubber gloves can be used without protectors under limited-use conditions where small equipment and parts manipulation necessitate unusually high finger dexterity. Extra care should be taken to visually examine and air test rubber gloves before use and avoid handling sharp objects. After completion of the single shift where insulating rubber gloves were used without leather protectors the insulating gloves shall be electrically tested by an approved testing service prior to return to service.
 - e. When protective equipment selection depends on voltage levels, the phase-to-phase voltage on multiphase circuits shall be used. Phase-to-ground voltage can be used if there is no multiphase exposure or if energized conductors have been covered with rubber protective equipment, eliminating any possible multiphase exposure.

Arc Flash Protection

The NFPA 70E defines an arc flash boundary. When an arc flash hazard exists, the arc **flash boundary** is an approach limit at a distance from a prospective arc source within which a person could receive a second degree burn, exposure to bare skin exceeds 1.2 cal/cm², if an electrical arc flash were to occur. juwi will provide arc flash risk assessments.

- a. Employees must use PPE appropriate for working near exposed live parts and rated for the voltage and incident energy level expressed on the arc flash label or if no label than utilizing the arc flash PPE category method.
- b. When working within the arc flash boundary of an exposed energized conductor or component (whether directly working on the equipment or working near it), employees shall wear arc-rated clothing and protective gear.
- c. All clothing worn underneath arc-rated (AR) apparel shall be made of natural fiber (e.g. 100% cotton).
- d. AR apparel must be kept in good condition, with no rips or tears. It should cover all body parts exposed to the arc flash hazard according to the severity of the incident energy level.

Table 4: Arc Flash PPE Category PPE Characteristics

Category	Cal/cm ²	Clothing
1	≤ 4	Minimum AR of 4
2	≤ 8	Minimum AR of 8
3	≤ 25	Minimum AR of 25
4	≤ 40	Minimum AR of 40

* Refer to *NFPA 70E Table 130.7(C)(16)* for more details

Conductive Articles Being Worn (*NFPA 70E 130.6(D)*)

Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn within the restricted approach boundary or where they present an electrical contact hazard with exposed energized electrical conductors or circuit parts.

Energized Electrical Work Permit (*NFPA 70E 130.2(B)*)

- a. If live parts are not placed in an electrically safe condition, work to be performed shall be considered energized electrical work and shall be performed by written permit only.
 - o Exception 1: Increased hazard, i.e. it is more dangerous to turn off the power.
 - o Exception 2: Infeasibility, i.e. voltage measurements, current measurements, troubleshooting. (Anything that cannot be performed with the power off)
- b. The juwi Energized Electrical Work Permit (Appendix E) must be originated by a qualified electrical worker.

D. Safety Protocols for Electric Power Generation Facilities (*29 CFR 1910.269*)

1. Insulated Tools

- a. Only insulated ladders shall be used near energized lines or equipment except where non-conductive ladders might present a greater hazard than conductive ladders.
- b. If hand tools are used near exposed, energized conductors or parts AND the hand tools could make contact with the conductors or parts, the hand tools shall be the insulated type and rated for the use.
- c. Insulated tools must be visually inspected prior to use to ensure the insulating material is not damaged.

- d. Use insulated tools only for their designated purposes. Do not use hand tools on energized circuits over 1000VAC.
- e. If the work could cause the minimum approach distance to be violated, appropriate tested and inspected insulating rubber gloves must be worn when using insulated hand tools.

2. Testing for Voltage

- a. Lines and equipment shall be considered energized until they have been isolated, tested for voltage and grounded where applicable.
- b. Personal protective equipment shall be worn as required based on the arc flash risk assessment. If the arc flash PPE category is unknown, qualified employees will consult the appropriate tables (Arc Flash Identification table and Arc Flash Hazard PPE Categories table) in the NFPA 70E standard to determine which arc flash category level to adhere to. This will be documented on the energized work permit.
- c. Insulation penetrating methods shall not be used when checking for the presence of voltage.
- d. Because equipment can be fed by more than one source or can be actuated from more than one location, employees shall remain aware at all times.
- e. If any unusual condition is encountered (e.g., voltage present when it should not be), the employee shall immediately stop work, place the equipment in a safe condition, and contact the supervisor.
- f. Voltage must be tested initially, at shift change, and after other work stoppage. The voltage test shall be done utilizing the "Live, Dead, Live" test method.
- g. If the circuit to be tested is over 600 volts, the test equipment shall be checked to ensure it is in good working order before and immediately after use. The manufacturer's instructions for the device shall be followed.
- h. If there is a possibility of the re-accumulation of stored energy to a hazardous level, the system should be grounded providing grounding creates no adverse issues. Safe work conditions shall be verified periodically throughout the shift until the possibility of such accumulation no longer exists.
- i. Test instruments, leads, cables, power cords, probes, and connectors shall be visually inspected for appropriate voltage, category and external damage prior to use. If there is any doubt as to the equipment's integrity, it must not be used.
- j. Employees shall verify that voltage-testing devices are operating properly and that appropriate settings are used for the parameter and type of voltage to be checked.
- k. Employees shall verify that the testing device is being used for the correct application and in the proper configuration. The instructions in the operator's manual for the specific make and model being used shall be followed.
- l. The maximum safe voltage for the test equipment must not be exceeded. Manufacturer's guidelines and/or group procedures for specific limitations of equipment used must be followed.

3. Grounding

- a. When grounding lines and equipment for the protection of employees, juwi will determine available fault currents and appropriate size of safety ground leads. Regardless of the results, safety ground leads shall not be less than No. 2 AWG flexible stranded copper insulated cable or its equivalent, and capable of conducting the maximum fault current potential and duration necessary to clear the fault. Where generation equipment has been de-energized according to LOTO procedures, grounds do not have to be sized for maximum fault current.
- b. When installing and removing grounds, employees must use a live-line tool. For smaller grounds, specially designed tools that provide insulation and distance between the employee and the line/equipment shall be used instead of a live line tool. The employee is not permitted to apply a ground by hand (even if wearing insulated gloves).

- c. Grounding cables and connecting clamps must be inspected before installation to ensure that all connections are solid and wires or connectors are not frayed or corroded.
- d. Before any ground is installed, lines and equipment shall be tested and found absent of nominal voltage, unless a previously installed ground is present.
- e. When a ground is to be attached to a line or to equipment, the ground-end connection shall be attached first, and then the other end shall be attached.
- f. When a ground is to be removed, the grounding device shall be removed from the line or equipment before the ground-end connection is removed.
- g. In switchyards and on power delivery installations, grounds shall be attached to and removed from the line or equipment with a live line tool.

4. Tools, Equipment, & Fixtures

- a. Only flashlights with exposed parts made of nonconductive material shall be used for work near energized circuits.
- b. Ladders with nonconductive side rails shall be used for work on or near electrical equipment.
- c. Lamps used for general illumination shall be protected from accidental contact or breakage by a suitable fixture or lamp holder with a guard. Brass shell, paper-lined sockets or other metal-cased sockets shall not be used unless the shell is grounded.
- d. All live equipment operating at 50 volts and above shall be guarded (unless elevated at least 8-feet from the floor).
- e. Before replacing fuses, employees shall verify that ratings and types are correct.
- f. Appropriate tools shall be used for installing and removing fuses (e.g. insulated fuse pullers). No fuse operating at 50 volts or greater shall be removed or installed while energized!
- g. Before working on energized equipment, employees shall attempt to dry wet floors. If floors cannot be dried, employees shall use appropriate tested and inspected insulating rubber gloves, insulating floor mats/blankets, and a wooden foundation to elevate the mat above the moisture.
- h. Doors, hinged panels, etc. shall be secured or removed to prevent them from swinging into a worker and causing contact with exposed energized parts.
- i. For arc welding equipment, a disconnecting switch or controller must be provided at or near each welding machine that is not equipped with such a switch or controller mounted as an integral part of the machine.
- j. When working on rackable equipment (e.g. motor control centers and draw-out circuit breakers), employees shall either remove or secure the cubicle to prevent re-engagement to the bus.

E. Ground Fault Protection for Personnel in Construction

- 1. Persons must be protected from ground fault hazards as described below during activities involving construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities.
- 2. Temporary wiring: Class A Ground Fault Circuit Interrupter (GFCI) shall be used on all 120 volt, single-phase 15, 20, and 30 amp receptacles that are not part of the permanent wiring of a building or structure. Portable Class A GFCI devices shall be used when plugging power cords into existing outlets.
- 3. Portable generators: National Electric Code requirements shall be followed. GFCI is required on receptacles on 2-wire, single-phase portable or vehicle-mounted generators rated not more than 15 kW. For all conditions, a Class A GFCI is required.
- 4. For cord sets, extension cords, and cord- and plug-connected tools, personnel shall comply with one of the following options:

- a. Option 1: For all 15, 20 & 30 amp 125 volt temporary circuits a Class A GFCI shall be used on all cord sets, extension cords, and cord-and-plug-connected tools. When using portable GFCIs, the GFCI shall be installed between the receptacle and the cord set, not between the tool and the cord set.
- b. Option 2: For all circuits exceeding 30 amps or 125 volts an assured equipment-grounding program shall be implemented. *29 CFR 1926.401(b)(1)(iii)*
 - i. Cord sets, extension cords, and tools must be visually inspected before each day's use for external defects.
 - ii. Equipment must have current monthly inspection color tape. If it doesn't, the equipment must either be removed from service until corrected or a competent person must inspect and correctly mark it with the appropriate tape.
 - iii. Extension cords and grounded tools must be tested for continuity before first use, monthly, and following repairs. Testing is not required for double-insulated tools or for cords with illuminated ground continuity monitors.

F. Extension Cords

1. Flexible cords and cables shall be protected from accidental damage.
2. Flat extension cords shall not be used.
3. Extension cords shall be hard service or extra hard service type cord.
4. All extension cords shall be visually inspected for external defects before EACH USE. The inspection shall include a check for loose parts, damaged pins and defective insulation. Damaged cords must be removed from service and replaced or repaired.
5. Personnel must verify that cords have current color tape for monthly inspections (for assured equipment grounding program only). Only extension cords with grounding conductors shall be used.
6. Extension cords must not be used to raise and lower equipment.
7. Extension cords must not be fastened with staples, suspended by nails or with wire, or hung in a fashion that could damage the outer jacket, insulation or conductors.
8. Interior extension cords passing through work areas or between arrays shall be elevated to protect them from damage and to eliminate tripping hazards. All personnel must have dry hands when plugging or unplugging extension cords.
9. Locking connectors must be properly secured after connection, if applicable.
10. If an extension cord is wet from immersion and is still energized, appropriate tested and inspected insulating rubber gloves must be worn.
11. Extension cords must be protected from vehicular traffic (e.g., forklifts, man lifts, tractors).

G. Electrical Equipment in Conductive Work Locations

1. Electrical equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees
2. Portable electric equipment used in highly conductive work locations (such as those inundated with water or other conductive liquids) or in job locations where workers are likely to contact water or conductive liquids shall be approved for those locations (e.g. Class I, Division 1).

3. Class A GFCI protection for personnel shall also be used on all temporary and permanent receptacles or generators 15kW or less if used for temporary electric power. (*NEC 590.6 (A)*)

H. Batteries (29 CFR 1926.441)

1. Smoking is prohibited, as is anything that might create sparks, arcs, or flames in battery areas. Signs must be posted accordingly.
2. Personnel shall use extreme caution when carrying or using conductive materials around batteries. Insulated hand tools shall be used.
3. To prevent shocks, employees shall avoid physical contact with exposed conductors on batteries.
4. Unless specific maintenance work is being performed, vent plugs shall not be removed from cells. After work is completed, vent plugs must be reinstalled immediately.
5. Before performing battery-related tasks, personnel shall confirm the location of the nearest eyewash or eyewash/shower. If the eyewash/shower has not been tested within the last week, it must be tested before work is performed on the batteries.
6. Battery-related tasks may be performed by persons working alone. Ask for assistance if necessary.
7. Battery rooms must provide adequate ventilation.
8. Manufacturer's recommendations must be followed when batteries are being charged, repaired, or serviced.
9. Employees must wear PPE as follows:
 - a. Eye protection, full-face shield, chemical resistant gloves, full-body apron, and protective footwear to:
 - i. Add/remove electrolytes (acid)
 - ii. Move lead acid cells
 - iii. Check specific gravity
 - iv. Wash/clean battery cells
 - b. Appropriate Eye protection to:
 - i. Read cell battery voltage
 - ii. Adjust inter-cell connecting hardware

I. Photovoltaic and DC Electrical Safety

Solar electric systems present a semi-unique condition of having two electrical power sources. Electricity comes from both the utility and from the solar electrical system. Disconnecting the utility power will not shut off the electricity generated by the solar array. Voltages can be present, even in low light conditions. This is a new consideration for many electricians and must be understood while working on solar (or photovoltaic, PV) construction sites.

In general, safety procedures for working with AC power will be used for working with DC power produced from photovoltaic modules; however, the unique natures of photovoltaic systems require the following special considerations:

1. Personal Protective Equipment

The 2015 edition of *NFPA 70E* addresses DC systems. However, the arc flash PPE for DC voltage categories only go as high as 600 V. juwi can work on systems up to 1500 V DC. PPE selection will be made using the *NFPA 70E* guidelines.

NOTE: *NFPA 70E* Table 130.4(D)(b) has shock hazard boundary distances for up to 800kVDC.

2. Electrical Considerations for DC Power

- a. DC voltage is constant and thus has no zero crossing and will, therefore, not provide a self-breaking point if contacted.
- b. DC typically creates no audible "hum" as AC does, so the absence of sound does not mean the system is de-energized.
- c. Both the line and load side of disconnects on the AC and DC side can be live when the disconnecting switch is in the open position. Employees shall refer to one-line diagrams for equipment isolation. Employees shall assume lines are energized until tested utilizing the "Live, Dead, Live" test method.
- d. PV cable connectors, and array feeder disconnects are not load break. Current flow should always be stopped by shutting off the inverter or using load break switches before any alternate methods of disconnections are made.
- e. Voltage may be present for several minutes after DC cables have been isolated. Employees shall assume lines are energized until tested.
- f. Normally grounded conductors will become energized when ungrounded.
- g. Normally grounded conductors may be ungrounded and energized when a ground fault is present.
- h. To determine if voltage is present on an ungrounded system, voltage must be checked between the positive and negative pole and not just from the positive pole to ground.
- i. Before a previously energized combiner box can be considered de-energized on an ungrounded system, the voltage must be read from between the positive and negative pole, not just the positive pole to ground.

3. Photovoltaic Modules

- a. PV cable connectors are touch-safe; however, solar modules can generate DC power when exposed to any light source such as the sun. Care must be taken to avoid pinching module wire during installation.
- b. Insulated or heavy duty leather gloves shall be worn during module placement.
- c. PV cable connectors are **NOT LOAD BREAK** designed. Workers **SHALL NOT** disconnect PV cables without prior approval and supervision. Heavy duty leather gloves shall be worn when disconnecting PV cables.

