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BEWARE

the Dangers from AM Radio and 5G Transmission Sites

BY RICK HOWLAND

As if tree care isn't dangerous enough, there's an increasing safety threat that hasn't yet gotten much attention – radio waves. Radio waves are everywhere, and have been since the dawn of the universe. Man-made ones have been around for more than a century, starting with the wireless telegraph. But with ever-more sophisticated uses of the radio spectrum and increased use of aerial equipment – aerial lifts and cranes – in proximity to the source of radio waves, serious injury becomes a concern.

The latest threat is the proliferation of the so-called 5G, or Fifth Generation, cellular-phone networking that promises faster data speeds and greater reliability using multiple technologies, including mini-cell sites at the neighborhood level on utility poles. But working too closely or too long near one of these mini installations or near a high-power radio transmitter can be dangerous in several ways, specifically resulting in burns or, in some rare circumstances, electric shock.

The industry has experienced incidents related to radio-frequency (RF) radiation. John Haehnel, director of safety and training for Tree Tech, Inc., a dual-accredited, 38-year TCIA member company headquartered in Foxboro, Massachusetts, can speak to the dangers from experience, and has the scars to prove it.

This past September, Haehnel and his utility line-clearance crew were working just outside of Boston with an all-terrain crane within the proximity – about 100 yards – of several AM radio towers and a 5G cell-transmission installation. "I got zapped," he reports, "maybe from the AM tower or the 5G. We are running into that more and more."

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John Haehnel

Haehnel, who happened to be filling in for the vacationing crane operator that day, states that, as one of his crew was getting ready to go aloft, the worker reported something was wrong and that he felt as if he was being shocked. (This phenomenon is described in numerous Federal Communications Commission [FCC] documents.)

Haehnel had the crane boom out about 110 feet or more. "I had the crane's ball down to tie in the worker, walked over to it, got to within a foot-and-a-half and got zapped by the ball." He says the lightning-like flashover resulted in first- and second-degree burns and a scar to one hand. "The ball was so hot, you could not touch it."

Initially, Haehnel thought the situation might be something electrical with the crane, until the nearby radio towers explained it. "Ironically, I had just done a

A **small-cell-site round, omni-directional antenna atop a pole. Photo courtesy of Lucas Tree.**

The equipment on this pole is part of the small-cell site. There is usually information on the pole about who owns it and contact information, as well as caution signs. Photo courtesy of Tree Tech.

small-scale, 5G safety presentation just two weeks prior," he says, adding, "but from where we were, we could not see the big 5G antenna," which is part of a 5G network, not just the small local sites.

Haehnel reports that they later discovered four or five AM antennas and the big 5G antenna installation nearby. "We had scoped out the site and put the crane ball next to the tree, but we could not see the towers from ground level," he says.

Because of this incident, Haehnel's crew shut down the job and left the site.

When he got "zapped," initially the effect did not seem too bad, Haehnel says. "It was like an electric burn flashed over my left hand like a first-degree burn." The next day, Haehnel says, "the middle finger had developed a second-degree burn and there was a hole in my finger," which accounts for the scar.

Background

The American Cancer Society (ACS) says of radio frequency, "Some people can have significant RF exposure as part of their jobs. This includes people who maintain antenna towers that broadcast communication signals and people who use or maintain radar equipment."

TCIA has found this also includes aerial-lift and crane operators performing tree care, mostly utility-line clearance, but potentially residential crews as well.

The ACS continues, "If RF radiation is absorbed by the body in large enough amounts, it can produce heat. This can lead to burn and body-tissue damage. Although RF radiation is not thought to cause cancer by damaging the DNA in cells the way ionizing radiation does (for example, X-rays), there has been concern that in some circumstances, some forms of non-ionizing radiation might still have other effects on cells that might somehow result in cancer."

The FCC, in multiple published documents, refers to both the dangers from RF exposure mentioned above and the rare but potential danger of electrical shock from radio waves. Though

speculation on some level continues, it is clear and proven that under certain conditions, radio waves can burn you.

