Work Performed On or Near Overhead/Underground Utilities and Emergency Response Program

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Best Practice Category:	**Jobsite** *Category the document will be located on the Intranet under Best Practices*	**Document #:**	**BP034** BP + Sequential Number = Category
Document Title:	**Work Performed On or Near Overhead / Underground Utilities and Emergency Response Program**		
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Business Unit Designation:

☐ BU 01 - Infrastructure ☐ BU 02 - BR Civil ☐ BU 04 - Houston Civil

☐ BU 15 - Deep Foundations ☐ BU 23 - Marine ☐ BU 29 - BR Mechanical

☐ BU 30 - Houston Mechanical ☐ Pipe Fab Facility ☐ Form Fab Facility ☐ Westport Operations

☐ Cajun Office Facilities

A check next to a Business Unit indicates this best practice is required by that business unit and therefore is a mandatory Standard Operating Procedure (SOP) for that business unit.

PURPOSE:

Many tasks with electrical equipment require special training. Work on those tasks must be restricted to individual with special training that qualifies them for that work.

DEFINITIONS AND ACRONYMS

Absolute Limit of Approach Distance is the minimum safe distance a vehicle, equipment, machine, or load can approach an energized overhead power line. This distance is voltage dependent as shown in the following Table 1 of this document.

At Risk Activities Work Near Overhead Power Lines any work such as excavations, earth moving, drilling, blasting, lifting or reaching with the use of cranes and boom trucks within 75 feet of an energized overhead power line.

Overhead Element is any overhead metal element that may inadvertently get dangerously close to a high voltage line, for example: crane booms, mobile scaffolding, dump truck hoppers, etc.

Overhead Power Line is any above ground live or dead conductor that is not fully voltage sheathed or enclosed. Poles, guy wires, underground anchors and any such structural member that contributes to the structural integrity of the power line shall be included as part of the power line.

Overhead Power Line Work Supervisor is the supervisor responsible for the work who is present at the work site to monitor and control work within 75 feet of an overhead power line.

ELECTRICAL SAFETY MANAGEMENT

Management will do the following:

- Identify what tasks will be done only by qualified electricians and communicate this information to all personnel.
- Identify, mark, and restrict access to areas with electrical hazards
- Equip outside receptacles and those in wet locations with a Ground Fault Interrupter (GFI). The GFI may be at the receptacle or at the breaker box.

HOW DO ELECTRICAL INJURIES OCCUR

Electricity is ground seeking and will force its way through anything grounded. It will usually choose the path which offers the least resistance. Electrical current will easily pass through the human body (a good conductor) causing serious injury.

The human body is affected mainly by the intensity of current, measured in amperes. Contrary to popular belief, it is the intensity of the current that kills, not the force of the current (voltage). Amperage as low as 0.080 amps can kill a person. Current (voltage) of 50 volts (AC) and 100 volts (DC) are considered the safe level.

INDIVIDUAL RESPONSIBILITIES

It is each employee's responsibility to be aware of the following:

- Review and evaluate any Hot Work procedures for work on energized equipment. Obtain appropriate permits where necessary to protect personnel from electrical hazards.
- Do not enter a transformer bank/high yard enclosure except with an electrician or qualified person and only when specifically authorized by the electrician.
- Do not remove original equipment protective guards from equipment during operation or use. Take special precautions to prevent contact with any electrical line when handling guy wires or when using any type of mast or gin pole.
- Treat electrical circuits as live until the condition of the circuit is known. All voltages are to be regarded as dangerous.
- Ground portable electrical tools with a three wire circuit or use double insulated tools.

When using electrical extension cords, the following precautions:

- Use only approved outlet and connections
- Make sure cord is properly connected, grounded and protected from traffic.
- Use care to keep cord from becoming wrapped around any part of your body.
- Inspect all cord and plugs prior to use. All damaged cords will be taken out of service and tagged "DO NOT USE".
- Use only approved lighting equipment when working in vessels, boilers, vats or hazardous areas. The lights should be low voltage (12V) or protected by a GFI.
- When electrically operated equipment is being repaired or services - both selector switch and circuit breaker are to be in the "OFF" position. Refer to the Lockout/Tagout procedure.

TRAINING:

OSHA 1910.332

The training requirements apply to employees who face the risk of electric shock that is not reduced to a safe level (50 volts AC and 100 DC).