4. Procedures and Precautions for handling DC Cables (for Module interconnection, and all DC Cabling):

DO:

- Ask questions if unsure about anything.
- Treat all cables on modules as energized. The sunlight is a power source.
- Wear proper PPE when handling cables
- Wear appropriate tested and inspected insulating rubber gloves with leather protectors when plugging connections together.
- When making plug connections, push the mating parts together quickly in a straight line. Make sure audible click is heard when complete.

DON'T:

- Pull string cables around sharp edges or use excessive force while pulling.
- Let cables dangle free or lay in areas that have water in them or could collect water.
- Make final connections to string feeders without prior approval.

- Start module interconnection unless all modules in string are installed.
- UNPLUG CABLES WITHOUT SPECIFIC PERMISSION.

If connectors are approved to be unplugged:

1. Always wear appropriate tested and inspected insulating rubber gloves with leather protectors while unplugging
2. Make sure all load is removed and locked out.
3. Use proper tool for release of connector. DO NOT use screwdriver or pocket knife.

CAUTION: POWER IS BEING GENERATED DURING DAYTIME HOURS EVEN IF CLOUDY WEATHER IS PRESENT; WHILE MODULE CURRENT AND VOLTAGE ARE LOW DURING NIGHTTIME HOURS, PROPER SAFETY EQUIPMENT IS STILL REQUIRED TO BE USED.

J. Electrical Safety for Transmission and Distribution (29 CFR 1926 Subpart V)

The following policies refer to work on distribution and transmission systems.

1. General Safety Principles

- b. Electric lines and equipment shall be considered energized unless they have been properly isolated, tested for voltage, and grounded.
- c. Only qualified employees shall work on or with exposed energized lines or parts and in areas containing unguarded, non-insulated energized lines or parts of equipment at 50 V or more.
- d. When working around exposed energized parts, employees shall use proper protective equipment and work practices and comply with minimum approach distances.
- e. Avoid positions where a shock or slip could expose the body to equipment at a potential difference from the body.
- f. When installing or removing fuses with one or both terminals energized at more than 300 V or with exposed parts over 50 V, employees shall use the appropriate tools and gloves. When installing expulsion-type fuses with one or both terminals energized over 300 V, employees shall wear safety glasses or goggles, stay clear of the fuse barrel exhaust path, and use tools rated for the voltage.
- g. Devices used to open circuits under load must be designed to interrupt the current involved.
- h. At least two employees shall be present for the following work:
 - i. Voltage measurements, installation, removal, or repair of energized lines over 600 V
 - ii. Installation, removal, or repair of de-energized lines if an employee is exposed to contact with other parts over 600 V
 - iii. Installation, removal, or repair of transformers, capacitors, and regulators if the employee is exposed to parts over 600 V
 - iv. Work involving the use of mechanical equipment, other than insulated aerial lifts, near parts over 600 V

Employees may only work alone for emergency repairs (e.g., power restoration) to the extent necessary to safeguard the general public.

3. Determining Existing Conditions

- a. Prior to working on electrical lines and equipment, employees shall determine existing conditions, including:

- i. Nominal voltages of lines and equipment
- ii. Switching transient voltages
- iii. Induced voltages
- iv. Integrity of grounds
- v. Condition of poles
- vi. Environmental conditions relative to safety (e.g., high winds, lightning, ice, etc...)
- vii. Locations of circuits and equipment including power and communication lines
- viii. Fault current availability

4. Medical Services and First Aid OSHA Subpart C CFR 1926.23

- a. For transmission and distribution work, when two or more employees are working on exposed, energized equipment, at least two persons trained in first aid/CPR/AED shall be present. However, only one trained person need be available if all new employees are trained in first aid, AED and to include CPR, within 3 months of their hiring date. *CFR 1910.269(b)(1)(i)*
- b. First-aid kits in weatherproof containers shall be readily accessible at all work locations. For line crews, first-aid kits shall be inspected at least biannually. *CFR 29 Part 1910.266 App A* dictates minimum supplies to be on hand for two (2) to three (3) man crews and stipulates additional supplies shall be on hand for larger crews
- c. When the eyes or body parts may be exposed to corrosive materials or chemicals, emergency eyewash facilities shall be available and fully functional prior to commencement of any work.

5. Personal and Electrical Protective Equipment

- a. All PPE shall be properly worn per manufacturer's instructions.
- b. Class E or Class G hard hats and safety glasses must always be worn.
- c. Before each day's use, electrical protective equipment must be inspected for visible defects.
- d. Insulating rubber gloves, sleeves, blankets and line hose must be checked for current test date.
- e. Insulating rubber gloves must be air-tested daily before use.
- f. Electrical protective equipment used by juwi and its subcontractors shall be tested as shown. Documentation of the test will be available at the time of use. Equipment shall not be used if the test date is exceeded or the tests undocumented.

Table 5: Insulating Protection Inspection Schedule (ASTM)

Equipment	When to Test	Governing Standard
Blankets	Before first issue; every 12 months thereafter*	ASTM F 479
Covers	If insulating value is suspect	ASTM F 478
Gloves	Before first issue; every 6 months thereafter*	ASTM F 496
Sleeves	Before first issue; every 12 months thereafter*	ASTM F 496

*If the insulating equipment has been electrically tested but not issued for service, it MAY NOT be placed in service unless it has been electrically tested within the previous 12 months.

- g. If a defect is found during inspection of PPE, electrical protective equipment or live line tools, the equipment must be marked as defective and not used. Rubber goods must be returned for a retest if they are suspected to be defective.
- h. Leather glove protectors must be worn over rubber gloves at all times. Leather glove protectors shall not be used for any other purpose.
- i. Leather glove protectors shall be thoroughly inspected at the time of the air test on the rubber insulating gloves. Checking for any debris, penetrations or contamination that could damage the rubber insulating glove such as fuel or grease.
- j. Only 100% talcum powder or 100% cotton glove liners shall be used with voltage rated rubber insulating gloves.
- k. Where type EH insulated footwear is used as **protection against step and touch potential**, dielectric overshoes shall be required. Insulated soles shall not be used as primary electrical protection.
 - i. While handling downed conductors when working on the ground
 - ii. While switching primary underground systems, either by hand or with a hot stick
 - iii. While operating gang switches, disconnects, air break handles, or any device energized over 600V
 - iv. While installing or removing fuses in cutouts from the ground with a telescopic hot stick or operating pole.
 - v. While working around temporary mobile equipment in a substation
 - vi. While as a groundman when overhead energized work is being performed and the truck is grounded
- l. Type DI footwear is not recommended for use on gravel surfaces as the gravel may partially or fully penetrate the DI footwear rendering them ineffective for shock protection, similar to a hole in an insulating rubber glove.
- m. A class II, 20kV or greater rubber blanket placed on the ground can be used as a substitute for dielectric shoes. Dielectric footwear is not required in substations where adequate gravel and ground grids are present.
- n. Dielectric shoes must be visually inspected on a daily basis and replaced if worn or defective.

6. Live Line Tools

- a. Live line tools must be visually inspected and wiped clean before and after use each day. If a defect or contamination could adversely affect the insulating quality or the mechanical integrity of the tool, it must be removed from service and tested before returning to service.
- b. Every two years, every live-line tool shall be examined, cleaned, repaired if necessary, and electrically tested by an approved testing facility.

7. Materials Handling and Storage

In areas not restricted to qualified employees, materials shall not be stored closer than 10 feet to energized lines or exposed energized parts for lines 50 KV and less. For lines over 50 KV, the distance is 10 ft. plus 4 inches for every 10 KV over 50 KV.

K. Working On or Near Exposed Energized Parts

The following section is based on OSHA 29 CFR 1910.269 and 29 CFR 1926 Subpart V. These standards provide the minimum safety requirements for electrical power generation, transmission and distribution. All documentation herein complies with these standards or is considered additional best practice.

1. Making Connections (29 CFR 1910.269(l)(5)(i)(ii)(iii))

- a. If de-energized equipment or lines are being connected to an energized circuit using a conducting wire or device, the wire shall be attached to the de-energized part first.
- b. If disconnecting, personnel shall remove the source end first and keep loose conductors away from exposed energized parts.
- c. When lines or equipment are connected to or disconnected from energized circuits, loose conductors shall be kept away from exposed energized parts.

2. Minimum Approach Distances

- a. Employees shall not approach or take any conductive object closer to exposed energized parts than the minimum distance shown in Table 6 unless the employee is:
 - i. Insulated from the energized part by wearing appropriate rated, tested and inspected insulating rubber sleeves and/or gloves that are rated for the voltage; OR
 - ii. The energized part is insulated with line hose or rubber blankets; OR
 - iii. Doing live-line, bare-hand work

Table 6: AC Minimum Approach Distance from Live Parts CFR 1910.269 Table R-6

Nominal voltage in KV phase-to-phase	Distance phase-to-employee
0.05 to 1.0	Avoid contact
1.1 to 15.0	2 ft. 1 in.
15.1 to 36	2 ft. 4 in.
36.1 to 46	2 ft. 7 in.
46.1 to 72.5	3 ft.
72.6 to 121	3 ft. 2 in.
138 to 145	3 ft. 7 in.
161 to 169	4 ft.
230 to 242	5 ft. 3 in.
345 to 362	8 ft. 6 in.
500 to 550	11 ft. 3 in.
765 to 800	14 ft. 11 in.

3. Type of Insulation

- a. Any time insulating rubber gloves are worn to comply with the minimum approach distance requirement above, insulating rubber sleeves shall also be worn.
- b. However, insulating rubber sleeves are not required when the exposed energized parts on which work is not being performed are covered with line hose/blankets and the insulation is installed from a position not exposing the employee's upper arm to contact with other energized parts and the worker will not encroach on the 5-foot primary zone.

4. De-Energizing Lines and Equipment for Employee Protection

- a. Before considering lines and equipment as de-energized, personnel must ensure they are de-energized as described below, tested for voltage, and grounded.

- b. For systems under the control of a dispatcher or operator, personnel shall obtain a clearance to de-energize the lines according to standard operating procedures.
- c. Personnel shall de-energize lines and equipment by opening the proper switching device such as disconnects, interrupters, circuit breakers, reclosers, line switches, or fuses.
- d. For systems not under the control of a dispatcher or operator, personnel shall isolate lines with a visual break that may include one or more of the following:
 - i. Removing fuses
 - ii. Disconnecting recloser leads
 - iii. Opening switches
 - iv. Removing jumpers
- e. The following shall be rendered inoperable, as design permits, and tagged:
 - i. Automatically and remotely controlled switches that could cause the opened disconnection means to close (tag at the point of control)
 - ii. All switches, disconnects, jumpers, taps, and other means through which electricity may be supplied to the lines and equipment.
- f. Tags used shall prohibit operation of the disconnecting means and indicate that employees are at work. If an individual (or one crew) is working alone and the means of disconnection are accessible and visible, tags are still required, as well as an additional means of isolation such as de-terminating the conductors.
- g. If design permits, the recloser shall be rendered inoperable and tagged and the source and load side leads shall be removed. For parking the leads, if applied, a stand-off tool shall be used.
- h. Any disconnecting means that are open to protect employees and that are accessible to the public shall be rendered inoperable and locked out and/or tagged out.
- i. Lines and equipment must be tested to verify that they are de-energized.
- j. Grounds shall be installed as outlined in "Grounding" in this document.
- k. To release a clearance, the employee in charge shall:
 - i. Notify the crew
 - ii. Determine that everyone is clear of the lines and equipment
 - iii. Remove all protective grounds
 - iv. Report this information to the system operator and release the clearance
- l. Lines shall not be re-energized until: all grounds have been removed; all crews have released their clearances; all employees are clear of the lines and equipment; and all tags have been removed.

5. Grounding for the Protection of Employees

- a. Before considering lines and equipment to be worked on as de-energized, personnel shall ensure they are de-energized as described in the section above, tested for voltage, and grounded as described in this section.
- b. If installing a ground is impractical or would create greater hazards, the lines and equipment shall be treated as de-energized if all the following conditions are met:
 - i. The lines and equipment are de-energized, locked and tagged out as required
 - ii. Contact with another energized source is not possible
 - iii. No hazard of induced voltage exists
- c. Personnel shall visually inspect the grounding equipment before installing grounds on a supposedly de-energized circuit.

- d. To verify that the circuit has been de-energized, an approved voltage-testing device shall be used to check for voltage on the conductors to be grounded, utilizing "Live, Dead, Live" testing method.
- e. Temporary protective grounds shall be placed at such locations and arranged in such a manner as to prevent each employee from being exposed to hazardous differences in electrical potential.
- f. Protective grounding equipment must:
 - i. Be capable of conducting the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault
 - ii. Have an ampacity greater than or equal to that of #2 AWG copper (juwi requires 2/0 in most applications)
 - iii. Have an impedance-to-ground low enough to cause immediate operation of protective devices in case of accidental energizing of the lines or equipment
- g. If there is no previously installed ground, lines and equipment shall be tested before any ground is installed to ensure they are free of nominal voltage.
- h. If attaching grounds to lines or equipment, personnel shall attach the ground-end connection first; then attach the other end using live-line tools.
- i. When a ground is to be removed, the grounding device shall be removed from the line or equipment using a live-line tool before the ground-end connection is removed.
- j. If work is performed on a cable at a location remote from the cable terminal and the hazardous transfer of potential is possible should a fault occur, the cable shall not be grounded at the cable terminal.
- k. Grounds may be removed temporarily during tests. During the test, insulating equipment and other measures necessary shall be used to protect exposed employees in case the lines and equipment become energized.
- l. When installing or removing grounds, personnel must wear a hard hat, safety glasses, rubber gloves, and arc rated clothing.

6. Mechanical Equipment

- a. The critical safety components of mechanical elevating and rotating equipment must be inspected during each shift in which the equipment is used.
- b. Vehicular equipment shall not be operated with an obstructed rear view on off-highway job sites that expose employees to hazards created by the moving vehicle, unless the vehicle has a reverse signal alarm audible above the surrounding noise level or it is backed up only when a designated employee signals that it is safe to do so.
- c. If the suspended load of a line truck endangers any employees, the controls of the truck must not be left unattended.
- d. If vehicular equipment includes outriggers:
 - i. It shall be operated with the outriggers extended and firmly set as necessary to keep the vehicle stable.
 - ii. Outriggers shall not be extended or retracted outside of the operator's clear view unless all employees are outside the range of possible equipment motion.
- e. Lifting equipment shall be used within its maximum-load rating and other design limitations for the work conditions.
- f. Qualified employees shall operate mechanical equipment so that the minimum approach distances from exposed energized lines and equipment shown in Table 6 are maintained. The insulated portion of an aerial lift operated by a qualified employee is exempt from this requirement.

- g. A designated employee other than the operator must observe the approach distance to exposed lines and provide timely warnings before the approach distance is reached. (This is not required if the operator can safely determine the distance alone).
- h. If mechanical equipment could become energized when used around overhead power lines, the equipment must be grounded.