The good news is that the FCC and international health organizations such as the World Health Organization (WHO) report there is little to no evidence that the devices we use daily that employ electromagnetic fields (EMF) energy, such as microwave ovens and cell phones, pose a major threat. The bad news is, that is not the case for the higher RF-energy waves at or near broadcast sites.

According to the FCC, "Biological effects can result from exposure to RF energy. Biological effects that result from heating of tissue by RF energy are often referred to as 'thermal' effects. It has been known for many years that exposure to very high levels of RF radiation can be harmful due to the ability of RF energy to heat biological tissue rapidly. This is the principle by which microwave ovens cook food. Exposure to very high RF intensities can result in heating of biological tissue and an increase in body temperature. Tissue damage in humans could occur during exposure to high RF levels because of the body's inability to cope with or dissipate the excessive heat that could be generated. Two areas of the body, the eyes and the testes, are particularly vulnerable to RF heating because of the relative lack of available blood flow to dissipate the excess heat load." (For more on the subject, see https://www.fcc.gov/engineering-technology/electromagnetic-compatibility-division/radio-frequency-safety/faq/rf-safety.

AM radio tower also a danger

Another case was reported by Daniel Mayer, owner of Mayer Tree Service, Inc., a 28-year TCIA member company based in Essex, Mass., that occurred while working on the picturesque and historic campus of Endicott College in nearby Salem, Mass.

"It's the same thing," he begins. "We did not know we were working near the college's campus radio tower. I was feeling energy in the crane ball and we were getting arcing on the machine, so we folded the crane and called an inspector." Mayer says one's first instinct is to suspect electrical problems with the machine, but investigators soon found the situation was precipitated by the campus radio tower during broadcasting. To draw an analogy, Mayer notes, "It's very much like the effect on the rigging of a sailboat arcing during an electrical storm."

The caution sign on the lower-right side of the pole shown here warns of the dangers of small-cell sites. Photo courtesy of Tree Tech.

Mayer recounted the incident to Jay Sturm, president of and a crane-safety specialist with Cranes101, a training company and nine-year TCIA Corporate Member company based in Bellingham, Mass., and subsequently forwarded a copy of a video recording of the incident to Sturm for analysis. That helped determine that the problem was, indeed, radio frequency related and not equipment. Sturm says this is a growing concern among crane operators in all fields.

A new threat

"Interesting timing," says Timothy Walsh, director of corporate safety at The Davey Tree Expert Company, when asked about this topic. "People are just becoming aware of this situation."

Walsh says Davey Tree, an accredited, 48-year TCIA member company headquartered in Kent, Ohio, recently worked with an expert on the subject, who explained the hazards and how to identify these so-called small-cell 5G installations. "Right now, as an industry, we just do not yet understand the risk. So we also do not know of any formal processes that exist" to deal with the situation when it arises, Walsh says.

He adds that Davey Tree is in the process of developing operational protocols, but emphasizes, "This is all so new. It seems everyone got all excited about the new 5G system and forgot about addressing the potential hazards.

"We are formalizing a plan, and we do have safety alerts and tailgate meetings about the subject," Walsh says, cautioning. "There is conflicting information, but we want to understand the hazards and make our people aware of them.

"We have not yet had an incident," Walsh continues, noting the company does tree work for commercial and residential properties, with a separate group working around power and communications lines where, he states, "there is more potential for exposure."

If we do not know exactly what radio-frequency waves can do to a tree care crew working in proximity to such an installation, what can be done to remain safe?

Says Haehnel, "We talk to our teams about what happened and instruct our sales team as to what to look for," he says, referring to towers and small-cell-site installations. He says aerial neighborhood views (including sources such as Google)

John Haehnel's scarring still had not fully healed three months after he was zapped by the energized ball, resulting in first- and second-degree burns. Photo courtesy of Tree Tech.

can be very helpful in identifying towers, and the 5G small sites are easily spotted "on utility poles in front of homes along the street. They look like a metal can attached to a pole," Haehnel notes.