Employees shall be trained in and familiar with the safety-related work practices required by OSHA 1910.331 thru 1910.335 that pertain to their respective job assignments.

Employees not trained as "Qualified Person" shall be trained in and familiar with any electrically related safety practices which are necessary for their safety.

All "Qualified Persons" (those permitted to work on or near exposed energized parts) will be trained in and familiar with the following:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
- The skills and techniques necessary to determine the nominal voltage of exposed live parts, and
- The clearance distances specified in OSHA 1910.333 and the corresponding voltages to which the qualified person will be exposed.

Training will be classroom and on the job. The degree of training provided shall be determined by the risk of the employee.

OSHA 1910.333

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

De energized parts - Live parts to which an employee may be exposed will be de energized before the employee works on or near them, unless the employer can demonstrate the de energizing introduces additional or increased hazards or is infeasible due to equipment design operational limitations. Live parts that operate at less than 50 volts to ground need not be de energized if there is no increased exposure to electrical burns or to explosion due to electric arcs.

Work on exposed de energized parts or near enough to them to expose the employee to any electrical hazard they present, that has not been locked out tagged out will be treated as energized parts.

When any employee is exposed to contact with parts of fixed electric equipment or circuits which have been de energized, the circuits energizing the parts shall be locked out or tagged out or both.

Working on or near exposed energized parts - This paragraph applies to work performed on exposed live parts (involving either direct contact or contact by means of tools or materials) or near enough to them for the employees to be exposed to any hazard they present.

Before elevated structures, such as poles or towers, are subjected to such stresses as climbing or the installation or removal of equipment may impose, the employer shall ascertain that the structures are capable of sustaining the additional or unbalanced stresses. If the pole or other structure cannot withstand the loads which will be imposed, it shall be braced or otherwise supported so as to prevent failure.

Working on energized equipment - only qualified persons may work on electric circuit parts or equipment that have not been de energized under the procedures of the above paragraph. Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials and insulated tools. Replace with Company Name will use a certified electrician for this type work. Replace with Company Name does not perform or allow live line bare-hand work.

When a pole is set, moved, or removed near an exposed energized overhead conductor, the employer shall ensure that each employee wears electrical protective equipment or uses insulated devices when handling the pole and that no employee contacts the pole with insulated parts of his or her body.

Overhead lines - If work is to be performed near overhead lines, the lines shall be de energized and grounded, or other protective measures shall be provided before work is started. If lines are to be de energized, arrangements shall be made with the person or organization that operates or controls the electric circuits involved to deenergize and ground them. If protective measures, such as guarding, isolating, or insulating are provided these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

Unqualified persons - When an unqualified person is working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances:

(1) For voltages to ground 50kV or below - 10 ft.
(2) For voltages to ground over 50kV - 10 ft. plus 4 in. for every 10kV over 50kV.

Qualified persons - When a qualified person is working in the vicinity of overhead lines, whether in an elevated position or on the ground, the person may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in the below Table S-5 unless:

(A) The person is insulated from the energized part (gloves, with sleeves if necessary, rated for the voltage involved are considered to be insulation of the person from the energized part on which work is performed), or
(B) The energized part is insulated both from all conductive objects at a different potential and from the person, or
(C) The person is insulated from all conductive objects at a potential different from that of the energized part.

TABLE S-5 APPROACH DISTANCES FOR QUALIFIED EMPLOYEES
ALTERNATING CURRENT

Voltage range (phase to phase)	minimum approach distance
300V and less	avoid contact
Over 300V, not over 750V	1 ft. 0 in.
Over 750V, not over 2 kV	1 ft. 6 in
Over 2kV, not over 15kV	2 ft. 0 in
Over 15kV, not over 37kV	3 ft. 0 in
Over 37kV, not over 87, 5 kV	3 ft. 6 in
Over 87,5kV, not over 121kV	4 ft. 0 in
Over 121kV, not over 140kV	4 ft 6 in

The employer shall use the tension stringing method, barriers, or other equivalent measures to minimize the possibility that conductors and cables being installed or removed will contact energized power lines or equipment. Reel handling equipment, including pulling and tensioning devices, shall be in safe operating condition and shall be leveled and aligned. Load ratings of stringing lines, pulling lines, conductor grips, load-bearing hardware and accessories, rigging, and hoists may not be exceeded.