6. Overhead Lines

- a. Before climbing, installing, or removing any equipment, personnel must determine the amount of additional or unbalanced stress a pole or tower can handle; if necessary, the pole or tower shall be supported with braces.
- b. When poles are set, moved, or removed near overhead conductors, direct contact of the pole with energized conductors must be avoided.
- c. When handling poles near overhead power lines, appropriate electrical protective equipment (appropriate rated, tested and inspected insulating rubber gloves/sleeves and dielectric footwear) shall be worn.
- d. Employees must not contact the poles with un-insulated body parts.
- e. In areas where employees are working, pole holes must be guarded or an attendant provided.
- f. Precautions shall be taken to minimize the possibility that conductors and cables being installed or removed will contact energized lines or equipment (e.g., by using barriers or the tension-stringing method).
- g. The safeguards listed for mechanical equipment near energized lines shall be provided for conductors, cables, and pulling and tensioning equipment when employees are installing close enough to energized conductors to be energized by any of the following:
 - i. Failure of the pulling or tensioning equipment
 - ii. Failure of the wire or cable being pulled
 - iii. Failure of the previously installed lines or equipment
- h. If installing or removing conductors that cross over energized conductors in excess of 600 V, personnel shall render inoperative the automatic reclosing feature for the energized lines if permitted by the design of the circuit-interrupting devices protecting the lines.
- i. The voltage to be induced in the new lines shall be determined before lines are installed parallel to existing energized lines.
- j. If hazardous voltage induction is possible, personnel shall ensure the following:
 - i. Each bare conductor must be grounded so that no point is more than 2 miles from a ground
 - ii. Grounds must not be removed until the conductor installation is completed between dead ends
 - iii. Ground removal shall be the last phase of aerial cleanup
- k. If working on bare conductors, personnel shall install grounds at:
 - i. Each work location where the employees are working
 - ii. All open dead-end or catch-off points or the next adjacent structure
 - iii. If splicing two bare conductors, bond and ground the conductors before splicing.
- l. Reel handling equipment, including pulling and tensioning devices, must be kept:
 - i. In safe operating condition
 - ii. Leveled
 - iii. Aligned

- m. Load ratings of stringing lines, pulling lines, conductor grips, load-bearing hardware and accessories, and rigging and hoists shall not be exceeded.
- n. Defective pulling lines and accessories shall be repaired by authorized/qualified individuals or replaced.
- o. Conductor grips are not to be used on wire rope unless the grip is specifically designed for the application.
- p. The reel tender and the pulling-rig operator shall maintain reliable communications through two-way radio or the equivalent.
- q. Personnel shall operate the pulling rig only when it is safe to do so.
- r. While the conductor or pulling line is being pulled (in motion) with a power-driven device, personnel must not stand directly under overhead operations or on the cross arm, except as necessary to guide the stringing sock or board over or through the stringing sheaf.

7. Minimum Approach Distances (29 CFR 1910.333 (c)(3)(ii))

- a. When a qualified person is working in the vicinity of overhead lines, whether elevated or on the ground, the person shall not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than the minimum approach distances shown in the tables below unless:
 - i. The person is insulated from the energized part with appropriate rated, tested and inspected insulating rubber gloves and/or sleeves if necessary, rated for the voltage involved which are considered to be insulating the person from the energized part on which work is being performed; OR
 - ii. The energized part is insulated from all other conductive objects at a different potential and from the worker (line hose/blanket/etc); OR
 - iii. The person is insulated from all conductive objects at a potential different from the energized part.

Table 7: Minimum Approach Distances for Qualified Person near Overhead Lines

Voltage Phase-to-Phase	Minimum Approach Distance
300 V and less	Avoid contact
Over 300V, not over 750V	1 ft. 0 in
Over 750V, not over 2kV	1 ft. 6 in.
Over 2.kV, not over 15kV	2 ft. 0 in.
Over 15kV, not over 37kV	3 ft. 0 in.
Over 37kV, not over 87.5kV	3 ft. 6 in.
Over 87.5kV, not over 121kV	4 ft. 0 in.
Over 121kV, not over 140kV	4 ft. 6 in.

- b. All unqualified persons shall maintain these distances from overhead power lines:
 - i. For lines less than 50 KV: 10 feet.
 - ii. For lines over 50 KV: 10 ft. plus 4 in. for every 10 KV over 50 KV

8. Towers and Structures

- a. Unless assisting employees working above, personnel shall not stand under a tower or structure while work is in progress.
- b. Unless it is more hazardous, tag lines or other similar devices shall be used to maintain control of tower sections being raised or positioned.
- c. The load line must not be detached from a member or section until the load is safely secured.
- d. When adverse weather conditions make the work unusually hazardous, work shall be discontinued—except during emergency power restoration procedures.

9. Electric Vault and Manhole Entry

- a. Employees entering electric vaults and manholes shall complete Confined Space Training and shall be trained in rescue techniques.
- ~~b.~~ Any time work is performed in a manhole or vault, an attendant trained in first aid/CPR/AED shall be present outside. For brief entries to perform inspections, housekeeping, or to take readings, an attendant is not required. The attendant cannot enter briefly to assist in the work.
- c. Atmospheric testing shall be conducted prior to entry. The manhole or vault shall be ventilated or monitored continuously during entry.
- d. Rescue equipment shall be available at the job site any time work is performed in a manhole or vault. Rescue equipment is not required for brief entries for inspections, housekeeping, or taking readings.
- e. Employees may not enter a manhole or vault while it contains a hazardous atmosphere unless they comply with permit-required entry requirements of the Confined Space Entry Program.

L. Switchyard

All work in a switchyard will require juwi management pre-approval.

1. All conductors and equipment shall be considered energized until tested for voltage and grounded.
2. Any unusual conditions observed on substation structures, equipment, ground wires, busses, or wiring shall be reported to supervision or the system coordinator.
3. Personnel entering an occupied substation must report their presence to the employee in charge.
4. Substation job briefings shall include a discussion of the location of energized equipment in or adjacent to the work area.
5. Substation entrances that are not observed by an attendant must remain locked.
6. Signs such as "DANGER, KEEP OUT" (or the equivalent) must be posted to warn unauthorized persons.
7. Guarding shall be provided around live parts over 150 volts-to-ground that do not have an insulating cover unless they are located to prevent inadvertent contact.
8. Unless it is an emergency, personnel shall obtain permission from the system coordinator or other authorized persons before energizing or de-energizing a substation, the equipment in the substation, and the associated lines or busses.
9. Only qualified persons shall perform switching operations.
10. For all live-line tools:
 - a. Tools must be wiped clean and inspected daily before use and properly waxed as needed.
 - b. Every 2 years, tools shall be dielectrically tested at 75,000 volts per foot for one minute, using the appropriate tester.
 - c. Tools shall not be placed on the ground.

- d. When tools are refinished, repaired, or fail a visual inspection, they must be dielectrically tested before returning to service.
11. Red tape shall be used to designate energized areas next to work areas.
12. Red tape or red flags shall be attached to designate safe heights on structures, columns, or poles above which workers may not climb because of energized equipment or circuits.
13. Conductive material shall be carried or placed so as to prevent contact with energized lines, equipment, or busses.
14. Metallic cloth tapes, metal tapes, metal rules, or other conductive material shall not be used near energized conductors or equipment.
15. Before applying grounds, personnel shall de-energize static capacitors for 5 minutes.
16. Fall protection shall be attached only to designated substantial anchorage point(s) rated at least 5,000 pounds per individual attaching to the anchorage point—never to conductors or cables.
17. Portable metal or other conductive ladders are not to be used in substations.

M. Energy Control (Lockout & Tagout) (29 CFR 1910.147)

1. Overview

The employer shall establish a program consisting of energy control procedures, employee training and periodic inspections to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected start-up or release of stored energy could occur and cause injury, the equipment shall be isolated from the energy source and rendered inoperative.

- Employees shall be trained in the requirements of the Lockout/Tagout (LOTO) program prior to performing tasks that require LOTO.
- All hazardous energy sources associated with the work activities shall be identified.
- Hazardous energy sources shall be isolated, energy-isolating devices shall be tagged and locked, and stored hazardous energy shall be relieved as described in the LOTO Compliance Program.
- Before beginning work, personnel must verify by testing or operation that hazardous energy has been relieved.
- Before restoring hazardous energy, personnel must verify work is complete and persons are clear of equipment.
- juwi and its subcontractors will inform each other of their respective LOTO procedures.
- At generating plants, juwi's site-specific procedures for LOTO must be followed.

a. Scope

The LOTO procedure shall be in effect for both the construction and operation of a PV plant starting with whichever of the following comes first: (a) when photovoltaic (PV) modules are connected to wires beyond any array-mounted harnesses (commonly called "Array Feeders"), or (b) when preparations begin to first close the utility's disconnect. The procedures must be put into place before the two aforementioned events of the installation because safe practices require that LOTO be in effect before any energization of site equipment occurs.

Note: Photovoltaic modules generate harmful voltage whenever exposed to light. There is no LOTO procedure in effect for photovoltaic modules alone, or modules wired in series. PV modules must be treated as constant sources of voltage (such as a battery) at all times and compliance with module manufacturers' general safety procedures is required.

All employees are required to comply with the restrictions and limitations imposed upon them during the implementation of this lockout procedure. The authorized employees are required to perform the LOTO in accordance with this procedure. All employees, upon observing a piece of equipment which is locked out to

perform servicing or maintenance, shall not attempt to start, energize or use that equipment. At the conclusion of the construction phase of the project, the LOTO procedure will remain in effect.

THIS PROCEDURE PERTAINS ONLY TO juwi SOLAR INC ("juwi") PHOTOVOLTAIC INSTALLATIONS. ANY ATTEMPT TO APPLY THIS PROCEDURE TO EQUIPMENT OR MACHINES OUTSIDE OF THE DESIGN OF A juwi PHOTOVOLTAIC SYSTEM COULD RESULT IN PERSONAL INJURY OR DEATH. IT IS THE RESPONSIBILITY OF PERSONNEL FOLLOWING THIS PROCEDURE TO HAVE, AND COMPLY WITH, THE MOST CURRENT REVISION.

b. Purpose

This procedure establishes the minimum requirements for the lockout of energy sources whenever installation, maintenance or adjustment is performed on equipment or systems. This procedure shall be used to ensure that the equipment or system is stopped, isolated from all potentially hazardous energy sources and locked out before qualified personnel perform any work.

c. Definitions:

Authorized employee refers to an employee of juwi or the subcontractor who is knowledgeable of LOTO procedure and has the permission of the LOTO Supervisor to operate energy isolation devices and lock them out.

Energy isolation device refers to any mechanical device that physically prevents the operation of a system, and controls the potential release of hazardous energy. Push buttons, selector switches and other control circuit type devices are not energy isolation devices.

Lockout/Tagout or LOTO refers to the use of locks and tags to safeguard against the undesired energization or release of energy by equipment during installation, maintenance or adjustment.

LOTO Supervisor refers to the full-time employee of juwi or the subcontractor who is on the jobsite daily during all phases of electrical construction work and is assigned with the responsibility of oversight of this procedure and has been properly trained as required by OSHA's Occupational Safety and Health Standards.
CFR 1910.147

2. LOTO Procedure Administration

There must be an individual, who is (a) a full-time employee of the subcontractor and (b) on the jobsite daily during all phases of electrical construction work, (c) assigned as the authorized employee by name and title, and (d) has been properly trained as required by OSHA's Occupational Safety and Health Standards.
CFR 1910.147 (The Control of Hazardous Energy – Lockout/Tagout) (the LOTO Supervisor).

The LOTO Supervisor will control and be responsible for assuring implementations of the following procedures. Any employee violating the required lockout procedures will be summarily suspended and subject to dismissal if willful violations are determined after investigation. The LOTO Supervisor will maintain a LOTO log documenting all actions relating to LOTO. Form shall be similar to Appendix K.

After substantial completion of the construction phase of the project, the role of the LOTO Supervisor will be transferred to a juwi employee or other person designated by juwi.

3. Training

The subcontractor shall provide training to ensure that the purpose and function of this LOTO procedure is understood by its employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees.

The training shall include the following:

- a. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available on the project site, and the methods and means necessary for energy isolation and control.
- b. Each affected employee shall be instructed in the purpose and use of the LOTO procedure.
- c. All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize equipment which is locked out or tagged out. Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in equipment or processes that present a new hazard, or when there is a change in the energy control procedures.
- d. Training shall be documented for all authorized personnel using the form located in Appendix K.

4. Authorized Employee Responsibilities

Authorized employees shall meet with the LOTO Supervisor to identify all required LOTO location(s) within the project site as identified in project specific LOTO one-line diagram. In addition to the one-line, LOTO procedures shall apply to all energy sources on site. All personnel must review the section regarding energy sources before working on all machinery and non-plant installed equipment. Authorized employees shall understand the hazards of the energy and shall know the methods to control the energy. Authorized employees shall notify, in person, the LOTO Supervisor when any energy isolation device is to be locked out. The LOTO Supervisor shall ensure that all personnel working in the areas undergoing the LOTO procedure are notified of the action. If any equipment to be affected by operation of any Energy Isolation Device is operating, shut it down by the normal stopping procedure. juwi personnel will provide the normal shut-down procedure and/or perform the shut-down. Stored or residual energy (such as that in underground cables) must be dissipated by methods such as grounding.

CAUTION: If there is a possibility of re-accumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

CAUTION: Operating control(s) shall be put to a neutral or "OFF" position after verification of the isolation of the equipment.

The energy-isolating device(s) shall be deactivated so that the equipment is isolated from the energy source(s). The energy-isolating device(s) shall be locked out with assigned individual lock(s).

The lock must prevent the operation of the equipment.

Personnel shall use a voltage tester to confirm that the equipment is ground potential.

The responsible party shall place the lock and tag it with his/her name and the reason for placing the lock. If possible, the employee shall ensure that the equipment or systems is disconnected/isolated from all the energy source(s) by first checking that no personnel are exposed, then verifying the isolation of the machine or equipment or systems by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate. Each employee involved shall place their own lock on the equipment and only then is the equipment or system locked out.

5. Equipment that Cannot be Locked

Some equipment cannot be locked out, but that does not mean it cannot be dangerous if it starts or is energized accidentally. That is where tagout comes in. Tagout means using special tags that warn people of the danger of starting up a system or machine. A tag has a printed warning such as, "DO NOT OPERATE". Tags, however, do not physically impede equipment from starting up. If a tag system is used, it must be done with extra care and diligence given to informing project site personnel of its implementation, per the communication protocol below. The

procedure and sequence for tagout is the same as for lockout. When tagout systems are used, the LOTO Supervisor shall communicate the following to all affected personnel employees:

- a. Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.
- b. When a tag is attached to an energy-isolating device, it is not to be removed without authorization, of the authorized employee responsible for it, and it is never to be bypassed, ignored or otherwise defeated.
- c. Tags must be legible and understandable by all authorized employees, affected employees and all other employees whose work operations are or may be in the area, in order to be effective. Tags shall be in both English and Spanish when deemed appropriate. Location of tags shall be per a project specific one-line diagram. Style of tags shall be per Appendix K.
- d. Tags and their means of attachment must be made of materials that will withstand an outdoor environment.
- e. Tags may evoke a false sense of security and their meaning needs to be understood as part of the overall LOTO program.
- f. Use of tags shall be supplemented by an additional means of isolation.