"Actually, when working near an AM-radio broadcast site, we can contact the FCC, which can get the broadcast power turned down while we are working," Haehnel says.

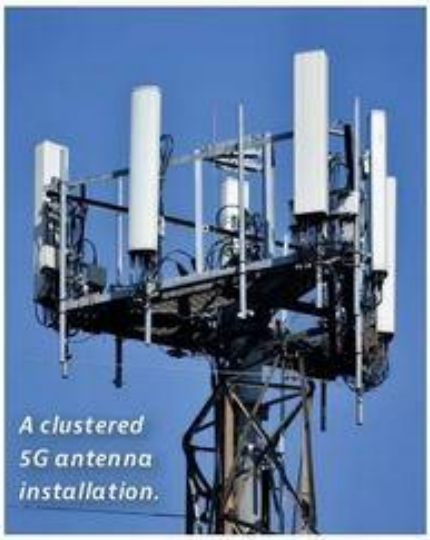
He maintains that all such sites have contact-information tags on them that identify the owner. Usually it requires 24 to 48 hours lead time to shut off the power to that site, he explains, adding that, "There should be no service interruption to 5G users, since the carrier can switch temporarily to another cell site."

Gerry Breton, CTSP, safety and training director for Lucas Tree Expert Company, Inc., a dual-accredited, 41-year TCIA member company headquartered in Falmouth, Maine, says, "The industry is just getting familiar with RF challenges. The issue is popping up in New England, but is not prevalent yet during this stage of the switch to 5G."

He's attended several briefings on the subject, which review FCC and OSHA updates. Breton says there are some things to become aware of – some quite unanticipated – especially when working around these new 5G installations. He notes that in addition to being marked with the name of the owner/service provider, each site (usually a utility pole) will have numerous warning notices about working in and around the antennas, indicating safe positioning and proximity for that antenna type and other safety information.

Breton reports the situation is so important that, "We reviewed with our supervisors what these installations are, what they look like and where they are located at the top of utility-distribution poles. Now when we're out planning our jobs, we pay close attention to how close vegetation is to the antennas.

"If our work plan indicates we will be working near this small-cell site, we know we must reach out to the cell provider," he continues. Breton suggests copying one of his techniques, which is to contact a few providers long before any jobs are planned to understand the processes needed to shut down a cell site if work is needed at that site.



A clustered 5G antenna installation.

Breton acknowledges that RF exposure is more a potential hazard for line workers and line-clearance contractors, but "even tree care crews working in and around small-cell areas will need a hazard-assessment protocol. When you have a tree crew working at the roadside and they may be trimming around a small-cell site, it is important to scope it out," he says. "If you're outside the danger zone, no action is required." If there is potential danger, Breton says, "workers are to notify their supervisor who, in turn, is to notify the carrier to shut down the site.

"It is important to note that there is no cost to shut down a site," he stresses.

In an aside that many may not consider, Breton warns of some unforeseen dangers. One risk is during a storm response when you are providing vegetation clearing. You need to know if those units, whether they are still standing or are on the ground, are disconnected either by the storm or by the utility. "The sites are powered by 120 volts," Breton reports, adding that even if regular power is out in a neighborhood, some sites have their own emergency backup and the cell antenna may still be capable of broadcasting, meaning it can be live with electric power.

So, one thing we know is that not all radio waves are benign, and it takes knowledge to recognize potential risks. Another thing is that there is a lot of information available online; not only are there resources such as seminars on the subject, but also there is a network of tree care safety professionals open to sharing information, and that includes with those who may be the competition.

To view a video demonstrating the radio-frequency-related arcing discussed here, go to tcimag.tcia.org and, under the Resources tab, click videos. Or, under the Current Issue tab, click View Digimag, then go to this page and click here.

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