UNQUALIFIED WORKERS

- A “Working near Overhead Power Lines Permit” is required any time “At Risk Activities” are to be performed within 75 feet of an energized overhead power line.
- De-energizing and grounding of lines (where possible) shall be the primary means of preventing injury from contact between cranes or machinery and power lines.
- Evaluate alternative work methods that do not require use of cranes, boom trucks, or overhead elements in the proximity of energized overhead power lines.
- Vehicles, equipment, booms, scaffolding, personnel etc. shall adhere to the appropriate “Absolute Distance of Approach” of any energized power line, except for specialized overhead power line crews with appropriate equipment and properly trained to handle this type of work safely.
- To protect employees from falling into holes into which poles are to be placed, the holes shall be attended by employees or physically guarded whenever anyone is working nearby. [3]
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Distance Of Approach (unqualified Workers)

TABLE 1

Line Voltage	Minimum
Up to 50,000 volts	10 feet
50,000 to 115,000 volts	12 feet
115,000 to 230,000 volts	16 feet
230,000 to 500,000 volts	25 feet

Vehicular and mechanical equipment - Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 ft. is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. for every 10kV over that voltage. However, under any of the following conditions, the clearance may be reduced:

(1) If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. If the voltage is higher than 50kV, the clearance shall be increased 4 in. for every 10kV over the voltage.
(2) If insulating barriers are installed to prevent contact with the lines, and if the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.
(3) If the equipment is an aerial lift insulated for the voltage involved, and if the work is performed by a qualified person, the clearance (between the uninsulated portion of the aerial lift and power line) may be reduced to the distance given in Table S-5

Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments.

Illumination - Employees may not enter spaces containing exposed energized parts, unless illumination is provided that enables the employees to perform the work safely.

Where lack of illumination or an obstruction precludes observation of the work to be performed, employees may not perform tasks near exposed energized parts. Employees may not reach blindly into areas which may contain energized parts.

All work requiring a “Working near Overhead Power Lines Permit” must be performed in daylight hours and shall be stopped anytime environmental conditions could potentially effect the safe completion of the work. Work may not be performed when adverse weather conditions would make the work hazardous even after the work practices required by this section are employed. Work shall be stopped if environmental conditions have some of the following characteristics:

- Wind speed higher than 20 miles/hr
- Heavy rain, hail and snow
- Electrical storms
- Other abnormal phenomena affecting safety

Insulating barriers, proximity warning devices, insulating boom guards, swing limit stops, non-conductive tag lines, ground rods, and similar devices may be used for protection against electrical hazards, but shall not take the place of de-energized lines or minimum absolute limit of approach distances.

INTERLOCKS

Only a qualified person following the requirements may defeat an electrical safety interlock, and then only temporarily while he or she is working the equipment. The interlock system shall be returned to its operable condition when this work is completed.

Working Near Overhead Power Lines Permit

As part of the permit, an Overhead Power Line Supervisor must be assigned to the work / project. This person will be responsible for:

- Generating the permit with a complete sketch of the work area and any overhead power lines in the area.
- Posting and barricading the work area prior to requesting authorization from the Electrical General Foreman.
- Notify the Electrical General Foreman of the work / project and conduct an inspection of the work area.

Equipment Spotter / Signalman

A person shall be assigned to observe equipment when:

- It is difficult for the equipment operator to visually observe how close his equipment or its load is to the energized overhead power lines.
- The equipment is within a booms length of the energized overhead power line
- The spotter / signalman must warn the operator when:
- The machine is working near a power line.
- Any part of the machine is nearing the Absolute Minimum Distance of Approach Step.

CONDUCTIVE MATERIALS AND EQUIPMENT

Conductive materials and equipment that are in contact with any part of an employee's body shall be handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts. If an employee must handle long dimensional conductive objects (such as ducts and pipes) in areas with exposed live parts, the employer shall institute work practices (such as the use of insulation, guarding, and material handling techniques) which will minimize the hazard. Protective shields, barriers or insulating materials shall be used when necessary when working in confined or enclosed work spaces where electrical hazards may exist.

Portable ladders - Portable ladders shall have nonconductive side rails if they are used where the employee or the ladder could contact exposed energized parts.

Conductive apparel - Conductive articles of jewelry and clothing (such as watch bands, bracelets, rings, keychains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) may not be worn it they might contact exposed energized parts. However, such articles may be worn if they are rendered nonconductive by covering, wrapping, or other insulating means.

