



Gulf of Mexico Electrical Safe Work Practice

KnowledgePlanet
Awareness & Quiz

July 2009

Electrical Work Procedures

Purpose & Objectives

- Intended to describe procedures, methods and practices associated with all electrical work activities in Chevron's drilling and production operations.
- Primary objectives are to:
 - Safeguard against electrocution, shock, arc flash & arc burns during performance of electrical work activities.
 - Provide for protection of personnel and equipment.
 - Establish uniform procedures for doing electrical work.
 - Heighten awareness to those in the work environment that are not electricians but use cord connected portable power tools, extension cords and other cord connected equipment during routine tasks.

Electrical Work Procedures

Guidance for GFCI Whip Cords and Breakers

- It is Chevron's intent that personnel use ground fault circuit interrupters when using cord connected portable power tools and other cord connected equipment. Reference Section 5.7.2 of GOM Electrical Safe Work Practices
- Before each use of cord connected portable Power Tools, Extension Cords, and other cord connected equipment, a visual inspection should be made.
- A periodical inspection should be made of all extension cords in stock. Never use a cord that has been taped up or repaired. Always roll up extension cords that have been unplugged first.
- Observe the following precautions for any cord and plug connected equipment not connected to premises wiring:
 1. Use a tool equipped with a cord containing an equipment-grounding conductor connected to the tool frame and to a ground on the other end.
 2. Use a tool of the double-insulated type.
 3. Use a tool connected to the power supply through and isolating transformer with an ungrounded secondary.

Electrical Work Procedures

Policy

- It is Chevron's policy that no maintenance or construction/installation work is to be performed on any conductor and/or exposed equipment parts at 50 volts and above while energized.
- Use Lockout Tagout to achieve electrical safe work condition.
 1. De-energize / isolate
 2. Lock & Tag
 3. Test / Tried
 4. Ground conductors when applicable

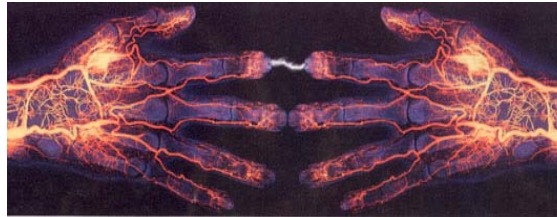


Electrical Work Procedures

Hazards associated with electricity

Electrical Shock and electrocution are well-known electrical hazards. But electricity can also cause burns, fires and explosions. These two serious sources of such accidents are **Arc Flashes** and **Arc Blasts**.

- **Electrical Shock**



For electrical shock to occur, the human body must become part of an energized circuit. Electrical current will flow whenever it has a complete circuit (path) that returns it either to the source or ground. Current will flow through your body if you are part of the circuit.

Electrical Work Procedures

Hazards associated with electricity

■ Electrical Burns

Electrical energy may cause two types of burns. The first is the electrical burn, which is a burn that results from current flow through the body's tissues. Contact with an exposed live part will cause this type of burn. This burn is from the inside out.

■ Thermal Burn

The second type of electrical burn is a thermal burn, which results from an **arc flash** and does not require any contact with the exposed live part. This burn starts from the outside in, an example is sunburn.

Electrical Work Procedures

Hazards associated with electricity

- **Arc Flash**

When electrical current passes through the air between ungrounded conductors or between ungrounded conductors and grounded conductors, the temperature can reach 35,000 degrees F, or about four times the temperature of the sun. Exposure to these extreme temperatures burns the skin directly and causes ignition of clothing, which adds to the burn injury. The majority of hospital admissions due to electrical accidents are from arc flash burns not shocks. Arc flashes can and do kill at distances of 10 ft.



Electrical Work Procedures

Hazards associated with electricity

■ Arc Blast

The tremendous temperatures of the arc cause the explosive expansion of the surrounding air and the metal in the arc path. For example, copper expands by a factor of 67,000 times when it turns to a vapor. The danger associated with this expansion is one of high pressures, sounds and shrapnel. The high pressures can easily knock workers off ladders, rupture ear drums, and collapse lungs. The sounds associated with these pressures can exceed 160 decibels. Finally, material and molten metal expel from the arc at speeds exceeding 700 miles per hour, fast enough for shrapnel to pass right through the human body.

