

SAFETY BULLETIN

ELECTRICITY-THE RULES

*HOW TO STAY SAFE WHEN WORKING
AROUND POWER LINES*

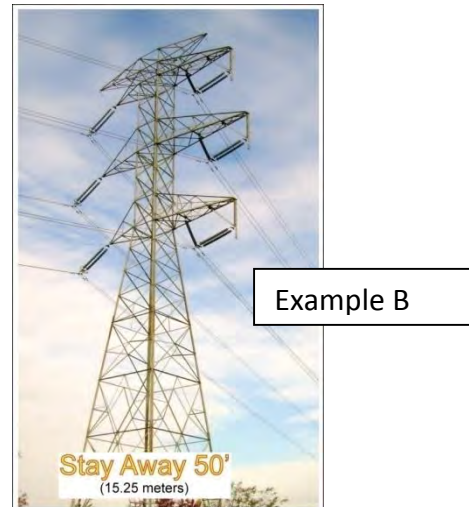
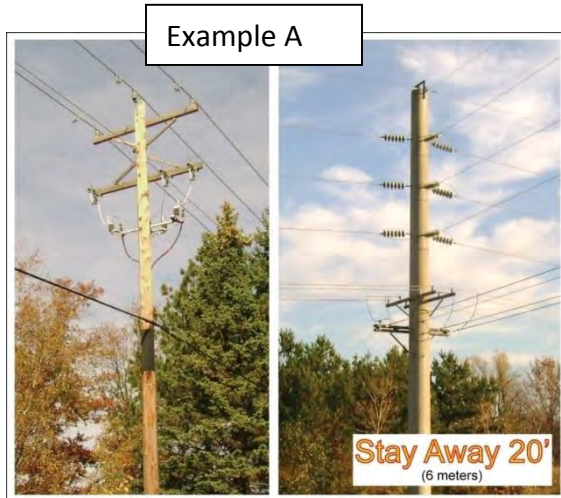


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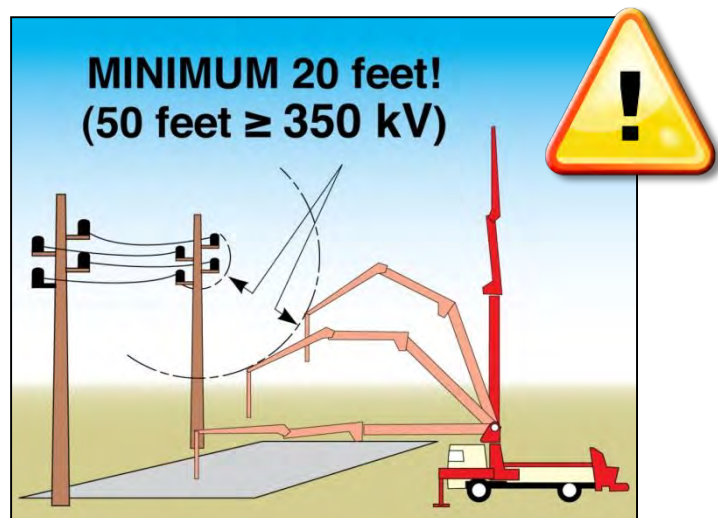
Electricity – The Rules

1. You **MUST** maintain 20 feet clearance from any power line carrying up to 350,000 volts, and maintain 50 feet of clearance for any power line carrying more than 350,000 volts. When working around wooden or concrete power line poles like the ones shown in Example A, maintain 20 feet of clearance. If the wires are mounted to a steel pole, such as the ones in Example B, maintain 50 feet of clearance. This distance accounts for high humidity, wind, lapses, poor vision and equipment malfunctions. If electricity enters your boom from contact OR arcing, you were too close and you were breaking the law.



2. When power lines are in the boom movement area of a pour, you must use a spotter whose only job is to warn you if the boom approaches the danger zone —which is either 20 feet or 50 feet of distance as described above. You need to make sure the spotter fully understands the responsibility and is able to judge distance. You might help him judge distance with some visual aids such as flags or cones placed beneath the wires. Position the spotter below the beginning of the danger zone so the closing gap can be easily seen.

