

Tower-mounted Antennas Improve RF Safety for Cell Phone Users

It may seem counter-intuitive, but sometimes the best way to reduce RF exposure for schoolchildren who use their cell phones is to place the antenna tower closer to the school.

By Richard R. Strickland

When the subject of installing a tower with wireless antennas or putting wireless antennas on existing structures such as water tanks or church steeples comes up, it often raises strong feelings. You just made a deal to lease space on your rooftop to a wireless company, and now you are having second thoughts as to what problems this might introduce. Somebody just noticed the antennas on the roof of the school — how dare they put children at risk!

Questions such as this come up every day. With the information available on the Internet, everybody is quick to do some research. But putting it all together and making sense of it is far from easy. RF standards and regulations can be confusing. And applying this information to your particular situation is even more difficult.

People are often afraid of the unknown. In the case of new installations of wireless antennas, they often fear the worst and think that by fighting the installation, they are making things safer for their families and themselves. Nothing seems to spark more concern than propos-



When you consider how high up the antennas are on a wireless tower, it is easy to see why there is nothing to worry about in terms of RF energy at ground level.

30 above ground level

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ing a new installation near a school. Few people realize that there are two forms of radiation with distinctly different biological effects. In their minds, your proposed antennas are akin to a proposed nuclear power plant in the neighborhood.

On the other hand, extremely few people seem to be concerned about using a cellular telephone. And only a few limit the use of cellular phones for themselves or even their children unless the concern is cost.

For you as a wireless service provider and FCC license-holder, having the ability to explain the issues in terms the generally nontechnical populace can understand can be a valuable tool for easing the concerns of many people who might otherwise oppose your planned installation. Consider the use of the following information as being proactive.

RF safety issues with towers

The major concern over exposure to RF energy is heating of the human body. Workers who climb wireless towers and get very close to wireless telecommuni-

Wireless telecommunications antennas have extremely little energy directed downward — that would simply be a waste of energy

cations antennas and other types of antennas must take care not to be exposed to excessive levels of RF energy, which is the reason that most companies require that workers who climb towers complete RF safety training. This is where I come in. When I explain the danger areas around such antennas to my students, I always use this rule of thumb: "You are perfectly safe and can remain in any area providing that the bottom of the antenna is at least 2 feet above your head." When you consider how high up the antennas

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are on a wireless tower, it is easy to see why I can state categorically that there is nothing to worry about in terms of RF energy at ground level.

Wireless telecommunications antennas have extremely little energy directed downward — that would simply be a waste of energy. Once the energy is just a few feet from the antenna, it begins to spread out in two dimensions, so the energy level drops off dramatically with distance. The energy level 100 feet from

an antenna is only 1 percent of the energy level 10 feet from the antenna.

RF and the human body

Much of the confusion and concern over exposure to RF energy comes from a misunderstanding about the two forms of radiation that people might encounter. I hear it in the classes that I teach, and I make a point to explain the difference in every class, even if the students are all professional engineers.

Think Hiroshima, Nagasaki, Chernobyl, Three Mile Island, x-rays and uranium, and everybody gets concerned. Radioactive materials and x-rays generate what is known as *ionizing radiation*, which can be very dangerous. Ionizing radiation kills or mutates human cells, its effects are cumulative, and there is no practical minimum exposure. So, continuous exposure to low levels of ionizing radiation can eventually lead to serious health problems. Just getting an x-ray kills or mutates millions of cells in your body. But your body will repair itself within two weeks, providing there is no additional exposure. However, the person giving you the x-ray has to be very careful to get behind the lead in the door so that they don't also get exposed when you are. In exposing multiple patients to x-rays, their exposure could be repetitive and could cause cumulative effects.

In contrast, radio frequency energy and the energy from most of the light



Two statements that apply to every tower site with wireless antennas

If you hold a wireless phone near your head, as opposed to texting, using a headset or using a hands-free device, you will absorb an absolute minimum of 100 times more RF energy than the maximum you could absorb from any tower-mounted wireless antennas, assuming you are on

the ground.

If wireless reception is poor in your area, the installation of a wireless tower or wireless antennas on a water tank or in a church steeple will dramatically reduce the RF exposure of anyone who uses a wireless phone in a handheld mode.