Electrical Work Procedures

- Definition of **Working On** (Live Parts) Coming in contact with Energized parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing.

There are two categories of “working on”:

Diagnostic (testing) - taking readings or measurements of electrical equipment that does not require making any physical change to the equipment. **Does Not Require Energized Electrical Work Permit**, but requires appropriate PPE, Tested Electrical Rated: Gloves, Face shield, FRC for the voltages being worked on.

Repair – any physical alteration of electrical equipment such as making or tightening connections, removing or replacing components, etc. **Requires: Energized Electrical Work Permit**, appropriate PPE, Electrical Rated: Tested Gloves, Face shield, FRC, or PPE according to the level of risk. See table C1 & C2 in Chevron Electrical Safe Work Practice for appropriate level of PPE for the voltages being worked on.

Electrical Work Procedures

Electrically Rated Gloves

Electrically Rated gloves are used to protect from SHOCK. They are rated by a class according to the voltage level they are being used to protect from.

Class 00 --- 500 Volts

Class 0 ---1000 Volts

Class 1 --- 7500 Volts

Class 2 ---17000 Volts

Voltage rated gloves and leather protectors are required anytime a person is within the Prohibited approach boundary (50 -300 volts - avoid contact, 301 to 750 volts – 1 inch, and 751 to 15,000 volts 7 inches)

Gloves need to be tested or replaced every 6 months from date placed into service. If two pairs are purchased, the second pair can be put into service to replace the first pair. Shelf life of the not in service gloves is 12 months.

Example; I purchase 3 pair of gloves tested on Jan 1, 2009.

I open one pair and put into service on Jan 15, 2009, This pair is not in compliance after July 15, 2009.

I now open the second pair July 16,2009 since they were not placed in service and use them for 6 months, they are out of compliance after Jan 16, 2010.

I cannot use the third pair I ordered because they are older than 12 months even though they were never in service.

Electrical Work Procedures

Energized Electrical Work Permit

- The Energized Electrical permit is in addition to the permit to work. All permit to work requirements need to be met as well as the Energized Electrical permit.
- The Energized Electrical permit needs to be approved by the Operations Supervisor, OIM and Field Coordinator (or In Deep Water an Operations Representative on location who acknowledges that all permit conditions are met and the work site has been inspected) and 2 Qualified persons.
- The permit is designed to identify the hazards involved, Identify the PPE requirements.
- Energized Work needs to be planned because of the amount of information needed on the permit.
- IT IS SAFEST TO DE-ENERGIZE

Electrical Work Procedures

2009 Energized Electrical Work Permit

PART I: TO BE COMPLETED BY THE REQUESTER

Job/D7I 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: _____

Requester/Title: _____ Date: _____

PART II: 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) Results of the Shock Hazard Analysis: _____

(4) Determination of Shock Protection Boundaries: _____

(5) Results of Flash Hazard Analysis: _____

(6) Determination of the Flash Protection Boundary: _____

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

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

(9) Evidence of completion of a JSA including discussion of any job-related hazards: _____

(10) Do you agree that the above described work can be done safely? c Yes c No If "No", return to requester

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

Date _____ OS, OIM _____ Field Coordinator _____

(or In Deep Water an Operations Representative on location who acknowledges that all permit conditions are met and the work site has been inspected)

Two Electrically Qualified Persons :

(1) _____ (2) _____

Electrical Work Procedures

“Qualified Employee” Training

Required to work on energized electrical equipment

For a person to be considered a “qualified employee”, he or she must:

- Understand the specific hazards associated with electrical energy and be able to identify and understand the relationship of such hazards to possible injury.
- Be familiar with safety-related work practices, safety procedures, and other personnel safety requirements that relate to the job or task assignments.
- Be familiar with any other safety practices, including applicable emergency procedures related to work and safety.
- Be able to perform cardiopulmonary resuscitation (CPR) and first aid.
- Be able to distinguish exposed live parts from the other parts of electric equipment, machines, and processes.
- Be able to determine the nominal voltage of exposed live parts.