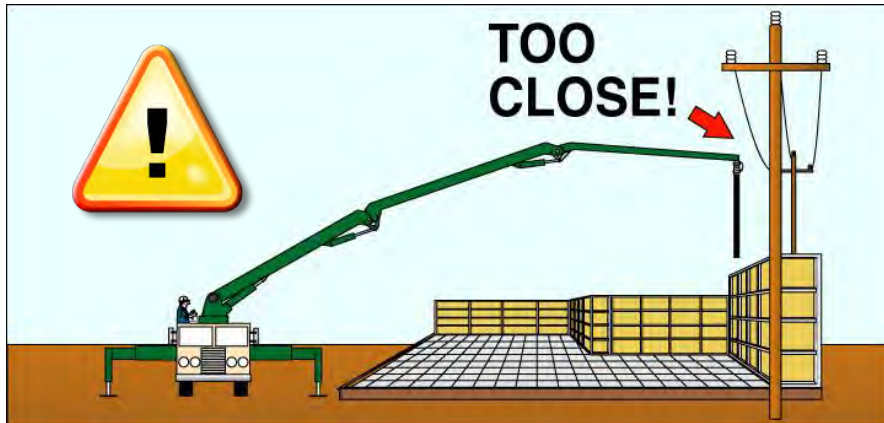
The spotter must understand the responsibilities assigned and be able to judge distance.



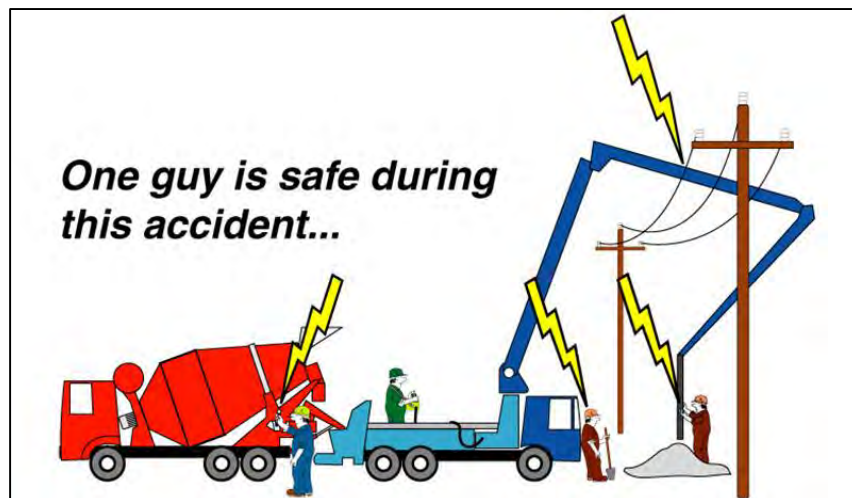
3. Do not allow yourself to be coerced into pumping without a spotter when power lines are within the danger zone. It is the policy of the ACPA that if power lines are within 20 feet (50 feet above 350kV) of the area to be poured, a spotter MUST be employed whose only job is to observe the movements of the boom and warn the operator if the boom approaches the danger zone. The spotter must understand his responsibilities and be able to judge 20 or 50 feet. If no spotter is available, the operator should not use the boom and contact his or her office for further instructions. This position paper can be downloaded from the ACPA website www.concretepumpers.com.
4. You must know how to disable your boom in the event of an emergency; for an example, use an E-stop. If that doesn't work, another method is to disengage the PTO; however, if the boom is moving towards the power lines you must get everyone away from the pump, ready mixed truck and tip hose; and do not attempt to get into the cab or approach the pump.
5. Never boom over wires even if it's possible to maintain the 20 feet of safety clearance. If your boom fails while you are over the power lines, or if a holding valve starts leaking, or if you'd have a tipping incident, there's no control and the boom will fall into the energized line.



6. If you are close enough to high-voltage wires that an OSHA inspector takes notice, you are too close. If you break these rules, he can read you your rights and haul you to jail.

