ELECTRICITY AND THE COMMERCIAL ARBORIST[1]

by Robert R. Herder

The kind of tree work we do is called line clearance. It is different from all other kinds of tree work. Energized electric wires are almost always close by, so we use special kinds of work procedures to protect ourselves from them, as well as from other hazards of the job. These work procedures have been developed by practical, experienced line clearance operating people in our own company, which was started almost 50 years ago. Any man who has worked on a job knows that each day new problems come up that you don't read about in the books. So, when the workmen themselves have helped to write the rules, we know the rules will be a real help in getting the job done safely!

You **must** make a point of knowing how men have been killed in line clearance, the basic cause of these accidents, and how they can be prevented. You can find out about this by reading what comes next. As you read, remember this covers the great majority of the fatal accident types, and is only a part of our total safety training program.

There are three measurements of electricity important to you. There are the *ampere,* the *volt,* and the *ohm.*

Ampere: This is the name given to the unit measure of the flow of electricity. Think of your garden hose. When you turn it on, so many gallons of water go through it in any given time. The ampere measures the flow of electricity the same way. The important thing to know here is that if you get an electric shock, how much it hurts you will depend on how much electricity flowed through your body and where. For example, a flow of electricity through your arm will probably affect only your arm and might even do very little damage. But, the same flow of electricity through your chest could kill you because that's where your heart is. As little as 1/10 of an ampere can cause ventricular fibrillation — that's a condition of the heart muscle that can kill.

Do you wonder how much 1/10 ampere is? Think of an ordinary 60-watt light bulb — it needs only 1/2 ampere. A small circulating air fan needs about one ampere and a clothes iron takes about 5. Any electric circuit you will work around in line clearance will carry 60 amperes or more. That's more than enough to kill. That's one reason why you must never touch any wire you work near!

Volt: This is the name given to the unit measure of electric pressure. You understand how water pressure causes water to flow through a hose. Electric pressure, or voltage, causes electricity to flow through a conductor in the same way. In line clearance work you will hear electric circuits called *secondaries* and *primaries.* Secondaries are low voltages, usually 110V-220V or 115V-230V. Primaries carry higher voltages, generally 2,400 volts or more. When people talk about primary circuits they usually say *so many KV* — for example, 13.2KV. *K* stands for kilo, or one thousand. *V* stands for volts. So, 13.2KV means 13,200 volts. 69KV means 69,000 volts, or 2.4KV means 2,400 volts.

To give you an idea about how much pressure one volt is, think about the electric lights and small appliances in your house. They all require about 110 volts. The electric stove needs 200 volts. The important thing for you to remember about the volt is that as little as 110 volts, or even less, can kill you. All line clearance work around electric circuits involves at least 110 volts.

Ohm: This is the name given to the unit measure of resistance of a wire, etc., to the flow of electricity. Electricity flows very easily through some things. Copper is a good example of this. A copper wire 1/10 inch thick has a resistance of only 1 ohm per 1000 feet and is one of the best conductors. Electricity does not flow very easily through some materials and not at all through others. These materials are said to have a high resistance. Porcelain, for example, is so resistant that it will not conduct electricity at all and is used to make insulators.

The important thing for you to know about

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resistance is that when it is low enough, any contact you make with an energized wire can kill you. Think about why this is so. Remember, we said that there are more than enough amperes available (flow of electricity) in every line you work on to cause death. Whether they will or not, whether you would be killed or not if you made contact, depends entirely on how much resistance (ohms) there is in the contact and it's the resistance in a contact that you can never know. You can find out how many amperes and volts are in an electric circuit just by asking, but there is no way for you to know how much resistance there will be in a contact. It's easy to see from this that you would be actually risking your life if you made any contact with a wire that carries electricity, or could carry it. You might be killed or you might not.

Completing the circuit: You may now be wondering if all this is true, why isn't a bird killed when it stands on an electric conductor? The reason is, electricity is not flowing through him. In order for electricity to do work (or, be harmful) it has to flow through. In order to have electrical flow, there must be a positive and a negative, or a source of electricity and a path to ground. Electricity will always follow from the source of electric power (called positive) to ground (called negative). This is called completing the circuit. If a bird pecked a tree branch while he was standing on a conductor he would be killed. If you touch any source of electricity and, at the same time, touch any path to ground, you would complete the circuit and risk electrocution.

There are two kinds of electric contact: 1) direct contact and indirect contact. Direct contact is where you actually touch, with some part of your body, a conductor or other energized wire. Example: bumping into a primary conductor. Indirect contact is where you touch, with some part of your body, a conductive object which is, itself, touching a conductor or some other energized thing. Example: having a branch you are holding touch a conductor.

