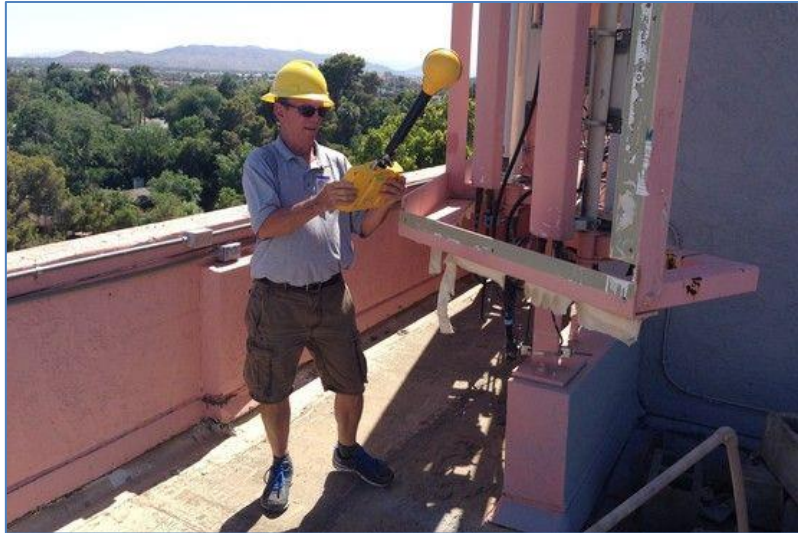


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Cellphone Boom Spurs Antenna-Safety Worries

BY IANTHE JEANNE DUGAN AND RYAN KNUTSON



Radio-frequency engineer Marvin Wessel has taken readings at more than 3,000 cellphone antenna sites across the country.

Ryan Knutson/The Wall Street Journal

The antennas fueling the nation's cellphone boom are challenging federal safety rules that were put in place when signals largely radiated from remote towers off-limits to the public.

Now, antennas are in more than 300,000 locations—rooftops, parks, stadiums—nearly double the number of 10 years ago, according to the industry trade group CTIA.

Federal rules require carriers to use barricades, signs and training to protect people from excessive radio-frequency radiation, the waves of electric and magnetic power that carry signals. The power isn't considered harmful by the time it reaches the street, but for workers and residents near an antenna, it can be a risk.

One in 10 sites violates the rules, according to six engineers who examined more than 5,000 sites during safety audits for carriers and local municipalities, underscoring a safety lapse in the network that makes cellphones hum, at a time when the health effects of antennas are being debated world-wide.

The FCC has issued just two citations to cell carriers since adopting the rules in 1996. The FCC says it lacks resources to monitor each antenna.

"It's like having a speed limit and no police," said Marvin Wessel, an engineer who has audited more than 3,000 sites and found one in 10 out of compliance.

On a sweltering June day in Phoenix, Mr. Wessel strolled through a residential area near Echo Canyon Park and spotted lawn chairs near a **T-Mobile US** Inc. cellular antenna painted brown to match a fence. His monitor showed emissions well above safety limits.

After being alerted by The Wall Street Journal, T-Mobile added warning signs and roped off a patch in front of the antenna with a chain. "The safety of the public, our customers and our employees is a responsibility that all of us here at T-Mobile take very seriously," said a T-Mobile spokeswoman.

At very high levels, radio-frequency radiation can cook human tissue, the FCC said, potentially causing cataracts and temporary sterility and other health issues.

To buffer people from these "thermal" effects, the FCC set two limits for how much RF people can absorb—one for the general public, and an "occupational" limit five times higher for people trained to work near antennas. The higher level is still 10 times below the thermal level.

Carriers have to restrict access near antennas that are above the limits. Workers and others who venture into hot zones—generally up to 20 feet in front of an antenna—must be trained and have RF monitors.

Most cellular antennas aren't strong enough to cause thermal problems, engineers say, and carriers are installing some smaller antennas with lower power levels. But some are being made stronger to meet demand for high-speed Internet access, high-definition video and other services. A German study in 2013 found higher emissions from 4G antennas.

"The more bandwidth, the hotter they will be," said Mr. Wessel, who expects some to exceed the thermal level within a year.

Richard Tell, a Nevada engineer, also expects some emissions to rise. At more than 1,000 sites nationally, he found roughly one in 10 out of compliance, similar to Mr. Wessel's conclusion. Some are hidden or disguised for aesthetic reasons.

"I've been on rooftops looking for antennas and couldn't find them because they were hidden in fake concrete blocks that were really foam," he said.

Daniel Ranahan, a Lowell, Mass., roofer, said antennas are slowing jobs. "There's no mechanism for the worker to know what buildings are safe," he said.

Peter Chaney, the director of safety and health for the Mechanical Contractors Association of America, which represents companies with more

than 270,000 workers, in August asked the FCC to create a database of cellular antennas.

One company, RF Check, in San Diego, has designed a protocol but requires collaboration from carriers and funding from phone customers.

Mr. Chaney is developing a training video and brochure on RF safety to distribute to the association's members next year.

"We want workers to know that the antennas are there and that there may be a potential hazard," he said. "I'm concerned about the chronic effect of this. If guys have 30-year careers and they're exposed to these things on a regular basis—is there any long-term effect?"

The National Institute for Occupational Safety and Health began studying that question after the World Health Organization in 2011 categorized RF radiation as a possible carcinogen, based on research by over 30 scientists, said Gregory Lotz, the top RF expert for Niosh. And the National Toxicology Program at the National Institutes of Health is exploring lower-level RF exposure.

Among those concerned is Gilbert Amelio, a scientist who was chief executive of Apple Inc. and National Semiconductor and a board member of AT&T Inc. He believes industry leaders will "take whatever steps may be necessary to prevent harm to workers or others who may have good reason to be close to these sites."

Jimmy Crespo complained to federal labor regulators in 2011 that he became disabled with cognitive issues after working more than 300 times on heating and cooling systems for antennas for **Johnson Controls** Inc., a **Sprint** Corp. contractor.

"I had no training, no monitoring devices and no warning from my employer," Mr. Crespo said.

Regulators asked Johnson to ensure the rules were being followed. Johnson said it no longer had the contract, and Sprint said the systems were a safe distance from antennas.

"Employees were not working in an area where radio frequencies would pose a hazard," a Johnson spokesman said.

Sprint said annual checks show all sites are compliant.

AT&T said it places "the utmost importance on the safety of workers and the public from RF emissions and we have a rigorous safety program in place to minimize exposure to RF emissions."

The FCC in April signed a consent decree with **Verizon Communications** Inc. to settle RF violations in Pennsylvania and Connecticut, involving an unlocked rooftop and a missing sign. Verizon agreed to pay \$50,000 and to train employees and contractors, and check other sites.

The carrier has told regulators that property owners complicate compliance.

"In New York City, condominium tenants became upset and concerned with RF notification signs we placed on a terrace access point," Tamara Preiss, Verizon's vice president of federal regulatory affairs, wrote to the FCC in February. Ms. Preiss said the signs were removed after the tenants hired a lawyer.

Hartford Financial Services Group Inc. and **A.M. Best** Co., the insurance-rating agency, have flagged RF as an emerging risk. **Swiss Re** wrote in a 2013 report that if RF radiation is linked to health problems it "could ultimately lead to large losses."