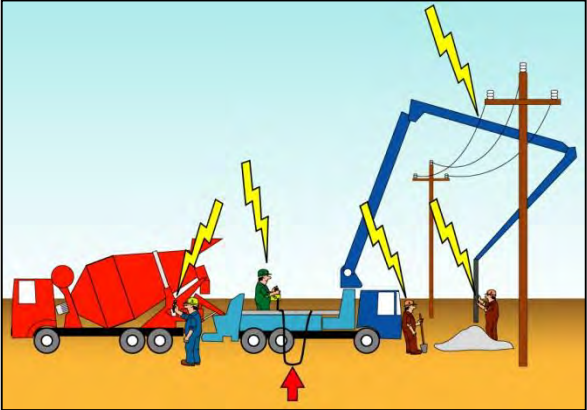


7. If your unit becomes energized, anything that is touching the unit will also be energized. Many times, the operator is on a radio remote with no connection to the unit, so it is usually not the operator who is injured or killed; it is the co-workers around the pump. Electricity will arc off the wire—but not very far—only zero point four inches per 1,000 volts. After the arc has formed, however; it may be drawn out on the superheated, ionized air for quite a distance. If you injure or kill someone, you simply got too close and had been breaking the law.



8. In the example below, a remote cable is touching the ground completing the path to the operator. Everyone involved in this accident is either injured or killed. The insulation of the remote cable is good for up to 600 volts, but the cable is energized to 8,000 volts. At that voltage, the insulation is ineffective, so the cable acts as a path to ground.

Everyone involved in this accident is either injured or dead!



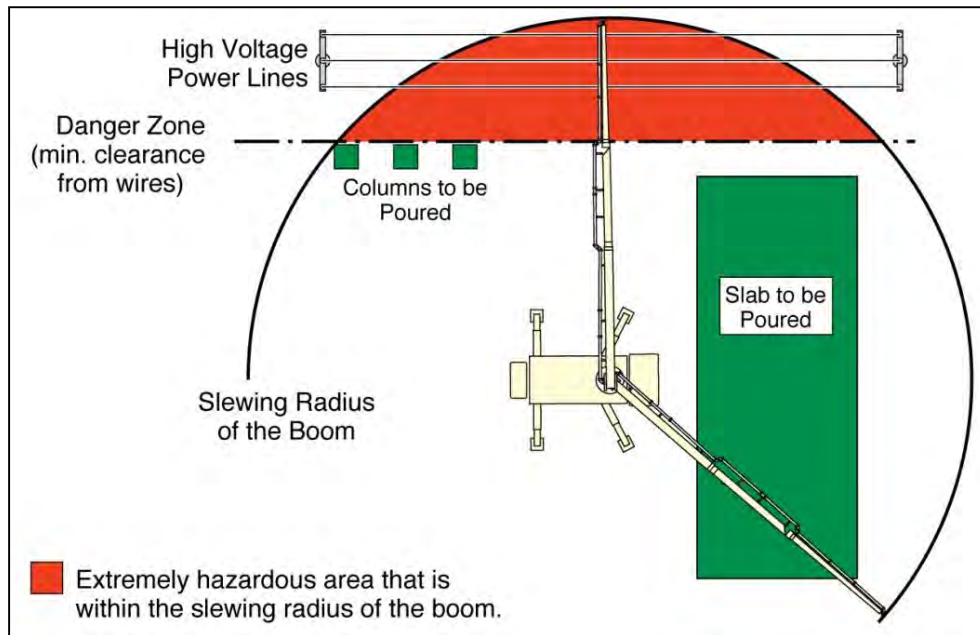
As an example, the hose man leads the boom into power lines and then falls to the ground unconscious. His co-worker runs to his assistance but doesn't notice the boom is still in the wires; energizing the hose, so he makes contact with the electricity as well. Until the pump and all system are de-energized, anyone who touches it or gets too close will be injured or killed – there's no limit. You should also be aware power lines may sometimes de-energize and then reset through the action of a self-resetting fuse!