6. Locks

Only individually keyed locks will be used. The key will remain in possession of the authorized employee placing the lock. A master series of locks to be used specifically for lockout shall be maintained by the LOTO Supervisor.

7. LOCKOUT or TAGOUT Device Removal

Each LOTO device shall be removed from each energy-isolating device by the authorized employee who applied the device. No one shall be able to leave the site, on a daily basis, with a lock on without permission of the LOTO Supervisor. When the authorized employee who applied the LOTO device is not available to remove it, that device may be removed under the direction of the LOTO Supervisor. An authorized employee on the job site shall verify that the authorized employee who applied the device is not at the job site and make all reasonable efforts to contact him/her to inform him/her that his/her LOTO device will be removed. After that, the authorized employee on the job site shall contact the LOTO Supervisor to obtain final approval to remove the LOTO device. The LOTO Supervisor shall confirm that the Authorized Employee who applied the LOTO device is aware that his/her LOTO device has been removed prior to resuming work at the job site. This process shall be documented per the use of Appendix K.

8. RESTORING EQUIPMENT TO SERVICE

When the servicing or maintenance is completed and the equipment is ready to return to a normal operating condition, the following steps shall be taken.

- a. The machine or equipment and the immediate area around the machine or equipment shall be checked to ensure that non-essential items have been removed from the area. Remove all equipment, tools, material, and scrap.
- b. The work area shall be checked to ensure that all employees have been safely positioned or removed from the area. All personnel must be notified that power is to be restored.
- c. The controls, if any, must be in a neutral or "OFF" position.
- d. Grounding jumpers, locks, tags, tools, material and scrap must be removed.
- e. The work area shall be double-checked to ensure that all personnel have been safely positioned or removed from the area.
- f. The lockout devices shall be removed and the machine or equipment shall be re-energized.
- g. Affected employees must be notified that the servicing or maintenance is completed and the machine or equipment is ready for use.

- h. The authorized employee shall meet with the LOTO Supervisor to declare that the lockout location is energized.

9. Tags

ANY PERSON WHO OPERATES A VALVE, SWITCH OR DEVICE TO WHICH "DANGER" TAGS ARE ATTACHED OR WHO REMOVES A TAG WITHOUT AUTHORIZATION FROM THE LOTO SUPERVISOR WILL BE SUBJECT TO IMMEDIATE TERMINATION AND PERMANENT BARRING FROM THE SITE.

10. Inspection Policy

Annual reviews of the LOTO procedures will be performed by all personnel who perform LOTO procedures. The inspection review procedures are performed for compliance with OSHA 29 CFR 1910.147. Inadequacies will be identified and corrected. The inspection will be recorded to identify the equipment, the date of inspection, the employees involved in the inspection, and the person performing the inspection. This inspection may be recorded on the juwi site safety inspection form.

11. Energy Sources

When working with all energy sources, personnel must relieve, disconnect and restrain all stored or residual energy. It is important to remember that hazardous energy can be found in springs, elevated machine members, capacitors, rotating flywheels, hydraulic systems, air, gas, steam and water pressure. Operator and service manuals can assist personnel in safely controlling the specific energy hazards. Common methods to restrain or dissipate stored energy are repositioning, blocking and bleeding down systems. Personnel shall know in advance the tools and equipment needed to control each hazard and be sure they are in proper working order and able to perform the tasks expected of them. All personnel must be in a safe location. The equipment must be properly isolated and all hazardous energy must be safely controlled. Push buttons and other controls shall be operated in order to verify isolation. Electrical meters shall be used to check circuits. Springs, pressure gauges and the location of moving parts and other sources of stored energy shall be inspected. Operating controls must be returned to the "NEUTRAL" or "OFF" position after the test. Each machine and piece of equipment is different. Personnel shall follow the instructions found in the operator's service manual. Employees shall proceed with maintenance and service activities only after they are absolutely certain that the energy is isolated and safely controlled.

Some machinery and equipment can reaccumulate stored energy even after the system has been de-energized. If there is a possibility of stored energy building to a hazardous level, verification shall be continued until maintenance or service is complete or until the possibility of accumulation no longer exists.

VIII. MOTOR VEHICLE SAFETY

A. General Motor Vehicle Operations (29 CFR 1926.601)

All employees shall walk around any vehicle to visibly check tires, lights, general safe condition before operating any vehicle. All of the vehicles' occupants must wear seat belts when the vehicle is in motion.

1. Impaired Driving

- a. Employees are prohibited from operating any vehicle while impaired.
- b. If involved in a motor vehicle incident, the driver will be required to submit to a Fitness for Duty test (e.g. a drug/alcohol test).

2. For off-project sites for general company travel, the following items apply:

- a. Drivers shall minimize driving distractions by using hands-free devices, speaker phone, or voice-operated dialing features and by letting incoming calls roll over to phone mail.
- b. If a driver determines that it is safe to take or make a call while driving, the call must be kept short to limit distraction.
- c. If a driver must take a call when driving and if possible, he/she shall suspend the call and then safely pull over to continue the conversation, parking as allowed in a safe place.
- d. Any hands-free accessories shall be positioned before driving.
- e. Other electronic equipment (e.g., pagers, radios, and recording devices) shall be used carefully while driving. The use of these devices shall not interfere with the driver's ability to drive safely. If necessary, the driver shall pull off of the road to use these devices.
- f. Drivers must be aware of all state or local laws that prevent the use of phones while driving.
- g. Drivers shall avoid:
 - i. Eating meals, smoking, looking for loose items
 - ii. Reading or taking notes
 - iii. Any other activity that removes attention from driving

3. Aggressive Driving

- a. All vehicles shall be operated in a safe manner, using defensive driving techniques.
- b. Drivers are prohibited from driving aggressively. Aggressive driving includes:
 - i. Speeding
 - ii. Tailgating
 - iii. Failure to signal lane changes
 - iv. Running red lights and stop signs
 - v. Weaving in traffic
 - vi. Yelling
 - vii. Making obscene gestures
 - viii. Excessive or inappropriate use of the horn

4. Operational Practices

- a. All vehicles must be operated according to applicable Department of Transportation (DOT) regulations.
- b. Before a vehicle is operated, all windows must be free of dirt, ice, snow, frost, or anything that obstructs clear vision.
- c. No driver shall operate a motor vehicle without authorization and a valid state operator license or permit applicable for the type of vehicle operated.
- d. Before operation, a vehicle must be visually inspected to determine whether the vehicle is safe to operate.
- e. Before operating a vehicle, the driver must become familiar with the vehicle's controls.
- f. When driving a commercial vehicle, a driver must perform and document post-operational and pre-operational inspections, according to current DOT regulations.
- g. Drivers must observe all traffic rules and regulations while operating a motor vehicle.
- h. Drivers shall observe traffic conditions before opening doors.
- i. Loose items are not to be placed on the front floors, front seat, rear window, or dash.

- j. Riding in trailers or other similar operating equipment being towed is prohibited.
- k. A driver shall report any defects noted while operating a vehicle. Unsafe operating conditions must be corrected before further use. Mobile equipment may not be towed without an approved hitch and safety chains adequate for the load.
- l. Wheel chocks must be used when provided with the vehicle. Chocks are required for 1-ton and larger trucks.
- m. Drivers must always remain alert to other vehicle movements.
- n. During refueling, the vehicle ignition must be turned off and personnel must refrain from smoking or using other portable electronic devices.
- o. During refueling, the driver shall attend the nozzle.
- p. When possible, vehicles should be positioned so as to eliminate the need to back up.

5. Periodic Vehicle Checks

- a. Periodic visual inspections should include:
 - i. Gauges
 - ii. Fuel and fluids
 - iii. Tires
 - iv. Mirrors and mirror adjustment
 - v. Windscreen, including wipers
 - vi. Lights, including headlights, directional lights and brake lights
- b. juwi company vehicles should be inspected on a monthly basis and documented on the vehicle's inspection log.

6. Emergencies

- a. In the event of vehicle trouble (e.g., a flat tire), the driver should pull off to the right side of the road, if possible, and use emergency flashers and warning signals.
- b. In the event of an accident, personnel should do the following:
 - i. Stop the vehicle immediately or as near the accident as practical
 - ii. Wear a traffic vest, if one is available
 - iii. Provide assistance and obtain medical first aid
 - iv. Call the police and notify supervisor as soon as possible
 - v. Exchange names, addresses, and vehicle insurance information
 - vi. Refrain from discussing who is at fault
 - vii. Get names of any witnesses to the accident
 - viii. Remain at the scene as long as necessary
- c. To report serious emergencies, personnel should dial 911 or a local emergency number. (Personnel should call the Ops Center line at 720-838-2323 for emergencies on or around generation plant property.)
- d. Personnel should use the emergency number provided by AAA for roadside assistance while driving a company vehicle.
- e. A vehicle emergency kit is kept in each company vehicle. The kits include:
 - i. First-aid kit

- ii. Flashlight
- iii. Chem light
- iv. Jumper cables
- v. Ice scraper
- vi. Fleece blanket
- vii. Reflective triangle

7. Incident Reporting and Analysis

- a. Any employee involved in an accident in a company vehicle must complete a vehicle accident report.
- b. Any employee who experiences an injury from any kind of vehicle accident while on company business must complete a personal injury report.
- c. Employees who receive a citation for any of the violations listed below while operating any juwi-owned vehicle, must immediately report the citation to their supervisor and the appropriate DOT File Administrator:
 - i. Moving violations or parking violations issued by law enforcement
 - ii. Commercial motor vehicle driver "Out of Service" (OOS) violations
 - iii. Violations for vehicle being overweight, over height, or over length

B. Work Zone Motor Vehicle Operations

1. Impaired Driving

- a. Employees are prohibited from operating any vehicle while impaired.
- b. If involved in a motor vehicle incident, the driver will be required to submit to a Fitness for Duty test (e.g. a drug/alcohol test).

2. Distracted Driving

- a. Driving motorized equipment or a vehicle while speaking on cell phones or other communication devices is prohibited.

3. Use of Spotters Policy

A spotter should be used for all equipment that needs to move backward or for assistance with an obstructed view, or "blind spot". If a spotter is not available, a 360 degree walk around inspection shall be performed and obstructions and other hazards in the path of the vehicle shall be identified and avoided.

Spotters Responsibilities:

- a. The spotter must constantly be aware of his surroundings and watch for vehicles that may enter the path of the vehicle that is backing up.
- b. The spotter must either stop the oncoming hazard or stop the vehicle backing up.
- c. The spotter must be aware of all objects in the area and direct the driver around obstacles.
- d. The spotter must not only be aware of objects on the ground, but also overhead.
- e. The spotter must stay in visual contact with the driver and stay in view of the mirrors.

- f. Spotters must use hand signals while directing equipment backing. The meaning of each hand signal should be confirmed with the driver before moving the vehicle.
- g. Areas of heavy congestion may require an additional spotter to avoid near misses or accidents.

4. All Terrain Vehicles Use Policy

juwi uses ATVs on many projects in areas of restricted size. The probability of multiple operations, personnel and additional equipment all in the same general workspace obligates the need for safe operating guidelines. The safety of all personnel on any juwi project is always the top priority. Statistics show, on average, the underlying causes of ATV accidents are:

- a. Lack of training and/or experience
- b. Excessive speed
- c. Carrying a passenger or unbalanced load
- d. Tipping on a bank, ditch, rut or bump

Many accidents are also caused by driver complacency. Although employees may be tempted to push on and get the job done, accidents often occur when they are least expected. When operating an ATV, the driver should always:

- a. Wear safety glasses to protect the eyes
- b. Plan each task beforehand. Pre-planning helps prevent potential hazards and improves efficiency.
- c. Perform an inspection of the vehicle before driving. Check the brakes regularly, as they can have a relatively short life span in a construction setting.
- d. Check the tire pressure and look for signs of damage.
- e. Make sure loads are properly secured.
- f. When backing up in an ATV that has no back-up alarm, use the horn and/or a spotter.
- g. Maintain visual focus of surroundings and avoid distraction while operating any equipment, including an ATV.
- h. Carry passengers in proper seating. All riders **MUST** wear a seat belt when the ATV is in motion.

C. Mechanized Equipment and Trucks (29 CFR 1910.178)

A powered industrial truck is a mobile, power driven truck used to carry, push, pull, lift, stack, or tier material. These requirements do not apply to trucks used for earth moving, over-the-road haulage, or elevating work platforms (e.g., scissor lifts).

1. All operators of powered industrial trucks must be trained and evaluated on the operating instructions, warnings, and precautions for the types of truck the operator is authorized to operate.
2. Powered industrial trucks must be inspected before being put into service each day.
3. All powered industrial trucks must be equipped with, and operators must use, seatbelts.
4. Each powered industrial truck must be equipped with an ABC fire extinguisher that is properly sized for the potential hazards that may arise during operation.
5. If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, it must be removed from service immediately. The department supervisor must be notified so that he/she can notify the person responsible for making repairs.

6. During operation of a powered industrial truck, the operator shall always travel with the forks approximately 6 inches from the ground so they clear any uneven surfaces.
7. There must be a safe clearance and headroom for equipment operation through aisles and doorways.
8. If a load obstructs the view, the operator must travel in reverse or use a "spotter".
9. Employees shall keep all body parts inside the driver's compartment and away from the mast, carriage, moving chains or other parts that are a pinch-point or shear-point hazard.
10. Additional counter weight to allow for lifting a heavy load must never be added to a powered industrial truck.
11. All employees must drive at appropriate speeds.
12. Passengers may not ride on the powered industrial truck unless it is designed for that purpose.
13. Employees must sound the horn when turning a blind corner.
14. No person shall stand or pass under elevated portions of any powered industrial truck, whether loaded or empty.
15. When powered industrial truck operators are working on elevated platforms that are 4 feet above a lower level, appropriate fall protection devices must be worn (e.g., order pickers).
16. When traveling behind other powered industrial trucks or vehicles, employees shall always maintain at least three truck-lengths from the vehicle or powered industrial truck ahead, and maintain control of the powered industrial truck at all times.
17. To prevent accidents or damage, the forklift and load weights must not exceed floor limits and the raised mast or overhead guard must clear all overhead obstacles, lights, pipes, sprinklers, heaters, overhead tracks and doorways.
18. Loads cannot be rigged underneath the forks of a powered industrial truck unless specifically permitted by the manufacturer. Most manufacturer's provide attachments made for this application. Check the operator's manual.
19. Operators must approach ramps and inclines slowly and in a straight line, not at an angle.
20. Operators must never turn the powered industrial truck while on a ramp or incline.
21. Running powered industrial trucks must never be left unattended and the power must be shut off when the truck is being parked and before the operator dismounts or leaves the unit.
22. Before leaving a powered industrial truck unattended, the operator must lower the load-engaging means, neutralize the control, shut off the power, set the brakes, and turn off the ignition key. If the truck is parked on an incline, the wheels must be chocked. Note: A powered industrial truck is considered unattended when the operator is 25 feet or more away from a vehicle that remains in the operator's view or whenever the operator leaves the vehicle and the truck is not in view.
23. Forklifts must not be used in areas of poor lighting unless they are equipped with auxiliary directional lighting and the lighting is turned on.
24. A powered industrial truck may not be parked in front of any fire protection equipment, emergency exits, or in a manner that would obstruct a person from exiting the area.
25. A powered industrial truck must be shut off and the parking brake engaged when it is being refueled or the batteries are being recharged.
26. Powered industrial trucks shall be refueled or recharged only in areas that are designated and well ventilated.
27. Employees must wear gloves, arm protection (long sleeves) and a face shield when working with battery electrolyte.
28. When working with electrolyte, employees must know the location of the nearest emergency eyewash/shower station.
29. To allow heat and potential flammable off-gases to dissipate, battery cover or compartment cover shall be left open during the charging of batteries. When replacing or closing the cover, employees shall take care not to let it slam shut, which could cause a spark or personal injury.

