

Safety Training for Workers in High-RF Environments

RF safety training is important for anyone who climbs a tower, ventures onto a building rooftop or works in close proximity to RF transmission equipment and AM detuning networks at ground level.

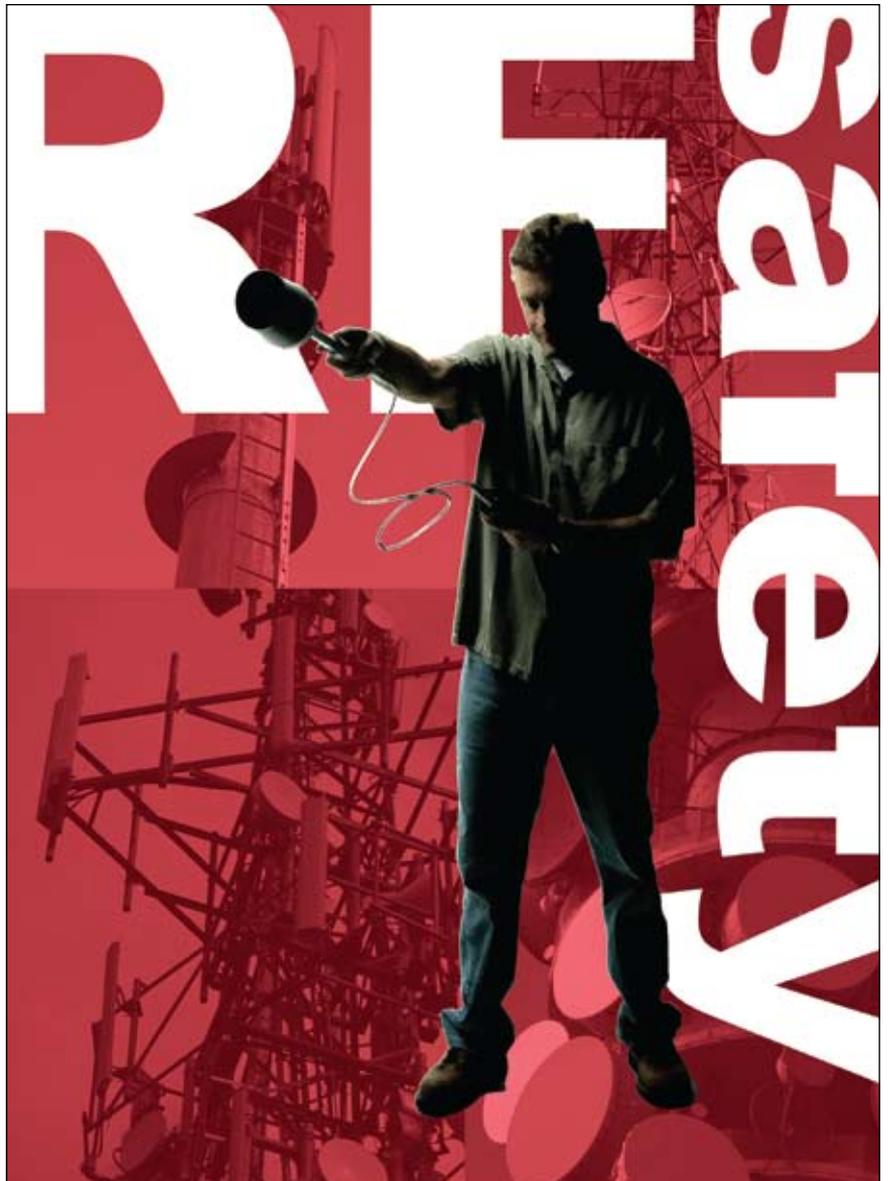
By Richard R. Strickland

What do you and your employees know about RF safety issues that they might face? Could you or your employees answer these questions correctly?

1. True or False: The energy from typical microwave point-to-point antennas is a significant hazard if you are within 6 feet of the aperture of the antenna.
2. True or False: Exposure to significant levels of RF energy over a period of several months can lead to the development of cancer.
3. Which antenna system is potentially more dangerous, assuming the same level of input power: a 6-foot omnidirectional whip antenna operating at 150 MHz or a 12-foot omnidirectional whip antenna used for a 2-GHz system?

Most people would answer True to the first question prior to receiving appropriate RF safety training. However, these antenna systems are never an RF safety concern. Many would also answer True to the second question, although that statement is also false. As for the last question, most people would not have an opinion but if you think about it, the answer could be very useful information. If you or any of your employees got even one answer wrong, RF safety training could provide immeasurable peace of mind for you and your organization.

Whether it comes down to safety



concerns or contractor requirements, RF safety training is important for many organizations and employees. Knowing you've met all your obligations and provided your employees with the information needed to keep themselves out of harm's way can bring a sigh of relief to anyone, from corporate CEO to small independent contractor.

Training content

Opinions vary on what should be included in RF safety training. Many believe that workers do not need to understand RF safety, they only need to follow the rules and procedures. The problem with this approach is that it is virtually impossible to teach enough rules to cover every possible scenario. The other problem with simply memorizing rules is that people tend to remember only a fraction of what they are taught and for a short period. People who *understand* a subject learn and retain the information much longer.