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frequencies are forms of non-ionizing radiation. This form of energy can heat tissue when it is concentrated enough, and non-ionizing radiation is what the common microwave oven uses. Exposure to very tiny amounts of RF energy has much less of an effect on you than would a change in room temperature by a small fraction of a degree. Problems occur with exposure to RF energy only when it is so concentrated that your body has a problem dealing with the excess heat. The effects are very similar to overexertion.

Wireless phones versus towers

People who do some reading on the subject come across concerns about exposure to wireless energy, and the tendency is to equate this as a concern over the antennas on the tower. The reality is that if there is any RF safety concern related to wireless phone systems, it is with using the phone itself, not with the energy from the antennas on the tower. The only exception is if

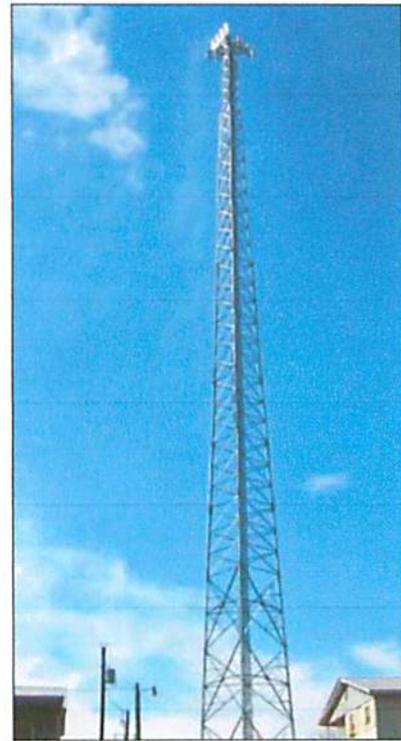
you are a worker on the tower very close to one or more of the antennas.

Here are two statements that apply to every tower site with wireless antennas:

1. If you hold a wireless phone near your head, as opposed to texting, using a headset or using a hands-free device, you will absorb an absolute minimum of 100 times more RF energy than the maximum you could absorb from any tower-mounted wireless antennas, assuming you are on the ground.

2. If wireless reception is poor in your area, the installation of a wireless tower or wireless antennas on a water tank or in a church steeple will dramatically reduce the RF exposure of anyone who uses a wireless phone in a handheld mode.

There is no doubt that the RF exposure that you get from using a phone is much higher than from the antennas high up on a tower.



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Consider a typical case where it is proposed for a church to obtain some revenue by renting space in the church steeple to a wireless provider. But there is a school in the church, and many people get concerned about putting their children at risk. The fact is that by adding the additional antennas, the cell phones in the area will dramatically reduce their operating power level. Cell phones are programmed to use the minimum amount of power needed to make a good connection. So, when the signal is strong (lots of bars) the phone transmits at no more than 10 percent of the power that it uses when the signal is weak. And when the connection is poor, people tend to hold the phone tightly to their heads so that they can hear better, which further increases their exposure by another factor of 10. So, a person holding a phone tight to his or her head with a poor connection will absorb at least 100 times more RF energy than when the phone is held about an inch away and the signal is strong. Under these worst-case



Workers who climb wireless towers and get very close to wireless telecommunications antennas and types of antennas must take care not to be exposed to excessive levels of RF energy.

conditions, the amount of RF energy absorbed will be a minimum of 10,000 times higher than you could possibly get from the antennas high up on the tower or in the steeple.

The other point is that children tend

to not use headsets. This is the reason that there are significant restrictions on the use of wireless phones by children in Great Britain. One study showed that children under 20 who use wireless phones are five times more likely to get brain cancer than children who do not use wireless phones. This study is controversial and contested by many. Most evidence points to cellular phones being quite safe. But there is no doubt that the RF exposure that you get from using a phone is much higher than from the antennas high up on a tower and that by having the antennas nearby, your phones will operate at reduced power levels.

So, when it is proposed to add a wireless tower near a school, consider the safety of your children and *vote to approve.* agil

Richard R. Strickland is an RF safety consultant and the owner of RF Safety Solutions, South Setauket, N.Y. Visit www.RFSafetySolutions.com

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