HOUSEKEEPING

Where live parts present an electrical contact hazard, employees may not perform housekeeping duties at such close distances to the parts that there is a possibility of contact, unless adequate safeguards (such as insulating equipment or barriers) are provided. Electrically conductive cleaning materials (including conductive solids such as steel wool, metalized cloth, and silicon carbide, as well as conductive liquid solutions) may not be used in proximity to energized parts unless procedures are followed which will prevent electrical contact.

Emergency Response for Contact with Overhead/Underground Utilities

(Electrical, Gas, Chemical, Water, Sewer, etc.)

GENERAL

- In the event of an aboveground or underground utility being unintentionally uncovered, displaced or struck in the course of work activities, all work in direct proximity of the incident is to cease immediately.

- The incident should be reported immediately to Site Supervision/ Management. Site Supervision/Management shall contact Cajun Division Management and the utility service provider immediately.

- Managers and supervisors are to take immediate emergency response action to ensure the protection of personnel at the site.

UTILITY - ELECTRICAL

- If contact is made a minimum 50’ separation should be maintained of all personnel from any part of the equipment or active electrical cable.

- Spotters should be placed in safe strategic locations to ensure no personnel are allowed in the immediate area.

- If it is **safely possible** to break contact with the utility the operator should attempt to slowly swing or back the machine away from the utility.

- Back far enough to a safe area where there is no potential for electrical shock when exiting the cab.

- Once clear of the utility the operator should exit the machine, ensure that the area is properly secured and report immediately to Site Supervision/Management to give an accurate account of the details leading up to the unplanned event.
- The machine is not to be used again until it has been thoroughly inspected by authorized personnel.

- If it is **not safely possible** to break contact with the utility the operator is to remain in the machine and should make no attempt to leave the machine until the power has been switched off and Site Supervision/Management have given the ‘all clear’.

    - The operator should:
        - Remain seated
        - Stay calm
        - Place the machine in park/neutral mode
        - Set parking brake if applicable.
        - Turn the machine off.

- Where **immediate evacuation of the machine is essential**, as in the case of a fire, or other IDLH situation, then and only then should the operator attempt to leave the cab of the machine.

- The operator must ensure he jumps clear of the machine and at **no time makes contact with any part of the machine and the ground** at the same time.

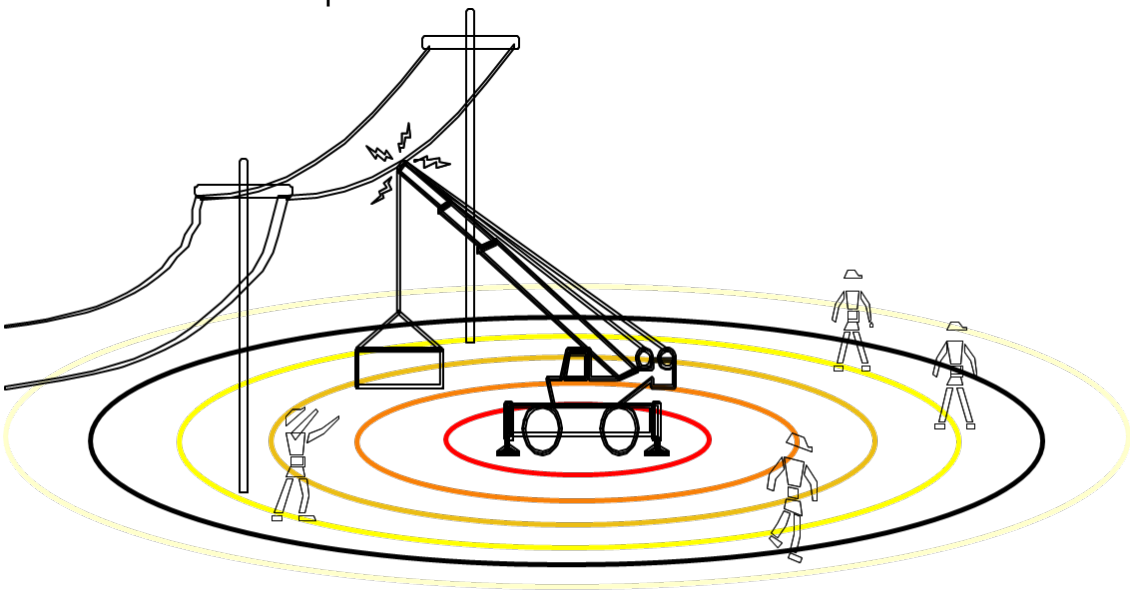
- There are two methods used to safely evacuate the area:

1. **The Shuffle**. The shuffle consist of a person shuffling/ sliding their feet a few inches at a time making sure to never break contact with the ground or cause separation between your feet. Avoid lifting feet while scuffling, avoid shuffling your feet more than 8 inches apart from each other, and do not allow anyone to come to your aid until you are clear of the high voltage zone.