Electrical hazards on the ground: A truck can become energized if 1) an energized wire should fall on it or 2) an uninsulated aerial device, or crane, is run against a wire. Never touch an energized truck while standing on the ground. You would complete the circuit. If a tree falls into the wires it will become energized. Never touch it. You would complete the circuit. Never touch a wet rope which is against a wire. You would complete the circuit. Never touch a fallen wire. You could complete the circuit. If a wire falls on a fence, a guard rail or any other conductive thing, that thing will be energized. Never touch it! You would complete the circuit.

Electrical hazards for the climber in a tree: A tree is conductive and provides a good path to the ground. If you're in a tree and touch a wire you will complete the circuit from the wire through yourself, through the tree to the ground. A tree is just as good a conductor in the winter as it is in the summer. You may hear some people say "the sap is running in the summer so the tree is more conductive then. But the sap isn't running in the winter so then the tree is not so conductive." This is wrong! There is just as much moisture (sap) in the tree in winter as there is in summer. So, there is just as much danger in the winter as there is in summer.

Electrical hazards for the bucket operator working from a trimlift: The Asplundh trimlift is built as a fully insulated machine. When it is built it is tested and certified for insulation of 68KV between the basket and ground through the booms and truck. But, it provides no insulation for other paths to ground, such as through a ground wire or tree branch, etc. The insulation of the trimlift should never be depended on or used as an excuse to touch a wire.

Hazards of fallen wires: You never know when you will come across a wire that is down. They can fall because of storm, a traffic accident, a broken pole, or even an accident involving your own crew operation. Remember, any fallen wire may be energized so never touch one. If a wire falls on a fence, guard rail, truck, etc., that thing will also be energized, so never touch it.

Asplundh Company Policy: It is our strict policy to avoid contact with all wires, cables, conductors, guy wires, messengers, etc. You should consider this as a condition of employment. Federal law (Occupational Safety and Health Act) as well as various state laws, make it illegal for

you, as a line clearance specialist, to get closer than 2 feet to a primary conductor carrying up to 15KV unless adequate protective measures have been provided by the electric company. It is our strict policy to obey these laws and they are adopted as our own safety rules. It is our policy to have tree climbers and bucket operators alike stay 6 feet from conductors at all times when it is possible for them to do so. It is our policy that a man working aloft around energized circuits shall always be within normal voice communication with another man.

If at any time you feel you do not understand any part of this or any other instructions you receive, tell your foreman. Don't be embarrassed about having to ask a question. Your company is anxious to have you learn all you can about your work so that you can work safely. We'll do everything possible to help you help yourself.

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ABSTRACTS

George, Wayne. 1979. **Protect Our Elm Trees Society.** American Forests 85(1): 27-29, 51-52.

Scientists have tested an improved form of Benlate called Lignasan BLP. This water-soluble fungicide was developed by the DuPont Corporation and was approved by the EPA for general use in May 1976. It is administered to elms by injection through the three's trunk. Following DuPont's lead, Merck and Company recently introduced another EPA-sanctioned fungicide patented under the name Arbotect 20. The availability of these fungicides has given hope to towns like Riverside, Illinois, one of many communities that have thrown down the gauntlet in the perhaps quixotic struggle against Dutch elm disease. Riverside, for certain unique aesthetic and historical reasons, has a very special interest in preserving its remaining elms. Riverside's elms, many as old as the town, represent a significant part of its charm and beauty; they are an intrinsic and historical element of it. In the fall of 1976 the residents of Riverside became acutely aware of the accelerated loss of elms, and a citizen's committee calling itself POETS (Protect Our Elm Trees Society) was formed. The people of Riverside, satisfied that their efforts during the 1977 season were of value, continued Lignasan inoculation treatment in the spring of 1978.

Kemmerer, Harleigh. 1979. **Managing mulches.** Grounds Maintenance 14(1): 62, 64, 66.

Forests and other areas of natural vegetation have layers of leaves, sticks and other organic debris that continuously cover the soil surface. This growth-promoting layer can be duplicated by applying mulch to the soil surface at the base of plants. Mulch helps to keep soil in good physical condition because water absorption is increased, and absorbed water penetrates to the root zone. The layer also reduces erosion by preventing raindrop impact on bare soil. The organic matter adds some nutrients to the soil. Artificial mulches break capillary action and reduce moisture loss by evaporation. Increasing the thickness of the layer of mulch generally increases the amount of weed control. Experiments with mulches on north and south-facing slopes have shown that mulches do reduce temperature. Frost penetration is less and alternate freezing and thawing is reduced. Organic matter mulches have a beneficial effect on the potassium content of the soil and its availability for plant growth. Root injury that frequently occurs with surface cultivation is eliminated. Winter injury is reduced. Texture and color is added to the landscape.