30. Smoking is prohibited in refueling and recharging areas. Fuel vapors and gases, which can escape from the battery and fuel vents, are extremely flammable.
31. Tools and other metallic objects must be kept away from the top of uncovered batteries.
32. An ABC rated fire extinguisher must be present in all refueling or recharging areas.

IX. HAZARD COMMUNICATION PROGRAM

A. Hazard Communication Program (29 CFR 1910.1200)

juwi is committed to protecting employee health and safety. The Hazard Communication Program put forth below meets OSHA requirements set by the Employee Right to Know Law. The purpose of the law is to ensure employees are informed about potential chemical hazards at work and establish procedures and training to protect employees from these hazards. The objectives will be met or exceeded by the following:

1. Safety Data Sheets (SDS)

- a. The Site Manager will maintain a copy of the SDS for all hazardous substances that are shipped to any job site.
- b. All job sites will have a centrally located SDS station available to all employees.
- c. It will be the responsibility of job-site management to maintain a current list of site specific SDS.

2. Training

Before working with new or unfamiliar chemicals all employees that have the potential to be exposed shall attend training for:

- a. Methods and observations that may be used to detect the presence or release of a hazardous chemical, such as odors or visual appearance of hazardous chemicals when being released.
- b. Recommended safe work practices, including required PPE, proper safe storage information and emergency procedures.
- c. The hazard communication program details, including an explanation of the labeling system, the location of the safety data sheets and how to obtain and use the hazard information.
- d. Some hazardous chemicals that juwi employees may be exposed to, and trained on (but not limited to) include: diesel fuel, gasoline, zinc galvanizing paint, propane, fluorescent marking paint, wet cement, silica dust.

3. Labeling

Only materials/chemicals that are appropriately labeled shall be used.

- a. A safety and health representative or a supervisor shall be notified if a label is missing or cannot be read. They will arrange for re-labeling.
- b. Unless advised otherwise, employees shall follow label instructions for chemical use and storage.
- c. A secondary container chemical label must be used when chemicals are being transferred to a second container.
 - a. Methods for obtaining secondary labels may vary between sites. The health and safety representative can clarify procedures.
 - b. The sole exception for labeling of secondary containers is when a single employee uses that container within a single shift. Under such circumstances, the container must remain in their possession.

4. Allowable Substances

Only chemical products that have been approved for use in juwi operations shall be used.

- a. A credit card or purchase card should not be used to obtain chemicals, except in an emergency.
- b. If emergency purchase is necessary, an SDS must be obtained for the chemical and provided to an Environment, Health and Safety (EHS) professional. The EHS professional shall evaluate the SDS prior to the chemical being used.
- c. Personnel who initiate a request for a new chemical purchase or a change to existing chemical stock must ensure that an SDS is obtained for the material.
- d. Any new or additional chemicals must be added to the site chemical inventory.

5. Work Practices

The following work practices shall be observed where hazardous substances (materials and chemicals) are present:

- a. Eating, drinking, and the use of tobacco products is prohibited.
- b. Hands and face must be washed at breaks. (When appropriate, workers must shower at the end of work task or shift.)
- c. Employees shall never blow on or shake off contaminated clothing and never use compressed air to clean it.
- d. Contaminated clothing shall be placed in plastic bags and labeled.
- e. The contaminated work area must be cleaned using approved methods to reduce/eliminate the spread of contamination.
- f. The work area shall be marked as necessary with ribbons, tapes, signs, or barriers in order to prevent unnecessary personnel exposure.
- g. When a splash hazard exists, workers must verify availability and location of eyewash water, and shower before performing tasks.
- h. Proper personal protective equipment must be used.

B. Asbestos Management (29CFR 1926.1101)

The work practices noted below are generic and do not include all requirements for contractors performing asbestos activities.

1. Personnel working in facilities must be aware of the types of materials known or suspected to contain asbestos.
2. Any suspect materials must be treated as asbestos-containing, unless bulk samples or documentation is on file disputing the presence of asbestos.
3. Employees shall stop work if at any time they are unsure if the material they are working on contains asbestos. Work shall not resume until the material has been sampled and verified as non-asbestos.
4. Employees must have current training in the appropriate asbestos discipline (supervisor, worker, inspector, and project designer). Some states may use different terms for similar functions.
5. When required by the applicable state agency, workers shall maintain current accreditations and/or licenses per discipline.
6. Employees working on known or suspected asbestos must use identified work practices, engineering controls, and PPE (including respirators) based on the work activity being performed.
7. Regardless of exposure levels, the following procedures must be followed at all times:
 - a. HEPA vacuums must be used to collect dust/debris.
 - b. Wet methods must be used to control exposures unless the methods create an electrical hazard or a slipping hazard in roofing operations.
 - c. Asbestos-contaminated materials (ACM) must be cleaned up promptly.

8. Regardless of exposure levels, the following asbestos work activities are prohibited:
 - a. High-speed abrasive disk saws without HEPA-filtered exhaust
 - b. Compressed air to remove asbestos
 - c. Dry sweeping of ACM
 - d. Employee rotation to reduce asbestos exposures
9. Regulated areas, including appropriate signage, must be established for Class I, II or III work activities.
10. Supervision of asbestos related jobs must be conducted by a competent person based on the level of asbestos work.
11. Depending upon the level of asbestos work activity and the material being disturbed, showers may be required at the completion of the task or completion of the shift. Wastewater from asbestos showers must be collected and filtered.
12. If a respirator is required, employees must follow the requirements for the respiratory protection program.
13. Waste must be sealed in leak-tight containers.
14. All ACM waste must be labeled appropriately, stored in secure ACM waste storage areas and disposed of in juwi approved landfills.

C. Waterborne Pathogens

1. Personal protective measures

- a. Employees must wash hands and face when leaving the work area.
- b. Where full body contact with contaminated water has occurred (e.g. soaked by contaminated cooling tower mists), a shower using soap is recommended. The shower shall have an effective drain system to ensure that contaminated water is removed from the area. Decontamination of the shower with a disinfectant is recommended to ensure that the shower area does not become contaminated.
- c. Workers shall refrain from touching their nose, mouth, eyes, or ears with their hands, unless they have just washed.
- d. Personnel with open wounds or sores must cover these areas with water-proof bandages. If not feasible, these personnel shall not enter the contaminated area.
- e. Eating, drinking or smoking in the work area is prohibited.
- f. The site health and safety representative will provide specific information regarding the level and type of respiratory protection needed. In most situations, wearing a full-face, negative pressure respirator equipped with P-100 (HEPA) cartridges can provide adequate respiratory protection from waterborne pathogens.
- g. Where water saturation of the respirator filter from visible airborne mists is a concern (e.g., during tube cleaning with high-pressure water), one of the following options shall be used:
 - i. A supplied air respirator
 - ii. A water vapor pre-filter in addition to the particle filter, if available
 - iii. The change-out schedule time for the filter cartridge shall only be decreased after consultation with the site health and safety representative.
- h. At a minimum, work gloves and regular clothing must be worn. If immersion of hands in the contaminated water is likely to occur, waterproof gloves (e.g. nitrile) must be used.
- i. If liquid contact is anticipated, employees shall wear the following:
 - i. Rainsuit or Tyvek overalls

- ii. Rubber boots
- iii. A face shield and safety glasses (if not using a full-face respirator)
- j. When employees leave the work area, contaminated protective clothing and equipment shall be removed and bagged for disposal and/or disinfection.
- k. Any illness believed to be related to work with waterborne pathogens must be reported.
- l. Tetanus and diphtheria shots must be offered to employees who work with sewage. Note: According to the Center for Disease Control, workers exposed to sewage are not at increased risks for contracting Hepatitis A, B, or the human immunodeficiency virus.

2. Protective Measures for Work During/After Floods

Some juwi employees may be required to work in an area during or immediately after a flood. Floodwater can be contaminated with microorganisms, sewage, industrial waste, chemicals, and other substances that can cause illness or death.

The following safe work practices apply in these situations:

- a. Protective gloves must be worn when:
 - i. Working in contaminated floodwaters
 - ii. Handling contaminated objects
 - iii. Handling animal remains
- b. Gloves shall be heavy, cut-resistant, made of waterproof material (nitrile or similar washable material).
- c. Employees must wash hands with soap and clean water or hand sanitizer:
 - iv. After cleanup or decontamination work
 - v. Before preparing or eating food
 - vi. Before smoking, chewing gum or tobacco
 - vii. After toilet use
- d. Employees must avoid touching the face with contaminated gloves.
- e. Wound care
 - viii. Wounds must be washed with soap and clean water or a hand sanitizer immediately.
 - ix. Immediate medical attention is necessary if a wound becomes red, swollen, or oozes pus.

3. Disinfecting water (when clean water not available)

In most situations, clean soap and water should be available for juwi crews. If not, water can be disinfected for hand washing or tool/equipment decontamination by using the following procedure:

- a. Mix 1/4 teaspoon of household bleach per 1 gallon of contaminated water.
- b. Let bleach-water mixture stand for 30 minutes.
- c. Label containers (e.g., "bleach disinfected water – DO NOT DRINK").
- d. Prepare fresh solutions daily, preferably just before use.
- e. For equipment/tool decontamination, immerse in the solution for 10 minutes.

Employees shall avoid getting bleach on fire retardant (FR) clothing.

D. Bloodborne Pathogens (29 CFR 1910.1030)

1. Overview

29 CFR 1910.1030(b) defines **Bloodborne Pathogens** as microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, Hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

As a preventive strategy, **all blood and potentially infectious materials shall be treated as if they are, in fact, infectious**, regardless of the status of the source individual.

The use of appropriate PPE helps prevent contact of blood or other potentially infectious bodily fluids with the eyes, mouth, mucous membranes and non-intact skin. For example, wearing latex gloves is a simple precaution that should always be used in order to prevent blood and bodily fluids from coming into contact with the skin. **An impervious barrier is essential to protect against potentially infectious material.** Other PPE examples are: splash goggles, face shields, aprons and mouth-to-mouth resuscitation masks.

2. Rules To Follow Regarding Bloodborne Pathogens:

- a. Personal protective equipment must always be worn in exposure situations.
- b. Any PPE that is torn, punctured, or that loses its ability to function as an effective barrier shall be removed and replaced.
- c. Only trained workers who use proper PPE may handle bloody clothing or contact contaminated surfaces. **Clean-up and disposal must be performed by a trained/competent person.**
- d. Any observed unsafe conditions or exposure to infectious materials must be reported to a supervisor, who will contact the juwi Site Manager immediately.
- e. Any worker who is exposed to bloodborne pathogens shall follow these procedures:
 - i. The exposed area must be washed thoroughly with soap (not alcohol-based hand cleaner) and running water.
 - ii. If antiseptic hand cleaner or towelettes are used, hands shall be washed as soon as feasible with soap and running water.
 - iii. If blood is splashed in the eye or mucous membrane, the affected area shall be flushed with soap and running water for at least 15 minutes. OSHA CFR 1910.1030(d)(2)(iv).
 - iv. The exposure must be reported to a supervisor.

3. Hepatitis B vaccination

Personnel that are trained in First Aid/CPR and are expected to use these skills if required, should be offered the Hepatitis B vaccination in accordance with 29 CFR 1910.1030 Appendix A. Employees may decline the vaccination by signing a written form, to be kept on record by the juwi Health and Safety Compliance Manager.

X. OFFICE SAFETY

A. New Employee Orientation Policy (29 CFR 1926.21)

All new employees will receive the necessary instruction and training that will provide the new employee with the information and training needed to not only perform their own tasks safely but assist in assuring other team members are working safely as well. This training will be documented and tracked to meet all OSHA or state requirements.

B. Office Safety Rules

1. All spills must be cleaned up immediately.
2. Wet floors must be indicated with warning signs until the area is dry.
3. All cords must be clear of doorways and other areas where they can be pinched by the opening and closing of doors.
4. Tripping hazards must be identified, marked and reported to the responsible group for repair.
5. Desk, file or cabinet drawers must be closed when not in use. To prevent tipping of file cabinets, only one drawer may be opened at a time.
6. Wherever possible, large, heavy objects should be stored on lower shelves and smaller, lighter objects on top shelves. When items are stored on top shelves, they must be positioned or secured so they cannot fall.
7. All chair legs must remain on the floor while a person is seated.
8. Running in hallways or up and down stairs is prohibited. Handrails should be used where provided.
9. Only UL/FM-approved electrical appliances shall be used.
10. Electrical equipment must never be used with wet hands.
11. Combustibles should be kept to a minimum.
12. When moving heavy or bulky items, employees shall remove contents, use correct lifting techniques, and get assistance.
13. At the end of each workday or shift (if there is no oncoming shift), the power must be turned off on small appliances (e.g., coffee makers, space heaters).
14. All malfunctioning or faulty electrical equipment shall be removed from service, disconnected, or repaired.
15. An outlet must never be used beyond its capacity. If additional outlets are needed, appropriate power strips shall be used.
16. Standing on chairs, desks or tables is prohibited.
17. All office equipment shall be operated according to manufacturer recommendations and all safety devices must be in place and operable.
18. Paper cutters shall only be used when the guards are in place and the blade must never be left in the up position.
19. Employees are prohibited from tampering with or ignoring guards on office machinery.
20. The contents of office furniture must be removed before the furniture is moved.
21. Electric-powered portable heaters must be approved by management, attended while in use, turned off after normal working hours, and kept at least 3 feet away from combustible materials.
22. To avoid tipping over, employees shall not prop feet up on a desk or table when sitting in office chairs.

C. Office Workstation Ergonomics (29 CFR 1910.900)

Work Practices to avoid Musculoskeletal Disorders:

1. Employees should be cognizant of the primary risk factors that can lead to the development of musculoskeletal disorders (MSD):
 - a. Awkward postures
 - b. Excessive force
 - c. Excessive repetition
 - d. Contact stress (hard edge/pressure)

- e. Heavy vibration
2. Employees should recognize the signs of musculoskeletal disorders:
 - a. Decreased range of motion
 - b. Deformity or swelling
 - c. Decreased grip strength
 - d. Loss of function (e.g., cannot close hand)
3. Employees should recognize the symptoms of musculoskeletal disorders:
 - a. Persistent numbness and/or burning sensation
 - b. Pain
 - c. Tingling
 - d. Cramping and/or stiffness
4. Work patterns and tasks should be alternated as much as possible throughout the day to allow rest for different muscle groups.
5. Stretching exercises should be performed periodically throughout the workday to relieve stressed muscles.
6. The body should be kept in "neutral" positions as much as possible.
7. Good posture should always be used.
8. A physical fitness program should be maintained.
9. Signs and symptoms of MSD should be reported through normal incident reporting process.

