Toolbox Talks

All Kinds of Electrical Safety Part 1

Electrical Hazards

Electrical hazards are doubly hazardous in that there is not only the chance of electrocution, but also, there is the probability that any electric shock will cause a loss of consciousness that may well result in a fall of some sort. Today we will discuss methods of receiving an electric shock & ways to avoid electrical hazards.

Methods of Receiving an Electric Shock:

•From a defective power tool. •From defective extension cords. •From overloading a switch or over-riding a by-pass. •By not grounding electrical equipment. •By coming in close contact with live electric lines. •By coming too close to high power lines with the power arching over & making contact.

Ways to Avoid Electric Hazards:

•Always inspect tools & equipment for frayed cords & defective plugs before using them. •Never use a power tool that has had the ground plug removed; always inspect the plug. •Never stand in water & operate a power tool without proper (i.e., insulated) footwear. •Keep extension cords out of water when in use. •Consider all power lines "live" & avoid contact with them. •Follow the company assured grounding/electrical protection program. •Disconnect all electrical tools & cords when not in use. •Be sure all temporary lighting is equipped with bulb covers. •Make sure all power supplies, circuit boxes, & breaker boxes are properly marked to indicate their purpose. •Use Ground Fault Interrupters (GFI's) on all jobsites.

True Story: Makeshift Repairs Lead to Workers Death

An employee in a manufacturing plant was found dead of a heart attack believed to have been caused by electric shock.

About two weeks before the fatality, an electric motor on a vibrator table had been removed for cleaning. An electrical connection had been severed & then repaired in a makeshift manner at that time. This seemingly minor repair was left unreported.

After the repair, the vibrator machine was not properly grounded; an electrified vibrator table top was the result.

Three fellow workers had received minor electrical shocks from the same table prior to the shock which is believed to have killed the victim.

Unauthorized & unqualified personnel who make repairs to equipment not only endanger fellow workers, but they also endanger themselves. In this case, it appears that the victim himself had made the faulty repairs, which presumably led to his death. Failure to report the damage to the equipment & the electrical shocks received by the other workers also contributed to this fatality. Unauthorized repairs should never be carried out, & all potential hazards should be reported immediately.

Electrical Shock

An electric shock is the tingling sensation or muscular contraction that a person experiences when an electrical current passes through the body. An electric shock can severely burn or kill if the muscle contraction is severe enough to stop the heart. This muscle contraction will, in many cases, cause the victim to remain firmly gripped to the source of electrocution, particularly where power tools or leads are being used.

Effects of Electrical Shock	
Effect	**DC Current (mA)**
Death	120+
Ventricular Fibrillation	50-120
Paralysis of Diaphragm	20-50
Makes hands "clamp-on"	16-20
Involuntary Reflexes	4-9
Perception	1-4

The human body conducts electricity. Even low currents may cause severe health effects. Spasms, burns, muscle paralysis, or death can result depending on the amount of the current flowing through the body, the route it takes, & the duration of exposure. In the event of a worker receiving an electric shock, it is vital that fellow workers act swiftly to attempt to limit the damage caused to the victim. Call emergency services immediately, so they are on the way prior to trying to release the victim.

Releasing a Victim From Live Electric Current

When a person comes into contact with a live electrical circuit of sufficient voltage to cause an electric shock, your first priority is to eliminate the flow of current. This typically is not just turning off the machine, equipment, or tool; you must break the current at the source by switching off the circuit or by removing the plug from the socket in the case of a power tool. On some occasions, this may not be possible to do quickly enough. At this point, your only option is to break the contact between the current & the person. This can be done by either moving the victim or moving the electrical source (wire), so they are no longer in contact. To do this safely without harm to yourself, you must not be another conductor for the electric path to ground. Insulate yourself if you must move a victim away from a live contact - wear electrical or dry gloves or cover your hands with cloth & stand on dry insulating material like cardboard, wood, or clothes. Ensure you have good footing & will not slip or fall when trying to move the victim. Utilize something non-conductive to release the victim, or move the source from the victim.

The following are some common items:

•Professional non-conductive release hook (best option & relatively inexpensive) •Long piece of lumber (2x4, etc) •Broom Handle •Leather belt (cut off buckle) •Dry Rope •Blanket, clothes, or other dry non-conductive materials

Once the victim is released from the live current, check their breathing & heartbeat. If breathing has stopped, but the victim's pulse is present, commence mouth-to-mouth resuscitation. If heartbeat has stopped, commence cardiopulmonary resuscitation (CPR). If both breathing & heartbeat have stopped, alternate between mouth-to-mouth resuscitation & CPR. Use blankets to keep the victim warm, & raise the victim's legs slightly above the level of the head to lessen the effects of shock.

