Safety Practices On Electrified Leases

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We in the electric utility business are always interested in safety, particularly that which applies to electricity. As so many people are uninformed about electricity, we are always eager to talk about electrical safety to any industrial or public group. Some people are of the opinion that electricity is not dangerous to a person unless he is standing in water. Other people have remarked that an electric circuit is not harmful if the person concerned is touching only one wire. These concepts are, of course, false and are the type of thing with which we are concerned and wish to correct.

The purpose of this discussion is to bring out several of the electrical hazards on electrified leases and to discuss these hazards in order that we may all determine the best methods of reducing or eliminating them.

In order to emphasize the potential danger of electricity, we wish to discuss some of the safety aids used by linemen in the electric utility business. These aids are as follows:

(a) Rubber Gloves: The linemen of our company wear rubber gloves while working on lines carrying voltages between 300 volts and 5,000 volts. In bad weather, these gloves are also worn when working with voltages between 0 and 300 volts. As you see, if our personnel were working on an oil field lease distribution system, the voltage on which would normally be 480 volts, they would wear protective rubber gloves.

(b) Rubber Blanket: Rubber blankets come in various sizes and are placed around wires, over transformers, lightning arresters, etc., in order that the linemen will be protected in cases where clearances are restricted.

(c) Rubber Line Hose: The line hose, which somewhat resembles an oversize garden hose, is placed on conductors and is used to protect the worker where clearances are restricted. It is used on voltages to 15,000 volts.

(d) Hot Stick: The hot stick is used when working on all energized lines above 5,000 volts. This piece of equipment consists of a long stick which is coated with a special varnish and which has on one end the proper tool—clamp, wrench, hook, etc., to do the job. This hot stick puts plenty of distance between the worker and the energized or "hot" line.

Even with the aid of the above safety equipment and knowledge of electricity and its hazards,, there were 90 fatal accidents due to electric shock and burn in the electric utility business in the United States in 1952. A few of those accidents are:

(a) A lineman on a pole had removed a primary jumper with the aid of his rubber gloves. He then moved down the pole, removed his rubber gloves, worked on the secondary lines, then moved back up the pole. Forgetting to put his rubber gloves back on, he reached over and touched the energized primary jumper.

(b) A lineman was working on a pole and had only one of his protective rubber gloves on. The ungloved hand accidently brushed an energized primary fuse cutout.

(c) A surveyor, while trying to measure the height of a primary line, threw a metallic tape over the line.

(d) A construction crew was removing some concrete piers from the ground with a crane. The crane accidentally moved into a primary line and the man holding the winch line was electrocuted.

It is evident that these examples could have occurred, with a few minor changes, on an electrified lease. Due to a general lack of electrical knowledge, we are indeed fortunate that these accidents do not occur often.

It is suggested that the following procedure be followed in the case of a pumper coming out to a lease on which none of the wells are pumping and he knows that under normal circumstances they should be:

(a) Go to the transformer bank location on the lease. Visually check the fuses to see if they are blown,, the lightning arresters, and transformers to try to determine if there is something wrong with them. If a fuse is blown or some of the equipment is damaged, the proper party, a company electrician or electric service contractor, should be called.

(b) If everything appears to be normal at the transformer location, the pumper should proceed to the power company tap. Most electric utility companies provide fuse protection at each point of service. Here again the pumper should check to see if fuses are blown. If so, he should call the power company and a serviceman will be sent out.

(c) If the fuses at the power company tap appear to be in good shape, the pumper may then attempt to start one of the motors on the lease. If the motor fails to start, he could then assume that the power company's lines were open somewhere on its system and should call the power company and tell them that he believes their power is off. A serviceman will then be sent to investigate.

It should be noted that the attempt to start the motor was not the first item in his procedure, the reason being that under certain conditions, such as a single phase condition, it is possible that the motor would be burned up or damaged in some way. By checking the fuses and equipment at the transformer location and the fuses at the power company tap, it is probable that this condition does not exist, at least, on the lease.

We wish to emphasize the importance of letting the power company know whenever their power is off, for in the majority of cases the power company is unable to tell when their lines are open in remote areas, and must rely on the customers who are out of service to tell them.

When primary fuses are blown, only authorized personnel should be allowed to re-fuse them. Here is a good example of what happened to a person who thought he was capable of operating electrical line equipment: On a farm in this area there was a power line from which a farmer operated some electrical machinery. In this case a fuse cutout or a disconnect switch was involved. At the time of the incident, this switch was open and the farmer, instead of calling the power company to come and close the switch, decided to take matters into his own hands. He took hold of a long piece of pipe, stood up on his tractor and attempted to close the switch.