Recommended Work Station Setup:

1. The working height of chairs, desks, and keyboards should be properly adjusted.
2. Employees should sit in an upright position, using good posture.
3. Monitor and copy stands should be adjusted side by side and at a comfortable viewing angle.
4. The angle of monitor and copy should be set to reduce glare.
5. Wrists and hands should be kept in line while using the keyboard and mouse to avoid bending wrists forward or backward.
6. When using a video display terminal, employees should blink frequently to maintain eye surface moisture.
7. Momentarily focusing eyes on a distant object can help prevent eye fatigue.
8. When using a video display terminal for prolonged periods, employees should frequently stretch and move the head, neck, shoulders, and arms to prevent buildup of muscle tension.
9. Chairs must be easily and fully adjusted and allow the body to shift position to the greatest extent possible. When adjustments to the chair height do not relieve pressure under the thigh, footrests should be used.
10. When continuously and simultaneously using the telephone and computer, employees should use a telephone headrest, headset, or speaker-phone to prevent injury.
11. Work areas should be organized to prevent the need to stretch or twist in order to reach items.

XI. APPENDICES: Safety Forms

A. COMPETENT PERSON DESIGNATION

<p>AN EVALUATION HAS DETERMINED THAT THE PERSON NAMED BELOW IS CAPABLE OF IDENTIFYING EXISTING AND PREDICTABLE HAZARDS IN THE SURROUNDINGS OR WORKING CONDITIONS, WHICH ARE UNSANITARY, HAZARDOUS, OR DANGEROUS TO EMPLOYEES, AND HAS AUTHORIZATION TO TAKE PROMPT CORRECTIVE MEASURES TO ELIMINATE THEM.</p> <p>COMPANY _____ NAME _____</p>
<p>COMPETENT PERSON DESIGNATION(S)</p> <p>AREA(S) COMPETENCY:</p> <p>1. _____ 2. _____ 3. _____</p> <p>CREDENTIALS REVIEWED AND VERIFIED FOR DESIGNATION</p> <p>CHECK AS APPROPRIATE:</p> <p><input type="checkbox"/> FORMAL TRAINING (DESCRIBE, WITH YEAR COMPLETED) _____ <input type="checkbox"/> YEARS OF EXPERIENCE (GIVE NUMBER OF YEARS) _____ <input type="checkbox"/> UNION APPRENTICESHIP _____ <input type="checkbox"/> INFORMAL TRAINING (DESCRIBE) _____ <input type="checkbox"/> ON-THE-JOB PERFORMANCE (OJT/OJE) _____</p>
<p>SIGNATURES:</p>
<p>COMPETENT PERSON:</p> <p>PRINT: _____ SIGNATURE: _____ DATE: _____</p> <p>CONSTRUCTION SITE MANAGER:</p> <p>PRINT: _____ SIGNATURE: _____ DATE: _____</p>

B. LIFT PLAN

Project Name _____	Project Number _____
Description of Load _____	Pick Configuration _____
<p style="text-align: center;">LOAD INFORMATION (in LBS)</p> Load Weight _____ Block Weight _____ Spreader Weight _____ Rigging Weight _____ Jib Weight _____ Jib Ball Weight _____ Auxiliary Boom Nose _____ Hoist Line Weight _____ TOTAL LOAD _____ LBS	<p style="text-align: center;">CRANE INFORMATION</p> Crane Manufacturer _____ Model Number _____ Serial Number _____ + _____ Crane Counter Weight _____ LBS Outriggers-- YES NO FULLY EXTENDED
<p style="text-align: center;">TIRES MUST NOT TOUCH PAVEMENT OR GROUND</p> Estimated Boom Tip Height _____ FT Permissible Line Pull _____ LBS Required Parts of Line _____ Hoist Cable Size _____ LBS/FT Will Blocking or Outrigger Pads Be Used--- YES NO CRANE RATE CAPACITY PER THIS LIFT PERMIT _____ LBS LIFT PERCENTAGE OF CAPACITY _____ %	<p style="text-align: center;">CRANE PICK CONFIGURATION</p> Boom Mode _____ Boom Length _____ FT Boom Angle _____ DEG Pick Radius _____ FT Jib Configuration _____ Jib Length _____ FT Jib Offset Angle _____ DEG
Minimum Pick Radius _____ FT (required to keep load away from crane body)	<p style="text-align: center;">LOAD WEIGHT</p> How Determined _____ By Whom _____ Two Crane Pick--- YES NO <p style="text-align: center;">TWO CRANE PICKS MUST BE ENGINEERED</p> Max Load at Radius _____ LBS
<p>PICKS THAT ARE OUTSIDE THE PARAMETERS DESCRIBED ABOVE ARE NOT ENGINEERED AND NOT APPROVED.</p>	
ARE THERE UNDERGROUND HAZARDS PRESENT? (Y/N) _____ ARE THERE OVERHEAD HAZARDS PRESENT? (Y/N) _____ ARE THERE FIRE OR EXPLOSIVE HAZARDS WITHIN REACH? (Y/N) _____ ARE THERE ELECTRICAL HAZARDS WITHIN REACH? (Y/N) _____	IF YES, WHAT LOCATION? _____ IF YES, WHAT LOCATION? _____ IF YES, WHAT LOCATION? _____ IF YES, WHAT LOCATION? _____
PREPARED BY _____ OPERATOR _____ SUPERINTENDENT _____	DATE COMPLETED _____ ERECT CREW _____ FORMAN _____ PROJECT MANAGER _____
<p>ISSUANCE OF THIS PERMIT DOES NOT SUPERCEDE THE RESPONSIBILITY AND FINAL AUTHORITY OF THE OPERATOR.</p> <p>LIFTS EXCEEDING 75% OF CRANES RATED CAPACITY, LIFTS EXCEEDING 60,000 LBS, LIFTS OF ESPECIALLY CRITICAL COMPONENTS, ALL ELECTRICAL COMPONENTS, PSL CONTAINERS, LIFTS REQUIRING 2 OR MORE CRANES ON THE SAME LOAD, AND LIFTS REQUIRING A CRANE IN A NON-STANDARD CONFIGURATION MUST COMPLY WITH THE REQUIREMENTS OF AN ENGINEERED LIFT AS ESTABLISHED BY CRANE SAFETY POLICY.</p>	

C. DAILY TAILBOARD

MAKE THE RIGHT CHOICE -- WORK SAFELY

Project Name: _____	Project Pin: _____
Company _____	DATE _____
WEATHER: ___MILD ___HOT ___COLD ___RAIN ___MUD ___SNOW ___ICE ___LIGHTING ___WINDY	
STRETCH BEFORE WORKING: ASK FOR A VOLUNTEER TO LEAD THE TEAM IN 5 MIN OF STRETCHING EXERCISES. REVIEW EMERGENCY PROCEDURES FOR THE DAY: RADIO CALL TO LEADER, REFER TO EMERGENCY ACTIONPLAN. REVIEW EMERGENCY NUMBERS. COMMUNICATE WITH THE PERSON IN CHARGE IF THERE ARE PERSONAL CIRCUMSTANCES THAT COULD AFFECT THE SAFETY OF THE JOB.	
A. WORK PROCEDURES	
SCHEDULED WORK ACTIVITIES FOR DAY _____	
JHA(S) COMPLETED & REVIEWED (IF APPLICABLE) _____	
DISCUSS THE WORK SCOPE. LIST EQUIPMENT TO BE USED: _____	

B. RISK DISCUSSION: (CHECK AND DISCUSS ALL THAT APPLY)	
___ FALL PROTECTION	___ WALKING/WORKING SURFACES
___ STRETCH BEFORE WORKING	___ EYES ON PATH
___ PUSHING/PULLING	___ EYES ON TASK
___ LIFTING/LOWERING MATERIAL (WEIGHT= ___LBS)	___ PINCH POINTS
___ REPETITIVE MOTION	___ LINE OF FIRE
___ CORRECT BODY POSITION	___ ASCENDING/DESCENDING (3 POINT CONTACT)
___ TWISTING	___ HOUSEKEEPING (DIRT, ORGANIZATION, ETC)
___ ASSISTANCE WHEN NEEDED	___ STAY TO RIGHT
___ OVEREXTENDED/CRAMPED	___ HAVE THE SKILLS/KNOWLEDGE NEEDED
___ FALLS	___ CONFINED SPACES
___ LADDERS	___ EXCAVATIONS
___ TOOLS, HOSES, CORDS	___ SCAFFOLDS
___ ENERGIZED PARTS	___ MATERIAL HANDLING
___ DRIVING VEHICLE (WEAR SEAT BELTS)	___ GROUNDING
___ CHEMICALS, OILS, FLAMMABLES ETC	___ WELDING (HOT WORK PERMIT REQUIRED)
___ ENVIRONMENTAL SPILLS	___ COMPRESSED GAS
___ INDUSTRIAL HYGIENE (AIR QUALITY)	___ ROTATING EQUIPMENT
___ PESTS (SPIDERS, WASPS, BEES, ETC)	___ POWERED VEHICLES (FORKLIFT, CRANES, ETC)
___ FIBERGLASS MATERIALS	___ ADDITIONAL LIGHTING REQUIRED
___ SHARP OBJECTS	___ OTHER _____
NOTE: BACK SPRAINS AND STRAINS ARE A LEADING CAUSE OF INJURIES. IF LIFTING MORE THAN 50 LBS, ASK FOR ASSISTANCE	
C. ENERGY SOURCE CONTROLS: IDENTIFY AND DISCUSS THE ENERGY SOURCES THAT NEED TO BE ISOLATED AND VERIFIED.	
___ ELECTRICAL	VERIFICATION METHOD: _____
___ MECHANICAL	VERIFICATION METHOD: _____
___ PRESSURE/HYDRAULIC	VERIFICATION METHOD: _____
___ CHEMICAL	VERIFICATION METHOD: _____
___ POTENTIAL ENERGY	VERIFICATION METHOD: _____
___ OTHER	VERIFICATION METHOD: _____
CLEARANCES AND BOUNDARIES: CLEARANCE OR SINGLE POINT ISOLATION NEEDED TO DO THIS JOB? Y/N	
VERIFY: CORRECT UNIT? CORRECT EQUIPMENT? CORRECT SYSTEM? CORRECT BOUNDARY?	

Project Name: _____	Project Pin: _____
Company _____	DATE _____

D. SPECIAL PRECAUTIONS: IDENTIFY AND DISCUSS THE LOCATION OF THE FOLLOWING ITEMS:

- | | |
|---|---|
| <input type="checkbox"/> FIRE EXTINGUISHER | <input type="checkbox"/> FIRST AID KIT |
| <input type="checkbox"/> EYE WASH STATION OR BOTTLES | <input type="checkbox"/> AED |
| <input type="checkbox"/> BLOODBORNE PATHOGENS KIT | <input type="checkbox"/> DRINKING WATER |
| <input type="checkbox"/> MUSTER POINT | <input type="checkbox"/> MSDS |
| <input type="checkbox"/> SPILL CONTAINMENT KIT | <input type="checkbox"/> STORM DRAINS, STORM RUNOFF |
| <input type="checkbox"/> SPECIFIC WORK INSTRUCTIONS, SPECIAL CONDITIONS | <input type="checkbox"/> OTHER PRECAUTIONS _____ |

E. RISK/HAZARD MITIGATION:

PERSONAL PROTECTIVE EQUIPMENT

- HARD HAT
- BUMP CAP
- SAFETY GLASSES
- GOGGLES
- FACE SHIELD
- WORK GLOVES
- CHEMICAL RESISTANT GLOVES
- OTHER (_____)
- STEEL TOE BOOTS OTHER (_____)
- EAR PLUGS/EAR MUFFS
- RESPIRATOR (TYPE: _____)
- FALL PROTECTION HARNESS
- DUAL Y LANYARDS (TWIN-TAILED)
- COVERALLS
- FLAME RETARDANT/ARC FLASH CLOTHING
- COLD WEATHER GEAR
- RESCUE EQUIPMENT AVAILABLE

ADMINISTRATIVE

- REQUIRED PERMIT(S)
- CAUTION/DANGER TAGS, TAPE/CONES
- WARNING SIGNS
- RESCUE PLAN
- AIR MONITORING (CONFINED SPACE, INDUST. HYGIENE)
- COMMUNICATION (RADIO CHANNEL _____)
- TOOL INSPECTION BEFORE USE (GUARDS, CORDS, ETC)
- RIGGING INSPECTION
- WASTE MATERIAL MANAGEMENT

ENGINEERING

- GROUND FAULT INTERRUPTER (GFI)
- SCAFFOLDING
- HOLE COVERS
- TIE OFF FOR FALL PROTECTION (ANCHOR POINTS)
- AIR MOVERS/FORCED VENTILATION
- CORDS AND HOSES RUN OVERHEAD OR OFF DECK
- WASTE CONTAINMENT

LIST ALL OTHER MITIGATION METHODS REQUIRED _____

F. DISCUSS TOOLBOX TOPIC, OSHA INCIDENT OR LESSON LEARNED FROM PREVIOUS ACTIVITIES.

G. POST TASK CHECKLIST: IDENTIFY AND DISCUSS THE REMOVAL OF THE FOLLOWING ITEMS:

- | | |
|---|---|
| <input type="checkbox"/> FIRE EXTINGUISHER, FIRST AID KIT, RESCUE KIT | <input type="checkbox"/> RADIO/PHONE |
| <input type="checkbox"/> TOOLS AND EQUIPMENT | <input type="checkbox"/> LOCKS/TAGS/GROUNDS |
| <input type="checkbox"/> ALL TRASH | <input type="checkbox"/> ANY OTHER ITEMS USED DURING THE TASK |
| <input type="checkbox"/> OILY WASTE RAGS/ PADS/ FILTERS | |

TAILBOARD PARTICIPANTS:

SIGNATURE: _____	SIGNATURE: _____

SUBMIT COMPLETED FORM TO juwi SITE SAFETY REP FOR REVIEW

CONDUCT A NEW SAFETY TAILBOARD MEETING IF THE PERSONNEL OR WORK SCOPE CHANGES

D. DIG PERMIT

PROJECT NAME: _____

PROJECT PIN: _____

Date: _____

Dig Test Contact Representative: _____

Phone: _____

City Permit #: _____

Date Permit Active: _____ Date Permit Inactive: _____

Primary Contact Name: _____

Phone: _____

Utilities Locate: Y/N/NA

Date of Locate: _____

Blue Stake #: _____

Utilities Contact Representative: _____

Phone: _____

DESCRIPTION OF BOUNDARIES: _____

PHYSICAL DRAWING OF BOUNDARIES:

E. juwi ENERGIZED ELECTRICAL WORK PERMIT

PROJECT NAME: _____

PROJECT PIN: _____

Date: _____

PART 1: TO BE COMPLETED BY THE REQUESTOR

Job/Work Order Number: _____

(1) Description of circuit/equipment/job location: _____

(2) Description of work to be done: _____

(3) Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage:

Requestor/Title _____ Date: _____

PART 2: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS "DOING" THE WORK:

(1) Detailed job description procedure to be used in performing the above detailed work: _____

(2) Description of the Safe Work Practices to be employed: _____

(3) Determination of Shock Protection Boundaries:

a. Limited Approach Boundary: _____

b. Restricted Approach Boundary: _____

c. Prohibited Approach Boundary: _____

(4) Determination of Arc Flash Protection Boundary: _____

(5) Necessary personal protective equipment to safely perform the assigned task: _____

(6) Means employed to restrict the access of unqualified persons from the work area: _____

(7) Evidence of completion of a Job Briefing including discussion of any job-related hazards: _____

(10) Do you agree the above described work can be done safely? YES NO (if no, return to requester)

Electrically Qualified Person(s): _____ Date: _____

Electrically Qualified Person(s): _____ Date: _____

PART 3: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:

Manufacturing Manager: _____ Safety Manager: _____

Maintenance/Engineering Manager: _____ General Manager: _____

Electrically Knowledgeable Person: _____ Date: _____

NOTE: ONCE THE WORK IS COMPLETE, FORWARD THIS FORM TO THE SITE SAFETY REPRESENTATIVE FOR REVIEW AND RETENTION.