Setting Up When Power Lines Are Present

Whenever possible, choose a location where power lines will not be a concern. Finding that impossible, here are the safety rules for setting up your unit when electrical wires are present.

1. Avoid locations where wires are within the radius of the boom, but not directly over the pour. This situation leads to deaths every year because when the wires are away from the pour, the operator and everyone else on the job will tend to forget, and then the operator inadvertently moves the boom into them. This diagram is an example of a situation where a spotter would be required whose only responsibility is to watch the movement of the boom, and warn the operator if the boom enters the danger zone.



If the boom can reach the wires, there is danger!

2. Stay alert and remember where the power lines are – NEVER let down your guard.
3. Be especially careful in the dark.
4. Do not rely upon depth perception when working around the power lines. In both of the photos on the next page, are you able to determine the actual distance from the boom to the wires? In multiple studies, the limit of human depth perception regarding wires has been established at about 25 feet. All booms are longer than 25 feet. Brighter objects are perceived by the human eye as closer than darker objects, which can distort your ability to judge distance. Using visual references such as cones or flags can help remind you where the danger zone begins.



Will the boom hit the wires? Use visual references (cones, flags, etc.) to help you know where the danger zone begins.

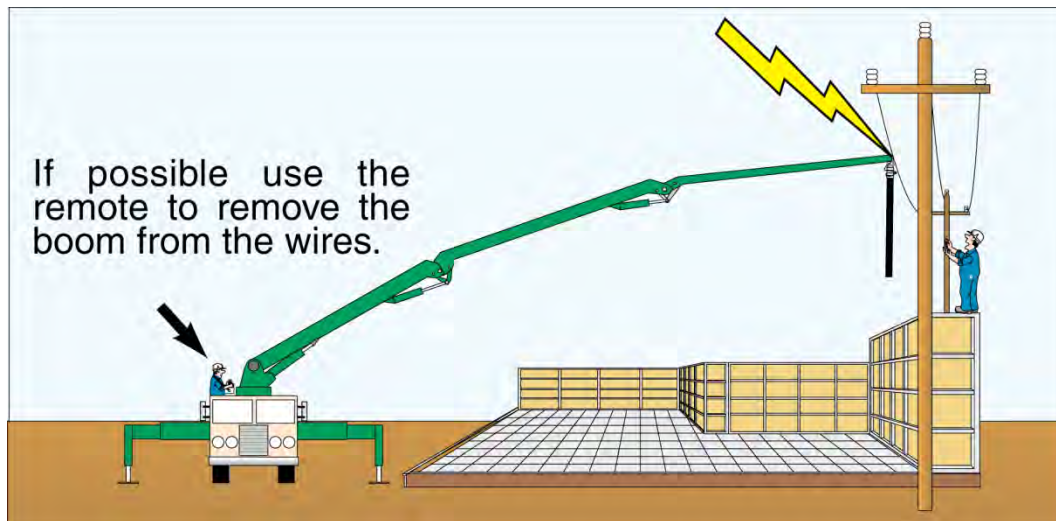
This pumping company used cones and red paint to clearly mark the “danger zone” when electrical wires were within reach of the boom.



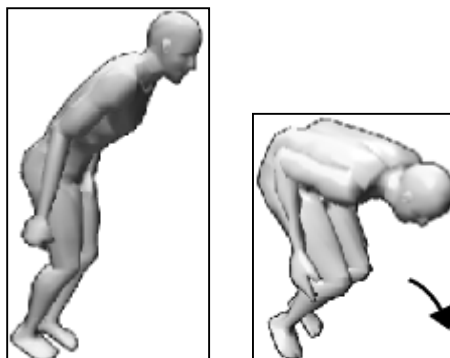
What to Do If You Make Contact

In the unfortunate event you make contact with the wires, remain calm. If you've hit the wires and are alive to think about it, you've already shown you're lucky! Now it becomes critical to think about how to get out of the situation without injury.