Toolbox Talks

All Kinds of Electrical Safety Part 2

Electrical Safety in the Workplace

Electrical safety in the workplace deserves daily attention. Electrocutions occurring between 1982 & 1994 were studied by the National Institute of Occupational Safety & Health (NIOSH) in 1998. The NIOSH researchers, Kisner & Casini, analyzed 224 electrocutions which resulted in 244 workplace fatalities. These fatalities accounted for approximately 7% of all workplace deaths.

The information they learned provides valuable lessons for everyone that works with or around electricity: •Younger males die most often. Victims ranged in age from 17- 70 years, 99% of them were men, 64% died prior to age 35, & 99% of the incidents involved alternating current (AC). •New hires need to take the most care. 41% of all victims were on the job for under 1 year. •Construction workers had the highest percentage of electrocutions at 40%. Other predominate industries included: transportation/communication/public utilities (16%); manufacturing (12%); & agriculture/forestry/fishing (11%). •Utility line workers (linemen) typically receive extensive training in electrical safety, yet they had the highest number of fatal injuries. 55% of linemen fatalities were caused by failure to use required Personal Protective Equipment (PPE), such as gloves, sleeves, mats, or blankets. Laborers, who generally receive little or no electrical training, had the next highest fatality rate.

NIOSH identified five case scenarios describing the 244 fatalities:

1) Direct worker contact with an energized power line (28%)
2) Direct worker contact with energized equipment (21%)
3) Boomed vehicle contact with an energized power line (18%)
4) Improperly installed or damaged equipment (17%)
5) Conductive equipment contact with an energized power line (16%)

Here is a partial checklist of basic safe electrical practices to help prevent occupational electrocution: •Are employees given & required to use the proper protective equipment & tools when working around electrical hazards? •Is there an effective lockout/tag out procedure for work on electrical circuits & equipment? •Have employees been advised of the location of hazards & proper protective measures to avoid contact with an energized circuit? •Are safe work practices (de-energizing live parts, discharging capacitors, lockout, etc.) used to prevent electrical shock & other injuries? •Are portable electrical tools & equipment grounded or double insulated? •Do electrical boxes & fittings have approved covers? •Are defective, damaged, or frayed electrical cords replaced promptly? •Are ground fault circuit interrupters &/or an assured equipment grounding program used on construction sites? •Are electrical installations in hazardous locations approved for those locations? •Is your electrical system regularly checked by someone trained in the National Electric Code?

All information found at www.safetytoolboxtalks.com, www.toolboxtopics.com, & www.integritysafety.com

Anatomy of an Electrical Accident

I know you guys are not linemen & do not work on utility poles, however, the following situation can serve as a reminder of the dangers that come with electricity, & the recommended safety practices can be applied to any work situation involving a group.

A crew of four linemen was installing intermediate poles on an existing single phase 14.4 KV distribution line. Three of the workers were journeymen with 30 or more years of experience; the fourth was an apprentice with almost 3 years experience. The following summary describes a tragic accident:

One of the journeymen & the apprentice were belted off below the neutral bracket on a newly installed pole, using hot sticks to tie off the energized conductor. Another journeyman on the ground was using a hold-down to keep the conductor in place while the wraplock tie was installed.

After asking the apprentice to move to the other side of the pole, the journeyman on the pole began to make the first wrap on the conductor. But he began this before the apprentice was fully in place & had secured the wrap with a hot stick. The unsecured conductor rolled out of the insulator, fell, & contacted the journeyman's left wrist. Trying to catch his balance, his right arm contacted either the neutral bracket or the pole.

As a result of the current flowing through his body, the journeyman lost his left arm & suffered severe burns over his back & right arm. He will never work as an electrician again.

Findings of the IBEW (International Brotherhood of Electrical Workers) Investigating Committee:

1. The primary emphasis was on production, not on safety.
2. There had been **no communication** with the utility or employer.
3. The neutral conductor was in the primary zone instead of being tagged down & out.
4. No clearance from the Utility to work on energized primary, the day of the accident.
5. Workers did not place the oil circuit reclosure into the non-reclose position.
6. The wire was not held in place with hot sticks while making hot tie.
7. The foreman did not wait for the apprentice to get back on wire after changing his position on the pole.

Safety Committee Recommendations:

1. **Obtain clearance** from Utility **prior to commencement of** hot **work.**
2. Place circuit reclosures on "non-reclose" prior to commencing work.
3. Leave grounds & neutrals out of the work area. If not possible, cover them.
4. Maintain positive control of energized conductors at all times, with appropriate tools.
5. **Plan ahead & discuss all moves with your partner before commencing work.**