Electrical Work Procedures

“Qualified Employee” Training

For a person to be considered a “qualified employee”, he or she must:

- Know and understand the clearance and minimum approach distances required when working with the voltages to which he or she will be exposed.
- Know proper use of special precautionary techniques, personal protective equipment including arc-flash protective equipment, insulating and shielding materials, and insulated tools, when required.
- Understand induced, static, and impressed voltages, grounding integrity, condition of poles and structures, and circuit and equipment location.
- Know how to determine the degree and extent of a hazard, the PPE needed and job planning necessary to perform the task safely.
- Be familiar with methods of release of victims from contact with exposed live parts.

Electrical Work Procedures

Work Zones

- The space to safeguard personnel. An area temporarily marked off with rope, tape or other barricading devices into which entry is prohibited for all persons except those authorized by the Person in Charge of the work zone.
- A work zone is established by the Qualified person in charge around the area where there are exposed energized electrical equipment. The person in charge has total authority over this area, **before ANYONE enters they must get the PIC's approval.**

Electrical Work Procedures

Ten Foot Rule

- Any person who is **NOT** electrically **Qualified** must maintain a minimum distance of **10 ft** from any exposed live part.
- As the distance between a person and the exposed live part decreases, the potential for an electrical accident increases. **These shorter distances also require higher levels of training and PPE.**

Electrical Work Procedures

Qualified Persons

- Determine the *flash protection boundary* and, if the boundary is to be crossed, use appropriate arc-flash protective equipment.
- For a person to cross the *limited approach boundary* and enter the limited space, he or she must be qualified to perform the job/task. An exception to this is that an “authorized person” is permitted to cross the limited approach boundary if he or she is specifically trained for the task to be done.

To cross the *restricted approach boundary* and enter the restricted space, the qualified person must:

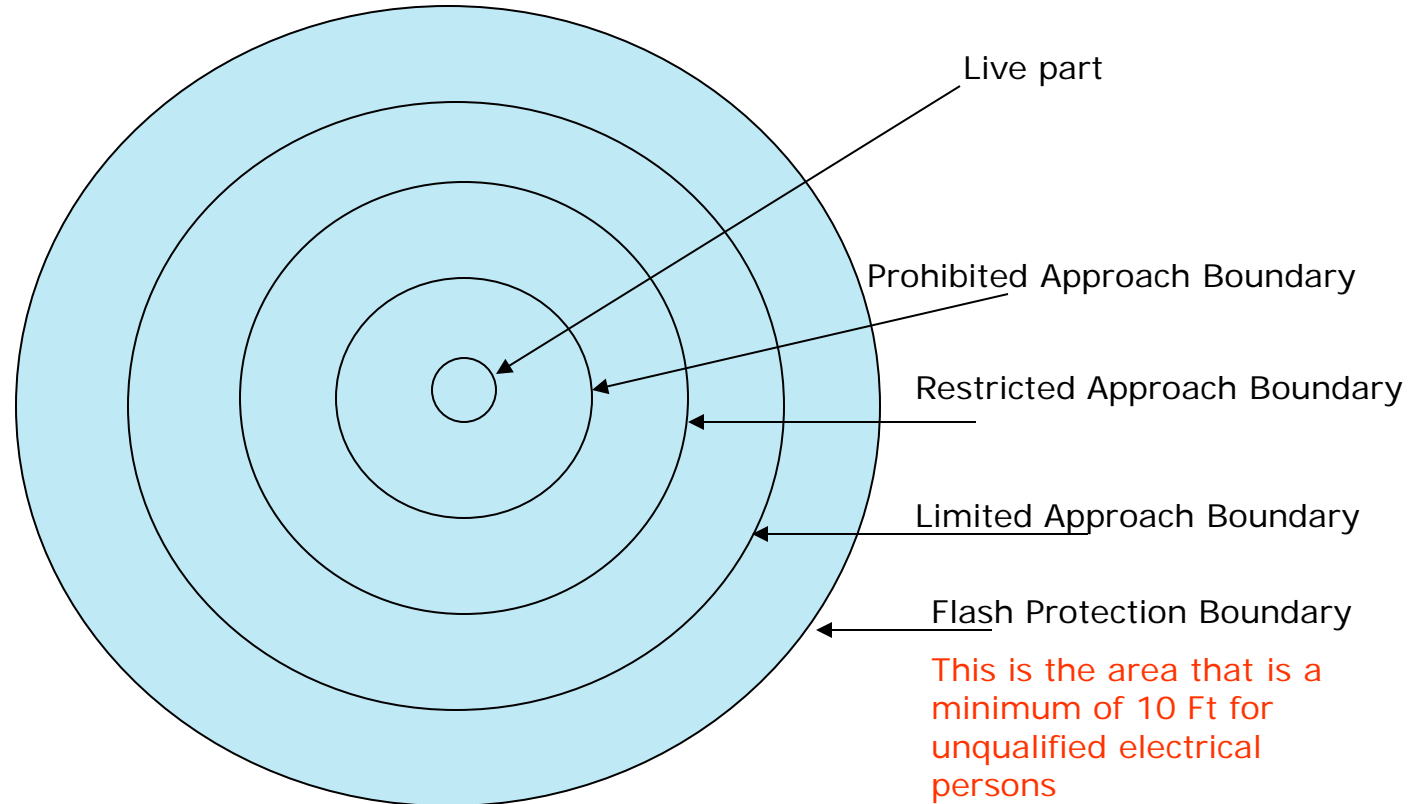
- Have a plan that is documented and approved by authorized management. (Energized Electrical Work Permit)
- Use personal protective equipment appropriate for working on exposed live parts and rated for the voltage and energy level involved.
- Be certain that no part of the body enters the prohibited space.
- Minimize the risk due to inadvertent movement by keeping as much of the body out of the restricted space, using only protected body parts in the space as necessary to accomplish the work.