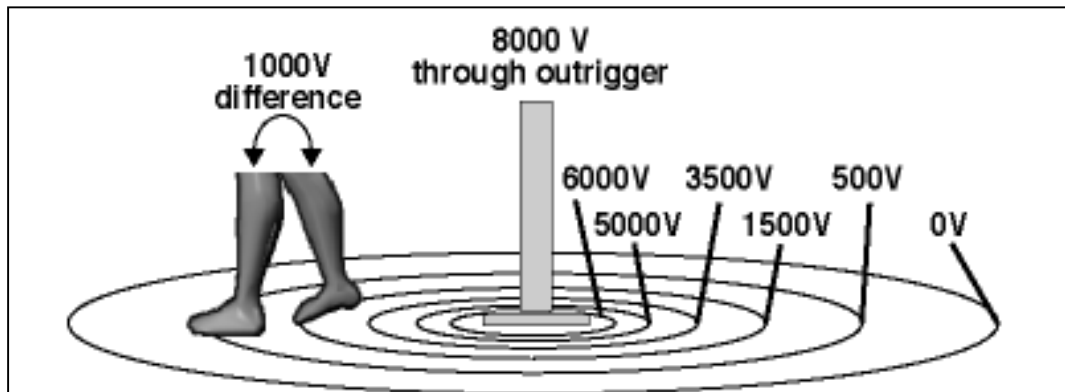
1. If possible, use the remote to move the boom out of the wires, but NEVER get off the machine to get a wired remote, which would be electrically connected to the pump and NEVER get on an energized machine to get anything – including the remote.
2. If you are not on the truck or pump unit, DO NOT touch anything connected to the truck or pump. It is possible that the electrical and hydraulic systems will no longer function, meaning the boom cannot be moved from the wires. In that case, call for help if you have a cell phone, or yell for assistance from others nearby. Do NOT let them touch the pump or anything connected to the pump. If you are on the pump and it's not on fire, you are in no immediate danger.



3. If you *are* on the pump and it starts to burn, you will have to get off. Jump clear with your hands at your sides and your feet together.
4. Once you are on the ground, get away from the unit by hopping (with your feet together) or shuffling your feet.

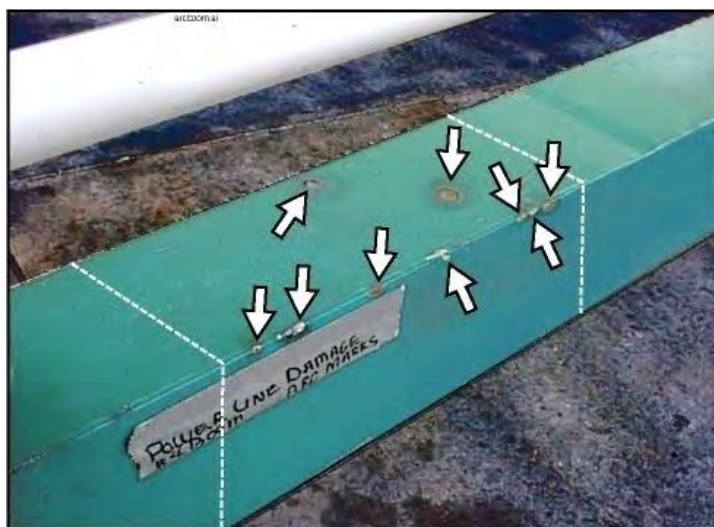


The reason for this is the high voltage is entering the ground through the outrigger legs; if you take a large step away from the outrigger, you can change the voltage between your feet. This is called residual voltage. If you separate your feet far enough, it will give you enough of a jolt to knock you down.