A better approach is to mix theory and practical examples so students can see the benefits and understand how RF safety applies to them in their everyday work. Nonelectronic analogies such as references to light, water and pressure, among others, help people understand the safety principles. The more relevant the training, the more likely it is that students will understand and retain the information. Even though the work environment for personnel involved in the wireless industry is relatively similar, using a short checklist to obtain details about how a company operates and doing some tailoring to optimize the training is helpful. It is "semi-custom" training.

For example, the checklist reveals whether a company is using RF personal monitors, the company's policies concerning monitor use and the models, whether the company uses RF protective garments, and whether employees ever work near AM radio towers. The AM tower question may seem strange, but there is a growing trend in some areas of installing wireless communications antennas on

Which antennas pose the greatest RF hazard to worker safety?

See answer on the next page



AM radio towers, which introduces contact and induced-current concerns that are generally not seen in connection with conventional wireless tower installations.

Delivery methods

Ten to 15 years ago, the vast majority of RF safety training was done in

traditional classroom fashion, with the instructor and the students face-to-face in the same room. Narda Safety Test Solutions started offering public, one-day classes nationwide around 1992. Until then, the only way to obtain RF safety training was to hire someone to conduct a private course.

Today, courses are often offered as



The 7,000-watt UHF television antenna is by far the most significant potential RF safety hazard. The safe distance depends on power, frequency and antenna height.

The two omnidirectional whip antennas just above the ice shield can have very significant RF fields at the same elevation.

The point-to-point microwave antennas below the ice shield are never a concern.

part of trade shows. Real RF safety training courses — not just 50-minute presentations — have been conducted in conjunction with the American Industrial Hygiene Association, the National Association of Broadcasters, National Public Radio, the International Wireless Conference and Exposition, and the National Association of Tower Erectors. Courses are still often taught on-site for clients, and at least one company offers public courses at various locations around the country.

More than 10 years ago, Richard P. Biby, P.E., *AGL's* publisher, was starting SiteSafe. One of the areas that was new at the time was computer-based training (CBT). We pioneered something new together that was innovative at the time, the first such program offered in the field of RF safety. The business principles were sound — CBT allows students to learn on their own schedules, and CBT was especially viable for the wireless industry because of its growth rate and high employee turnover.

Although few training experts would deny that live training is the most effective method, Peoplesafe training was a breakthrough in the area of RF safety training. The downside to CBT is the long, expensive development that makes it impractical to modify to fit different training requirements.

Peoplesafe training has been updated several times since Biby and I were involved, and its success has led to several other companies offering computer-based RF safety training. Some of these products are relatively crude and have obviously not had the same level of investment in expertise and course development. The cost per student is often comparable to on-site training with limited discounts for larger groups of students. The other downside is that not everyone learns in the same way. Some students do well with CBT and others do not, even if it is a good program.

Live Internet training

The cost of on-site training has led to other training options such as live

training via the Internet. This method has several advantages. It comes close to duplicating live, on-site training. For example, students can interact with the instructor and each other. No one has to travel far, because students can be taught at multiple locations simultaneously and the instructor need not travel to a customer's site.

Class size makes little difference to the cost, so companies are encouraged to have anyone participate who could potentially benefit from the training. Those who typically take classes at trade shows or travel to take public classes are often in management. Meanwhile, the employees with the greatest safety risk often receive limited training from their bosses, who are working from what they learned in a class.

The classes that I teach for the Society of Broadcast Engineers are all taught live via the Internet and fully benefit from these advantages — for example, the most recent session in August 2009 had more than 60 students in 18 cities. I taught the class from my office in New York. One tower-company customer of the safety class typically has 25 to 35 students for each session, each signed in individually using their laptops and cell phones to take the course. The interaction between students and instructor as well as among students makes it a dynamic learning environment.

Frequency

How often should employees receive RF safety training? Everyone seems to have an opinion. Some companies say that employees only need RF safety training one time. Of course, no one retains information forever if they do not use it regularly, so one-time training does not make much sense when the subject involves personal safety. Some companies require annual training. Others offer a full training session every two years with a shorter refresher course in alternate years.

Neither the Federal Communications Commission nor the Occupational Safety and Health Administration speci-

fies much about training. The FCC states that a person must have received written and verbal instruction to be considered a *fully aware* person, which is one of the requirements to qualify a work site to use the less-restrictive maximum permissible exposure limits for occupational/controlled exposure. It does not specify anything about the training other than it must include information about how to mitigate one's RF exposure.

Years ago, two senior environmental health and safety professionals from large television networks gave similar answers when asked about training frequency. They both stated that they determine the frequency for the training based on the risk factor. Both networks use a training schedule of one, two or three years for various environmental health and safety threats, with a majority of their employees being on a one- or two-year RF safety training cycle.

Another determining factor for training frequency is how thoroughly the employees have been trained. If the training is thorough and effective and the employees have really learned the subject, two years is reasonable. Many employers use a two-year training cycle with occasional classes held during the off year to accommodate new hires. This makes sense when the training is thorough and the employees demonstrate good comprehension.

RF safety training is important for anyone who climbs a tower, ventures onto a building rooftop or works in close proximity to RF transmission equipment and AM detuning networks at ground level. Companies need to make a concerted effort to reduce the potential for personal injury and satisfy the regulatory requirements of the FCC and OSHA. Doing so not only makes good business sense, it also provides a strong defense against potential liability claims. **agl**

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