F. EQUIPMENT OPERATOR

PROJECT NAME: _____

PROJECT PIN: _____

Date: _____

Company: _____

I have received the necessary training so that I can safely operate this equipment.

I have also received the necessary information so that I can use the proper PPE and inspect this equipment before use for safety purposes.

Equipment type (list all): _____

Equipment Operator (PRINT): _____

Equipment Operator Signature: _____

Date: _____

Competent Person (PRINT): _____

Competent Person Signature: _____

Date: _____

I. INCIDENT REPORT FORM

PROJECT NAME: _____

PROJECT PIN: _____

Today's Date: _____

Safety Representative completing this form: _____ Date of Incident:

_____ Time: _____

Date Reported: _____ Time: _____

Person(s) involved in the incident (list if multiple): _____

Employer: _____

Sex: M F Date of Birth: _____

Experience in industry: _____

Job Title: _____

Number of Hours worked in the week of this incident: _____

Type of Injury: _____ Part of Body: _____

INCIDENT:

Outcome		Recordability		Property Damage	Reportability	
	Injury		First Aid	Estimate of repair cost:		Fatality
	Illness		OSHA Recordable			Admitted to Hospital
	Damage					Amputation
	Near Miss					Loss of Eye

Describe the hazard, unsafe act, or condition causing the incident (be sure to include who, what, when, where):

Medical Treatment:

Employee Statement:

Witness Statement(s) (attach additional pages if necessary):

Root Cause:

Additional Information/Contributing Factors:

Corrective Actions:

Subcontractor Safety Representative (Print)

Date

Signature

juwi Site Safety Representative (Print)

Date

Signature

J. JOB HAZARD ANALYSIS

Address the specific hazards associated with each step of the task. Review with all members of the crew assigned to this task.			
Company:	STEPS	POTENTIAL HAZARDS	HAZARD CONTROL
Project Name:			
Project Pin:			
Date:			
Task Description:			
Foreman Name:			
Foreman Signature:			
Personnel involved in the task:			
(Print name here)	Initial Here		
PPE required:			
PERMITS (Y/N/NA):		TOOLS/EQUIP/SAFETY (Y/N/NA):	
Energized Electrical Work _____	Dig _____	Have required tools _____	Reviewed by JSI
Welding Hot Work _____	Critical Lift _____	All equip inspected _____	Initials: _____
			Date: _____

Procedure When Authorized Employee Not Present

Before removing any LOTO device of an Authorized Employee who is not able to remove it confirm the following:

Item #	Description	Initial by LOTO Supervisor
1)	Verify that the Authorized Employee who applied the device is not at the job site.	_____
2)	Have reasonable efforts to contact him/her to inform him/her that his/her LOTO device will be removed.	_____
3)	Final approval to remove the LOTO device been granted by LOTO Supervisor.	

The LOTO Supervisor shall confirm that the Authorized Employee who applied the LOTO device is aware that his/her LOTO device has been removed prior to resuming work at the job site.

Name: LOTO Supervisor Date:	Name: New Authorized Employee Date:	Name: Original Authorized Employee Date:
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M. QUALIFIED PERSON DESIGNATION

AN EVALUATION HAS DETERMINED THAT THE PERSON NAMED BELOW HAS, BY POSSESSION OF A DEGREE, CERTIFICATE OR PROFESSIONAL STANDING, OR WHO BY EXTENSIVE KNOWLEDGE, TRAINING AND EXPERIENCE, HAS SUCCESSFULLY DEMONSTRATED HIS ABILITY TO SOLVE OR RESOLVE PROBLEMS RELATING TO SUBJECT MATTER, THE WORK OR THE PROJECT, HAS BEEN DELEGATED PER OSHA GUIDELINES, THE RESPONSIBILITY AND AUTHORITY FOR COORDINATING ACTIVITIES AND OPERATIONS COVERED BY THE DESIGNATION.

COMPANY _____
NAME _____

QUALIFIED PERSON DESIGNATION(S) (TECHNICAL AND/OR ENGINEERING KNOWLEDGE)

CHECK AS APPROPRIATE:

- DC ELECTRIC
- AC ELECTRIC <480 V
- AC ELECTRIC >480 V
- ELECTRICAL INSPECTION

CREDENTIALS REVIEWED AND VERIFIED FOR DESIGNATION

CHECK AS APPROPRIATE:

- FORMAL TRAINING (DESCRIBE, WITH YEAR COMPLETED) _____
- YEARS OF EXPERIENCE (GIVE NUMBER OF YEARS) _____
- UNION APPRENTICESHIP _____
- INFORMAL TRAINING (DESCRIBE) _____
- ON-THE-JOB PERFORMANCE (OJT/OJE) _____

SIGNATURES:

QUALIFIED PERSON:

PRINT: _____

SIGNATURE: _____

DATE: _____

FOREMAN/GENERAL FOREMAN/SUPERINTENDENT/SUPERVISOR:

PRINT: _____

SIGNATURE: _____

DATE: _____

N. SITE SAFETY COMMITTEE MEETING MINUTES

Date:		Date of Next Meeting:	
Start Time:		End time:	
Attendees			
juwi:	Subcontractor	Subcontractor	
Agenda			
Previous Action Item		Responsibility	Status
Notes			
New Action Items			Responsibility

O. SITE SAFETY AUDIT

JSI Monthly Safety Audit

Project name/pin: _____

Date: _____

Name: _____

Initials Comments:

Forms	Tailboard*	Participate		
		On File?		
	Equip Inspection	Maint issues addressed?		
	Equip Operator	On File?		
		License copies as req?		
	JHA*	Each Task on File?		
		Observe 2-3 tasks for compliance		
	Orientation*	Stand in		
		Acknowledgments on File?		
	Orientation roster	Updated?		
		Copy to Security?		
	Qual. Person	All on File?		
	Comp. Person	All on File?		
	Dig Permit	Updated?		
		On File?		
	Critical Lift	On File?		
	Welding Permit	On File?		
	Electrical Permit	On File?		
	Incident Report	Closed and Documented?		
		Follow up/Recommendations for prevention in place?		
	MSDS	On File?		
		Up to date?		
		Stored appropriately?		
SPCC	Container Insp.	Completed?		
	Spill kit Insp.	Completed?		

Display	Emerg. Procedure	EAP?		
		Spill?		
		Contact info?		

Security	Visitors/new hires	directed to job trailers?		
	Guard	stopping/verifying all vehicles entering site are deared on orientation roster?		

**Participate in a Tailboard and Orientation, observe JHA compliance*

Items to be corrected:

Inspector:

Site Manager:

(Print)

(Print)

Signature

Signature

P. SITE SAFETY INSPECTION

PROJECT NAME/PIN : _____

DATE: _____

		Y/N/NA	COMMENTS
A General			
1	Observe personnel behavior for examples of best practices		
2	Observe personnel behavior for unsafe acts		
3	Observe the site for unsafe conditions		
B Prior to Work Commencement			
1	Is there an accurate list of personnel currently on site?		
2	Attend Daily Tailboard		
3	Does it cover, at a minimum, the following topics:		
4	Site overview		
5	Tasks to be completed		
6	JHA		
7	Risk Assessment		
8	Emergency procedures		
9	Inventory/inspect First Aid kits		
10	Order replacement items as req.		
11	Inventory/inspect Fire Extinguishers		
12	Tagged and serviced in regular intervals?		
13	Fully charged?		
C Personal Protective Equipment			
1	Are hard hats being worn by all personnel on site?		
2	Are safety glasses being worn by all personnel on site?		
3	Are safety vests being worn by all personnel on site?		
4	Are gloves being worn as required (material handling)?		
5	Are all personnel wearing safety toe protection?		
6	Is all protective equipment replaced when it becomes damaged?		
7	Is hearing protection used when sound levels exceed OSHA standards?		
D Hand Tools and Equipment			
1	Are hand tools and equipment in good condition?		
2	Are tools properly stored in secure locations when not in use?		
3	Are broken or fractured handles on hammers, axes, and similar equipment replaced promptly?		
4	Are damaged tools tagged and removed?		
5	Are knives or other cutting blades retracted and/or covered when not in use?		
6	Are all cords connected, electrically operated tools and equipment effectively grounded or the approved double insulated type?		
7	Are pneumatic and hydraulic hoses on power operated tools deteriorated or damaged?		
8	Is there any equipment such as ladders, extension cords or tools on site? Inspect equipment or verify inspection is current.		
E Lockout/Tagout Procedures			
1	Have all workers received LOTO training and is it documented?		
2	Are a sufficient number of locks and tags available for assigned tasks?		
3	Were all affected workers briefed on equipment that was being locked and/or tagged out?		
4	When the status of equipment changed, were all workers informed of the new status?		
5	Are there documented LOTO procedures on site?		
6	Are they being adhered to?		
F Electrical			
1	Is test equipment used to determine what conditions exist before starting work on electrical equipment and lines?		
2	Are all flexible cords and cables located, routed and arranged as to be protected from physical damage?		
3	Are GFCI installed on any temporary circuit used to perform work?		
4	In wet or damp locations are electrical tools and equipment appropriate for the use or location or otherwise protected?		
5	Is the location of electrical power lines and cables determined before digging, drilling or similar work is begun?		

6	Are disconnecting means always opened before fuses are replaced?		
7	Is the use of metal ladders prohibited in areas where the ladder or the person using the ladder could come into contact with energized parts of the equipment, fixtures or circuit conductors?		
8	Is sufficient access and working space provided and maintained about all electrical equip. to permit ready and safe operations & maintenance?		
9	Are workers who regularly work around energized electrical equipment annually certified in CPR?		
10	Is the buddy system being used for electrical work?		
11	Are all energized parts of electrical circuits and equipment guarded against accidental contact from personnel?		

G Site Approach/Housekeeping

1	Does the site appear to look overall well maintained?		
2	Do all needed warning/safety signs appear to be in place and in good repair?		
3	Is the site clear of trash and debris along the fence line?		
4	Is the fence and security gate in good repair?		
5	Do all buildings appear in good condition and secured properly?		
6	Are the sanitary facilities adequate and clean?		
7	Are all surfaces and areas free from protruding nails, splinters, sharp corners and/or similar hazards?		
8	Is combustible scrap, debris and waste stored or properly contained and promptly removed from the site?		

H Buildings, Roadways and Walkways

1	Are the roads free of major potholes or other conditions that would make their use unsafe?		
2	Are all the access ways between arrays free of all tripping, falling or other hazards?		
3	If hazards are present are they visibly marked to prevent potential injuries?		
4	Are holes in the floor, sidewalk, or other walking surface repaired properly, covered or otherwise made safe?		
5	Are materials or equipment stored in such a way that sharp projectiles will not interfere with a walkway?		
6	Are site posted speed limits and traffic patterns being observed?		
7	Are all exits kept clear of obstructions?		
8	Is material stacked on elevated surfaces, piled, stacked or racked in a manner to prevent it from tipping, collapsing, rolling or spreading?		
9	Is proper storage practiced to minimize risk of fire?		
10	Are surfaces that tend to get wet (stairs), covered in non-slip		
11	Do stairs or other exits open directly into areas that vehicles operate?		
12	If so, are adequate barriers and warnings provided to prevent into the path of traffic?		

I HAZCOM

1	Are all hazardous substance containers properly labeled?		
2	Are all hazardous materials properly stored?		
3	Is there an accurate list of all chemical substances on site?		
4	Are the spill kits and containments' inspections current?		

ADDITIONAL COMMENTS/OBSERVATIONS:

Inspector:

Site Manager:

 Name (Print)

 Name (Print)

 Signature

 Signature

Q. WELDING HOT WORK PERMIT

SAFE OPERATING PLANS & REQUIREMENTS <i>ALL EMERGENCIES CALL 911</i>		NUMBER: ISSUED: REVISED:
BEFORE INITIATING HOT WORK, ENSURE PRECAUTIONS ARE IN PLACE!! MAKE SURE AN APPROPRIATE FIRE EXTINGUISHER IS READILY AVAILABLE!!		
THIS HOT WORK PERMIT IS REQUIRED FOR ANY OPERATION INVOLVING OPEN FLAMES OR PRODUCING HEAT AND OR SPARKS. THIS INCLUDES BUT IS NOT LIMITED TO: WELDING, CUTTING, GRINDING, SOLDERING, ETC.		
INSTRUCTIONS A. Verify precautions listed at right (or do not proceed with work) B. Complete, Post and retain this Permit	REQUIRED PRECAUTIONS CHECKLIST <input type="checkbox"/> Available extinguishers are in service and operable <input type="checkbox"/> Hot work equipment in good repair REQUIREMENTS WITHIN 10M (35 FT) OF WORK: <input type="checkbox"/> Flammable liquids, dust, lint and oil deposits removed. <input type="checkbox"/> Explosive atmosphere in area eliminated <input type="checkbox"/> Floors swept clean <input type="checkbox"/> Combustible floors wet down, covered with damp sand or fire-resistant sheets <input type="checkbox"/> Remove other combustibles where possible <input type="checkbox"/> All wall and floor openings covered <input type="checkbox"/> Fire-resistant tarpaulins suspended beneath work WORK ON WALL AND FLOOR OPENINGS: <input type="checkbox"/> Construction is noncombustible and without combustible covering or insulation <input type="checkbox"/> Combustibles on other side of walls moved away <input type="checkbox"/> Enclosed equipment cleaned of all combustibles <input type="checkbox"/> Containers purged of flammable liquids/vapors FIRE WATCH/HOT WORK AREA MONITORING: <input type="checkbox"/> Fire watch personnel will be provided during all phases of the work activity, including any coffee or lunch breaks <input type="checkbox"/> Remain on scene 30 min after welding complete. <input type="checkbox"/> Fire watch personnel must have suitable extinguisher <input type="checkbox"/> Fire watch personnel are trained in use of equip. and in sounding alarm <input type="checkbox"/> Additional fire watch personnel may be required for adjoining areas above and below OTHER PRECAUTIONS TAKEN: <input type="checkbox"/> Confined space permit <input type="checkbox"/> Ample ventilation <input type="checkbox"/> Lockout/Tagout	
HOT WORK BEING DONE BY: Employee: _____ Contractor: _____		
DATE: _____	LOCATION: _____	
TYPE OF HOT WORK: _____		
DESCRIPTION OF JOB: _____		
NAME OF PERSON DOING WORK: _____		
SIGNATURE OF PERSON PULLING PERMIT: _____		
<i>I verify the above location has been examined, the precautions checked on the checklist have been taken to prevent fire, and permission is authorized for work</i>		
SIGNATURE OF JSI SITE REPRESENTATIVE: _____		
NAME OF FIRE WATCH (IF REQUIRED): _____		
PERMIT EXPIRES:	DATE: _____	TIME: _____
HOT WORK COMPLETED: _____		
SIGNED: _____	DATE: _____	TIME: _____

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1.0 PURPOSE

The purpose of this document is to outline the general response and action plans for a fire or other emergency situation within a Colorado Springs Utilities owned substation by Public Emergency Response Personnel in terms of proper emergency response, communications, medical response and fire fighting measures.