To cross the *prohibited approach boundary* and enter the prohibited space is considered the same as making contact with exposed live parts, the qualified person must:

- Have specified training to work on exposed live parts and be approved by authorized management.
- Use personal protective equipment appropriate for working on exposed live parts and rated for the voltage and energy level involved.

Electrical Work Procedures

■ Figure A-2: Limits of Approach



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Electrical Work Procedures

Substations, and MCC rooms

Storing Materials

- Keep substation and MCC rooms free of debris. Do not store flammable materials (paper goods, boxes) and equipment not necessary for electrical systems repair and maintenance in substation and MCCs.
- Do not allow substation and MCC rooms that contain energized electrical equipment (480 V Switch gear) to be public areas, like smoking areas and offices.

Inspections and Maintenance

- Annually inspect substations and MCC rooms to determine the general condition of all equipment, including grounding systems (see Annex J). Qualified employees should perform the inspection. Equipment maintenance is recommended every three to five years.

Electrical Work Procedures

Job Safety Analysis (JSAs)

- A JSA is required to be completed prior to conducting any Electrical work activity and needs to be a major part of the Energized Electrical Work Permit.
- Use of the HAZARD IDENTIFICATION TOOL should also be an essential part of the JSA when doing electrical work.

Electrical Work Procedures

This CBT does not make individuals Electrical Qualified. Training classes will be provided through ERTC to Qualify electrical personnel.

Quiz Questions

Quiz Questions

1. What Hazards are associated with Electricity

- A. punctures
- B. Burns
- C. Shock
- D. Arc Blasts, and Arc Flashes
- E. B,C,D

Quiz Questions

2. What needs to be done to put equipment into an Electrical Safe Work Condition ?

- A. Locked
- B. Locked & Tagged
- C. De-energized, Locked/ Tagged, Tried/Tested & Grounded
(grounded if applicable)
- D. nothing

Quiz Questions

3. When is an Energized Equipment Work Permit required ? What approvals does it need?

- A. Working on less than 50 volts
- B. When working on energized equipment
- C. When working on energized equipment 50 volts or greater.
- D. No approval
- E. Written by a qualified person reviewed by second qualified person and signed by Operations Supervisor, OIM and Field Coordinator (or In Deep Water an Operations Representative on location who acknowledges that all permit conditions are met and the work site has been inspected)
- F. C&E

Quiz Questions

4. It is Chevron's policy that electrical repairs or maintenance will be performed on *de-energized* equipment whenever possible.