2. **The Bunny Hop**. The bunny hop consist of a person keeping both feet together and hopping a few inches at a time until they reach a safe zone (25'+).

Note: If equipment contacts power lines, electricity will contact ground, which energizes the earth in a large area around the contact point. The strength of the electrical charge decreases the further you move away from the point of contact. This is why it is vital not to separate your feet since there may be a difference in the electrical charge under each foot. This difference could create an electrical path through your body.

Current, from downed power lines in contact with other objects such as piping, wires/cables, fencing, etc., can travel significant distances and have been measured over 100 ft. from where the downed power.



Current can flow outward through ground in a ripple pattern from the equipment in contact with a power line.

UTILITY – GAS, CHEMICAL, WATER, SEWER, ETC.

- The machine should be shut down immediately. Do not continue to operate the machine as there could be further damage creating greater risk of health exposure, fire, explosion, etc.
- Applicable emergency protective equipment shall be utilized as required.
- Evacuate the area immediately by traveling up and/or cross wind to a designated assembly area, shelter in place or safe zone.
- Notify Cajun Site Management and plant/owner of the utility immediately. Give as much detail as possible when describing the incident.
- Warn others to stay clear of the area.
- After the situation is assessed by the plant/utility owner and Cajun Site Management and the utility contains a non-hazardous substance such as water, an effort may be made to turn the supply valve off to control the spill.

AFTER THE SITE IS SECURE

- The area surrounding the incident should not be disturbed any more than necessary to secure the scene until the investigation team has gathered all of the evidence needed for the investigation.

- Once the safety of the location is made good, managers and supervisors must ensure a risk assessment is undertaken before any work proceeds. Safe work methods must be modified to include controls for any additional risks arising from the unintended contact with underground or aboveground utilities.

- A risk assessment is to be undertaken and may consist of Plant/Owner representatives, Cajun Site Management/Supervision and appropriate employees/operators involved in the work.

- Expert advice must be sought from representatives of the utility service provider on emergency response measures, risk assessment and safe working methods. Variations to scope of work may be needed as a result of the unintended contact with the underground or aboveground utility.

- Once the site is released from any work restrictions a written plan should be developed to include the findings of the risk assessment along with a detailed execution plan for any activities needing to be performed.

- Untrained, unequipped persons should not attempt to rescue a person receiving an electric shock, as this may result ALSO in the death of the person rendering assistance.

TRAINING

- These emergency procedures shall be reviewed and acknowledged by all Site Management, Site Supervision, Safety and Equipment Operators.

RESPONSIBILITIES

Site Management/Supervision

- Implement all requirements of this procedure
- Ensure that no work is performed near utilities without approval and appropriate planning.
- Participate in risk assessments with a focus to identify aboveground and underground utilities that may be affected by our work.
- Verify the actual position of aboveground and underground utilities at the site and advise on any variations needed to reduce risk of contact with utility.
- Ensure all personnel undertaking the work, review all applicable plans, procedures and have been trained before any work begins
- Supervise work to ensure that all applicable procedures are implemented at all phases of work.

Equipment Operators

- Must follow all requirements of this procedure.
- Must exercise STOP Work Authority if they believe a utility is present that was not discussed in the plan or there is a need to deviate from the plan.
- Conduct a risk assessment of the area on a regular basis with a focus on aboveground and below ground utilities.

Approvals		
Title	***Signature***	***Date***

Revision History				
Rev #	***Date***	***Reason for Changes***	***Originator***	***Effective Date***

Note: SOP Requirement

Work must be performed in accordance with the information in this Best Practice. If it is determined, that work cannot be done as required in the document or that it presents additional risk, you must obtain authorization for variance from the Business Unit Sr. Construction Manager and Business Unit Manager of Safety.