He was, of course, electrocuted when the pipe contacted the primary power line. Another example concerns a man who was working as an electrician on a contracting job. In this case the fuses on a power company transformer bank were open and this man, realizing that the use of a hot stick was necessary, took a piece of board which had been wet from recent rains, charred this board in a fire, attached a coat hanger to one end of the board, climbed a ladder and closed the fuse cutouts on this transformer bank. His purpose in charring the board was of course, to dry it out; but evidentally he failed to recognize that carbon is a conductor of electricity. Possibly, the fact that he was on a ladder is the only thing that saved his life. In these two examples we have tried to show the things that can and do happen to people who are not thoroughly qualified or trained in electrical work.

In the design of an electrical distribution system for a pumping lease, it is, of course,. necessary that the National Electrical Safety Code be followed.

Ground clearances are of considerable importance. The Code specifies that on secondary voltages to 750 volts, the distance from the ground to the secondary line be 15'. For voltages between 750 and 15,000 volts, the distance between the ground and the conductors must be not less than 18'. There may be several instances, such as crossing over lease roads, where it is necessary to have the conductors higher than these minimum distances.

(At this point in the discussion several slides showing the safety hazards and practices were shown.)

The horizontal distance between an electric line and an oil well is, we believe, of considerable importance. Slide 1 shows a work-over rig on a well. The purpose was to show the location of the guy wires on the rig with respect to the electrical system. In this instance, the line was approximately 75' from the well and there was an underground service from the line to the motor on the beam unit. With a setup like this, it is virtually impossible for the rig guy wires to become entangled in the electrical lines. With this hazard in mind, some companies require that their lines be not less than 75' from the well. Others specify a minimum distance of 100'.

Slide 2 shows an overhead service to a beam unit. This service is coming in from the side at an angle of approximately 90 degrees with the beam unit. Since one of the guy anchors is located almost directly under the service wires, the guy wires could very easily become entangled with the service wires.

Even though the service wires may be what is called weatherproofed conductor, which means the conductor is covered with a type of impregnated cloth and material, it should be kept in mind that this weatherproofing should be handled as though it has no practical insulating effect. Weatherproofing is strictly weatherproofing.

Slide 3 shows a beam unit with overhead service wires coming in directly behind the beam unit. Where overhead service wires are used, it would appear that this type of installation would be the least hazardous, since the service wires are as far as possible from the guy anchors.

Slide 4 shows the wrong way to approach electrical equipment (in this case a motor control box was shown): that is, by reaching out and grabbing the equipment. If the control box or other equipment is energized, the muscles in the arm and hand of the person touching this "hot" equipment would contract, freezing the grip and the person would be unable to let go.

Slide 5 shows the proper method of approaching electrical equipment. (A control box was used here, also.) The person should brush by the equipment with the back of the hands. In this way, if the equipment is "hot" the hairs on the hand will stand up. This is easily detected. It would be an excellent safety practice if this method were used when approaching any electrical equipment.

The purpose of Slide 6 is to show that the control boxes should be mounted high enough so that a person will not bump into the raised lids. This factor is of considerable importance as it would not be difficult for a person to injure an eye or to cut a gash on his face.

Slide 7 shows the panel on a control box with only the main switch and necessary reset buttons showing. Behind the panels are located the fuses and all the electrical connections. The purpose of the slide was to illustrate that the main switch must be turned off before the control panel could be lifted, thereby exposing all the electrical connections.

Slide 8 shows one of the older types of control boxes where the main switch is behind the panel; and in order to open the main switch, the person is exposed to all of the electrical connections in the box. It would appear that the type of control box used in Slide 7 would be the safest, as the main switch must be opened before the connections can be touched.

Some companies allow only authorized personnel, such as company electricians, to open the panel of a control box. If conditions such as this are not practical, the persons involved should at least be familiar with the hazards of the situation.

Where capacitors are connected to a control box, the connections should not be touched until waiting at least five minutes after the main switch has been opened. The reason being that capacitors will retain a charge after the power is cut off, and quite possibly could cause a serious injury.

Under all circumstances the motor switch should be turned off when any personnel are working on or near the beam unit. Where a time clock is used in conjunction with an electric motor, the beam unit may start pumping without any notice and if a person is in the wrong place, he could very easily be killed or seriously injured.

All of the electrical equipment—transformers, lightning arresters, motors, and control boxes—should be grounded. An excellent method of grounding a control box is to attach one end of a wire to the control box and the other end to well head or to a flow line attached to the well head. The following is an example of what can happen when equipment is ungrounded: One phase of a 3-phase, 480 volt oil field system was grounded through broken down insulation in a motor. This system was such that a ground on one phase in no way affected its operation.