True

False

The policy is that NO maintenance, construction or installation work is to be performed on any conductors and or exposed equipment parts at 50 volts and above when energized whenever possible.

Quiz Questions

5. Who is permitted work on energized equipment?

- A. Persons that are qualified
- B. Any one
- C. A supervisor
- D. Only a contract electrician

Quiz Questions

6. Unqualified persons must maintain a minimum distance of _____ ft from exposed live parts.

- A. 45 Ft
- B. 10 FT
- C. 20 Ft
- D. none of the above

Quiz Questions

7. When is an Electrical Energized Work Permit required?

- A. When using test equipment, testing voltage on energized equipment.
- B. Working on energized equipment, tightening screws, on 480 VAC.
- C. Changing a light bulb in the galley with power off.
- D. None of the above

Quiz Questions

8. **What is done in preparation to work safely on electrical equipment ?
Who is allowed into this area ?**

- A. Create a work zone
- B. Allow only supervisors to enter
- C. Allow only those authorized by PIC to enter
- D. Allow Engineers to enter
- E. A & C

Quiz Questions

9. As the distance between a person and the exposed live part decreases, the potential for an electrical accident increases. Which also requires higher levels of training and PPE.

True

False

The closer a person is to a live part the higher the risk of shock, or arc flash, therefore, higher levels of Training and PPE are required.

Quiz Questions

10. Where can you find what PPE is required to perform certain energized electrical tasks ?

- A. In the Chevron Electrical Safe Work Practice rev. 4 (Tables C1 & C2) in the Operations manual.
- B. In NEC
- C. In D7I
- D. Design Check lists

The PPE required can be found in the Chevron Electrical Safe Work Practice rev 4 (Tables C1 & C2) in the Operations manual.

Quiz Questions

11. **What is the daily PPE requirement for electricians and automation specialists, company and contractor.**
- A. Hard Hat, Safety Glasses
 - B. Electrical Flash suite
 - C. Steel toed foot ware, Indura FRC
 - D. A & C
 - E. A & B

Quiz Questions

12. **Substation and MCC rooms that contain electrical equipment, 480V switchgear can be used as smoking areas so everyone can be cool and smoke and also an office with storage of excess paper goods.**

TRUE

FALSE

Quiz Questions

13. **When an Energized Electrical Work Permit is required, The following is true.**
- A. The Energized Electrical Work Permit needs to be signed by 2 electrical qualified persons, Operation Supervisor, OIM and Field Coordinator (or In Deep Water an Operations Representative on location who acknowledges that all permit conditions are met and the work site has been inspected) , the general permit to work must be filled out, a JSA needs to be done, the work must be justified to be done energized.
 - B. No other permits are needed.
 - C. The Energized Electrical Work Permit needs to be signed by 1 electrical qualified person, the general permit to work must be filled out, a JSA needs to be done.
 - D. None of the Above

Quiz Questions

14. Gloves that are in service need to be tested or replaced with tested gloves, every 6 months. Gloves sealed in a plastic bag not in service have a shelf life of 12 months.

True (correct answer)

False

False is the incorrect answer: gloves not **in-service** in a sealed bag have a shelf life of 12 months.

Quiz Questions

15. **Is the following electrician qualified to work on the 480 volt equipment described.**

An electrician was hired 2 months ago. His **credentials** are as follows:

He has a Wyoming electrical **license**,

He has worked in construction of commercial buildings,

He has worked offshore as a labor on a rigging crew,

He has spent 1 month at ERTC getting an introduction to the Gulf of Mexico work practices,

He is now sent to one of the fields by himself to be an electrician to work on and trouble shoot 480 vac motor starters and controls.

True

False (correct answer)

True is the incorrect answer:

He is not familiar with the equipment at this time to be qualified to work on it by himself.