2.0 SCOPE

This program affects those groups that have direct or some indirect interaction with Colorado Springs Utilities substation environments. These groups could include:

- Substations
- Electric Instrumentation & Control
- Troubleshooters
- System Control (SECC)
- Substation Engineering
- Colorado Springs Fire & Police Departments
- Other Public Emergency Fire & Police Departments which can respond to a SU owned Substation emergency – This can include various municipalities and volunteer fire and emergency departments.
- American Medical Response (Ambulance)
- Corporate Communications
- Environmental Services
- Safety & Health
- Electric Construction Operations & Maintenance

3.0 TERMS AND ABBREVIATIONS

The follow terms and abbreviations may be found throughout the document.

BLEVE Boiling Liquid Expanding Vapor Explosion

CEO Chief Executive Officer

CSFD Colorado Springs Fire Department

SF6 Sulfur Hexafluoride

SPCC Spill Prevention Control and Countermeasures

SU Colorado Springs Utilities Does this need updated to brand standard

S&H Safety & Health Department

4.0 SAFETY REQUIREMENTS

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Colorado Springs Utilities' main goal and responsibility in the event of a substation fire or emergency is the protection of life, preventing injury, minimizing environmental impacts and protecting property. The equipment is not a priority in these types of emergencies. At times, the safest action of response would be to let the equipment burn itself out without exposing employees or emergency response personnel to unnecessary hazards or injury. Substations have 4 main hazards related to substation fire or emergency; Electrical (high voltage), Insulated Electrical Cables, Oil and Batteries.

- 4.1.1. The electrical hazard is high voltage (12.4kV – 230kV) and, coupled with the physical clearances found within the substation, limits the type and amount of emergency equipment which can be brought into a substation. The use of any water based fire fighting agent on a substation fire which is not de-energized will expose all personnel to added dangers and risks. Water based agents can, and most likely will become a conductor in an electrical fire or spread an oil leak.
- 4.1.2. Insulated Electrical Cables – These cables which are typically a Type TC – Control or Instrumentation Cables, are found throughout the substation and used for the distribution of electricity and control functions. During burning, the cables and the associated insulation can give off decomposition products which may cause eye, skin and respiratory irritation. See the Material Safety Data Sheet for more details in Attachment I01 & I02.
- 4.1.3. Oil is the third consideration in a substation fire. The majority of oil in substations is Non-PCB containing and all equipment containing large amounts of oil are built within a containment area. If oil is leaking and it is not contained to the substation boundaries, there is a potential for public exposure and environmental impact. The oil will typically not be engulfed in fire unless there is a violent explosion igniting the oil and its mist. Should there be an aggressive fire engulfing a transformer, this situation could lead to a BLEVE. See the Material Safety Data Sheet on Transformer Oil in Attachment I03.
- 4.1.4. The fourth major concern is that of batteries. Each substation has one or more banks of batteries which if exposed to fire or extensive heat, could cause the batteries to explode, releasing high levels of hydrogen gas and acid or allowing electrolyte to leak. See the Material Safety Data Sheet on Batteries in Attachments I04, I05, and I06.

An additional but not as prevalent hazard in a substation is that of SF6. SF6 (Sulfur Hexafluoride) is used in the substation as a non-conductive gas within some circuit breakers and associated bushings. SF6 is an odorless, tasteless and colorless non-toxic gas in its pure state. SF6 is approximately

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5 times heavier than air and displaces oxygen. The sulfur within the SF6 can decompose to form SO2 (Sulfur Dioxide – rotten egg smell). Since water is needed for the formation of the SO2, care should be taken when handling to avoid contact with water. When fighting fires, emergency crews should be fitted with supplied air respirators to protect them from both the SF6 and SO2 hazards. See Material Safety Data Sheet attachment I07 – MSDS SF6

4.2. Emergency Services (Fire Department / Police Department)

- 4.2.1. Respond to the 9-1-1 call from Utilities or the public of a substation fire or emergency.
- 4.2.2. Secure the site perimeter and establish an incident command post.
- 4.2.3. Protect the public and surrounding properties without entering the substation.
- 4.2.4. Emergency Services personnel shall not contact any substation equipment or the fencing until they have been informed of the substations status and energization state.
- 4.2.5. Do not fight the fire with water or foam until a Utilities Representative (Site Supervisor) has verified the substation is completely, or the appropriate sections, de-energized. This will be achieved by ~~either the Site Supervisor providing this information or by the Emergency Services Employee (Fire & Police Departments) contacting Utilities~~ working with System Operations, **668-4091**, or **Distribution operations 668-4066** for communications on the substation status from the System Operator on duty.

5.0 RESPONSIBILITIES

This section outlines areas and roles of responsibilities as they pertain to this process of an emergency response to fire and / or personal injury:

5.1. Site Supervisor

- During the initial stages of the response, the **SU** System Control (SECC) dispatcher will act as the site supervisor until the first **SU** employee arrives on scene.
- A Springs Utilities employee that is first on the scene is in charge of the site in terms of **SU** employees. This would be the highest ranking **SU** employee on site with the appropriate level of awareness and knowledge of the system.
- This employee will remain as the site supervisor until released of this duty by another arriving employee of higher rank and authority.
 - Once the employee is replaced by another employee as the Site Supervisor, appropriate communications shall take place to System

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Operations, Fire & Police Departments and other affected groups to inform the groups of the change in command.

- Responsible for the overall control and command of the site and of **SU** employees responding to the scene.
- Acts as a liaison between the Fire & Police Departments and Colorado Springs Utilities.
- Coordinates with Fire & Police Departments, other utility crews, System Operations and whoever else is needed on an overall response and action plan for the emergency.
- Ensures all **SU** employees are following safety rules and procedures at all times.

5.2. System Operations

- To communicate, in a timely basis, system configuration status and intentions with appropriate System Operators for relay to 9-1-1 Operations Centers, Incident Command Center (if activated), Dispatch and the on-site Site Supervisor.
- To coordinate with field personnel to de-energize necessary equipment or systems to ensure the site is safe for responders.

5.3. Utilities First Responders (Troubleshooters, On Call Substation Techs)

- Upon arrival, assumes the role of the site supervisor or reports to the site supervisor.
- If they are the first person on scene and there is a fire or similar, they are to communicate the emergency and situation to System Control **or Distribution Control** for the notification of 9-1-1 services and secure the area.
- If notified of a fire or similar at a substation, they are to coordinate with System Control **or Distribution Control** on any efforts to de-energize the substation without jeopardizing their own, or the public's safety.

5.4. Substation Employees

- Upon arrival, assumes the role of the site supervisor or reports to the site supervisor.
- Any substation technicians ~~or maintenance personnel~~ called to the site are to remain as a support role in the de-energization, or other pertinent roles as needed, of the substation until released by the Site Supervisor.

5.5. Environmental Services

- Upon arrival at the scene, report in to the site supervisor.
- Coordinate with substation crews and Fire Departments / Hazmat on the containment and cleanup of leaking oils if applicable.

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5.6. Safety & Health

- Upon arrival at the scene, report to the Site Supervisor.
- Work with Utilities responders on proper response to the scene and site control.
- Ensure employees and first responders are employing proper safety practices and procedures to the work activities and response.
- Coordinate with Fire Departments and SU personnel on a solid communication and action plan for the emergency and the protection of employees, responders and the public.

5.7. Corporate Communications

- Upon arrival at the scene, report in to the site supervisor.
- Coordinate with Utilities responders and Fire Departments media relations on press releases and updates.

6.0 PROCESS

6.1. Substation Fire or Explosion

- 6.1.1. Emergency Services typically receives a 9-1-1 call from the public or Utilities and respond to the scene as appropriate.
- 6.1.2. Upon arrival, emergency services' first goal is to secure the perimeter of the substation and protect property and life outside the substation.
- 6.1.3. Emergency Services is not to enter the substation or fight the fire until they have been notified of the de-energized status of the substation or appropriate equipment by the Utilities Site Supervisor.
- 6.1.4. Springs Utilities insurance carrier requires the use of automatic fire suppression systems at the GSU which are only located at the power plant substations. If these systems are activated, the site and responding emergency agencies should keep the public and employees clear of any water or oil run off to avoid possible contamination and electrical contact from stray voltages passing through the water or oil.
- 6.1.5. Upon notification of a substation fire, coordination between system control and the SU electrical first responders to effectively de-energize the appropriate equipment or the entire substation is the first priority and responsibility of CSU personnel.
- 6.1.6. Once the site has been deemed safe and de-energized, the Site Supervisor will communicate the necessary information to the Emergency Services personnel so they can begin the needed response.

6.2. Motor Vehicle Accident Into A Substation

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- 6.2.1. Emergency Services typically receives a 9-1-1 call from the public or Utilities and respond to the scene as appropriate.
- 6.2.2. The 9-1-1 operator or on site emergency services personnel should inform the individual involved in the accident to remain inside the vehicle in an effort to avoid electrical contact. However, If the individual must evacuate the vehicle as a result of fire or similar life threatening situation, they should follow these procedures:
- Open the door or exit the window and stand on the door step or door frame without touching anything outside the vehicle.
 - Jump off the vehicle, Away from any equipment, landing with both feet together. Do not use your hands to balance on anything, including the ground or the vehicle.
 - The person should not touch anything once they jump from the vehicle (This includes the vehicle, cables, structures, fences, etc).
 - Bunny hop with both feet together, in small increments, away from the equipment.
 - Avoid spreading feet in any direction. They must be kept together.
 - Avoid any water or oil puddles.
 - When the individual is about 100 feet away, they may start to walk away.

~~6.2.3.~~ Upon arrival, emergency services first goal is to secure the perimeter of the substation and protect life and property. Do not allow anyone from the public or emergency services to enter the substation unless they know it is safe via notification from Colorado Springs Utilities by either the Site Supervisor. ~~or from direct communications with the SU Distribution Control, 668-4091 for communications on substation status.~~

6.3. Oil Spill and Leak

- 6.3.1. Emergency Services should secure the site and protect the public from exposure.
- 6.3.2. In the event there is an oil leak and the substation containment barrier is not able to contain the leak, the Fire Department along with **SU** personnel will attempt to contain the leak inside the substation perimeter or outside the substation perimeter if fire or other situations prohibit the containment inside the substation.

6.4. Employee Injury Response

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- 6.4.1. Emergency Services will typically receive a 9-1-1 call from a **SU** employee or Central Dispatch of the emergency and injury within the substation property.
- 6.4.2. Upon arrival, the Emergency Services personnel shall be escorted from the main gate to the site of the injured employee by a **SU** Site Supervisor or identified employee.
- 6.4.3. Emergency Services shall carry all equipment at hip height and shall not deploy or utilize any equipment which will reach higher than 8 feet off the ground without prior communications of the **SU** Site Supervisor.
- 6.4.4. If equipment or areas of the substation require de-energization for the emergency response, the onsite substation personnel shall coordinate with ~~System Control~~ appropriate switching authority and communicate with Emergency Services as necessary.
- 6.5. Public Injury Response
 - 6.5.1. Emergency Services will typically receive a 9-1-1 call from the public or **SU** employee of the emergency or injury within the substation property.
 - 6.5.2. Upon arrival, Emergency Services shall not enter the substation until a **SU** Site Supervisor arrives on scene and coordinates necessary communications from ~~Distribution Control~~ appropriate switching authority on the status of the substation.
 - 6.5.3. Once the site has been identified as safe for entering, Emergency Services shall follow the Site Supervisor to the injured individual.
 - 6.5.4. Emergency Services shall carry all equipment at hip height and shall not deploy or utilize any equipment which will reach higher than 8 feet off the ground without prior communications of the **SU** Site Supervisor

7.0 PROCESS METRICS / SERVICE LEVELS

Metric	Not applicable
Definition of Metric	
Source of Metric	
Calculation of Metric	

8.0 EQUIPMENT AND TOOLS

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In order to properly and safely support an emergency in a substation, the responding Utilities employee(s) need to possess the appropriate tools and knowledge to establish the work area as safe. These tools and equipment could vary depending on the substation or the circumstances to the emergency.

Some of the general equipment and tools could include:

Hotline tools, Personal Protective Grounds, Switching tags

- Education and knowledge in substation operation and associated hazards.
- Proper levels of PPE as necessary based on the circumstances and hazards.
- Radio or phone for communication to emergency services and or distribution control.

A generic Electric Utility Safety Video, (from Aegis Insurance) is available for review from the SU S&H Department to aid as a training tool for responding agencies. **Does this still exist do the responders know about this and view it?**

9.0 RECORDS MANAGEMENT

<u>Record Number</u>	<u>Record Title</u>	<u>Record Owner</u>	<u>Record Location</u>	<u>Type of Record</u>	<u>Retention Time</u>
N/A					

10.0 REFERENCE DOCUMENTS

<u>Source/Standard</u>	<u>Document #</u>	<u>Title/Description</u>	<u>QBD Status</u>
None			

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11.0 ATTACHMENTS

Attached to this document are several Adobe Acrobat Documents which pertain to this document. These documents are primarily Material Safety Data Sheets for substances located within the substation which could be of concern to the Responding Agencies, SU Employees, or the public.

Attachment Number	Title
I01-12052	Fact Sheet - Type TC – Control or Instrumentation Cable
I02-12052	MSDS – PVC/Nylon Insulated PVC Jacketed Tray Cable
I03-12052	MSDS – Transformer Oil
I04-12052	MSDS – Flooded Lead Calcium Battery
I05-12052	MSDS – Nickel Cadmium Batteries
I06-12052	MSDS – Battery Fluid, Alkali
I07-12052	MSDS – SF6