Another phase on this same system had energized an ungrounded control box through a damaged lighning arrester inside the box. After a storm, during which the ground had become very wet, the pumper on this lease attempted to put all of the wells back in operation. He was wearing only one rubber glove. When he stopped at this ungrounded "hot" control box, he opened the lid and started the motor with his gloved hand, then he attempted to close the lid with his ungloved hand. When he touched the control box,, he completed a phase-to-phase short circuit. The electric current went through his body, through the ground over to the motor through which the other phase of the system was grounded. He was, of course, electrocuted. This accident could have been avoided if the control box had been properly grounded. If such had been the case, a fuse or fuses would have blown on the transformer bank thereby informing the pumper that something was definitely wrong with the electrical system on the lease. Also, chances are that if the man had worn two rubber gloves instead of just one, he would not have been electrocuted.

As stated previously, the use of protective rubber gloves is a must in the electric utility business. We recommend that these protective rubber gloves be issued to all personnel working on electrified leases and that these personnel be required to wear them at all times when working on an energized control box. They should also be worn during stormy weather and particularly when the ground is wet. The gloves used by our company are rated to withstand 10,000 to 15,000 volts. These gloves are tested monthly to make sure they are safe to use. Rubber gloves should never be worn without a leather protective glove over them. These leather gloves protect the rubber ones from abrasions and in some instances puncture. There are several electrical supply houses that handle rubber gloves and there are also several testing laboratories in the United States. We heartily recommend that the wearing of rubber gloves became a part of the safety practices used on each and every electrified lease.

Turning to what should be done in the case of an electrical shock accident, a discussion of artificial respiration is needed. The first step following an electrical shock accident is to remove the subject from the energized device or remove the device from the subject. If possible remove the energized device from the subject with a long dry stick or board, dry rope or other non-conductive material. The rescuer should stay clear of all energized metal or conductors and the victim and be careful never to touch a truck which is in contact with an energized wire.

Once the victim is clear of the eneregized device start respiration immediately. Every moment of delay decreases the victim's chances for recovery. The five phases of artificial respiration are listed below.

1. Position of the subject—Place the subject in the face down, prone position. Bend his elbows and place the hands one upon the other. Turn his face to one side, placing the cheek upon his hands.

2. Position of the operator—Kneel on either the right or left knee at the head of the subject facing him. Place the knee at the side of the subject's head close to the forearm. Place the opposite foot near the elbow. If it is more comfortable, kneel on both knees, one on either side of the subject's head. Place your hands upon the flat of the subject's back in such a way that the heels lie just below a line running between the armpits. With the tips of the thumbs just touching, spread the fingers downward and outward.

3. Compression phase—Rock forward until the arms are approximately vertical and allow the weight of the upper part of your body to exert slow, even pressure downward upon the hands. This forces air out of the lungs. Your elbows should be kept straight and the pressure exerted almost directly downward on the back. A maximum of approximately 55 pounds of pressure is recommended for the average male victim with considerable less pressure being applied to children and female victims.

4. Position for expansion phase—Release the pressure, avoiding a final thrust, and commence to rock slowly backward. Place your hands upon the subject's arms just above his elbows.

5. Expansion phase—Draw arms upward and toward you. Apply just enough lift to feel resistance and tension at the subject's shoulders. Do not bend your elbows, and as you rock backward the subject's arms will be drawn toward you. Then lower the arms to the ground. This completes the full cycle. The arm lift expands the chest by pulling on the chest muscles, arching the back, and relieving the weight on the chest.

The cycle should be repeated 12 times per minute at a steady, uniform rate. The compression and expansion phases should occupy about equal time; the release periods being of minimum duration.

Additional related directions: It is all important that artificial respiration, when needed, be started quickly. There should be a slight inclination of the body in such a way that fluid drains better from the respiratory passage. The head of the subject should be extended, not flexed forward, and the chin should not sag lest obstruction of the respiratory passage occur. A check should be made to ascertain that the tongue or foreign objects are not obstructing the passages. These aspects can be cared for when placing the subject into position or shortly thereafter, between cycles. A smooth rhythm in performing artificial respiration is desirable, but split-second timing is not essential. Shock should receive adequate attention, and the subject should remain recumbent after resuscitation until seen by a physician or until recovery seems assured.

When we speak of safety we are concerned not only with peoples' lives and physical comforts but money also. Each accident regardless of seriousness costs someone money.

In the interests of all persons concerned, each petroleum company should have a well-defined safety program. Remember—

SAFETY IS NO ACCIDENT!

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