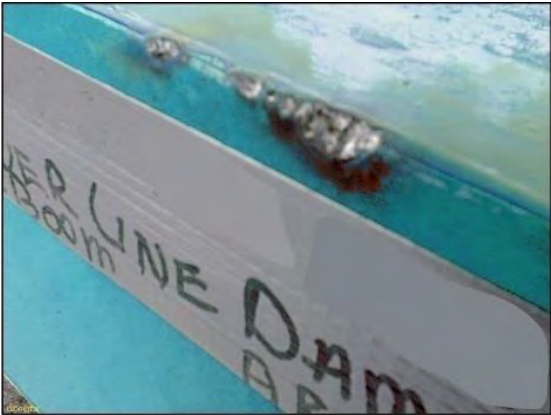


Effects *After* a Power line Strike

Even if you live to tell about the incident, you haven't "gotten away with it." There will be arc damage to the machine from the power line strike. The example below is where the arc was bouncing on the boom after it made initial contact. Each time the arc touched the boom, it crystallized the steel, causing it to become hard and brittle in each heat-affected zone. This causes the boom to eventually crack; and left unrepaired, could cause the boom to fail catastrophically. If a certified boom inspector determined that a brand new boom arm is not required, the boom can be "sectioned", meaning the boom is cut off at the dotted lines. A new section is supplied by the manufacturer and welded in place per manufacturer's instructions. It is then inspected and repainted.



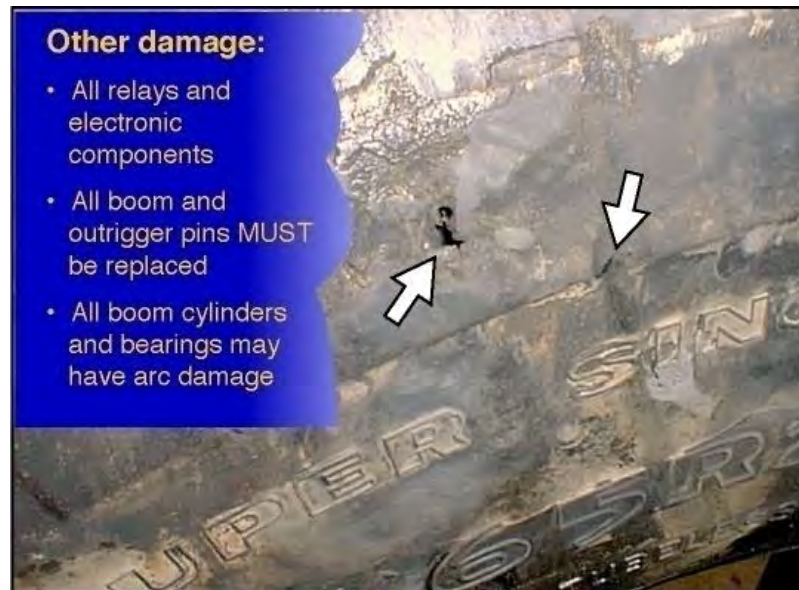
Below is a closer look at one of the spots of contact. You can see the damage is right into the corner weld where all stresses are concentrated, and there are places where it has actually burned right through. It is strongly recommended that a unit, which has been subjected to a power line strike, be professionally inspected by a certified boom inspector trained in what to look for after this type of accident. This boom arm must be repaired or replaced before it can be used again and could fail just lifting its own weight.



This next photo below proves wood conducts electricity. The outrigger pad was positioned on wooden cribbing when it struck the power line. You can see the hole left behind from the high voltage that traveled through the pad into the ground.



The truck tires will also be damaged after a power line contact. The tire shown below has obvious damage and is very easy to detect, but sometimes it may damage the steel belt on the inside and not be as noticeable on the outside of the tire. As a precaution, it is recommended you replace the front tires and any other obviously damaged tires before leaving the job site after a power line strike. All tires should be carefully inspected upon return to the shop. You should also check all relay switches and electronic components for damage, replace your boom and outrigger pins, and check the boom cylinders and bearings for possible arc damage.



The information contained within this safety bulletin is an excerpt from the ACPA Operator Safety Presentation 4.1. For more comprehensive information on power line and other pump safety, please visit our website at www.concretepumpers.com.

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AMERICAN CONCRETE PUMPING ASSOCIATION
606 ENTERPRISE DRIVE | LEWIS CENTER, OH 43035
P: 614.431.5618
WWW.CONCRETEPUMPERS.COM