

RF Exposure

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Radio frequency (RF) radiation, RF emissions, electromagnetic energy — whatever you choose to call it — is a hot subject today supported by new FCC regulations that have brought increased awareness of RF radiation issues. While most people involved with operating wireless and two-way radio systems know to avoid harmful RF exposure, the recent FCC regulations and increased attention from OSHA seem to have caught many organizations by surprise.

Where are we today? First, it is perhaps obvious but still important to remind everyone that RF radiation (also called non-ionizing radiation) is not to be confused with the far more dangerous **ionizing** radiation that is generated by X-rays and radioactive materials associated with nuclear technology. Quite simply, non-ionizing radiation, which is based on radio and light frequencies, can overheat your body in the same way that a microwave oven cooks food. To protect those who may encounter sources of non-ionizing radiation, particularly in their work environment, we have some reasonable regulations that are based on well-documented hazards.

In an important shift, concern over RF radiation exposure is no longer limited to electronics and telecommunication industry workers. The proliferation of wireless services and the location of all types of antenna systems on rooftops have changed all that. Radio transmitters, the primary source of RF emission (outside of RF heating systems used in industry), can be found on a wide array of government, commercial, and private buildings, including housing.

While powerful broadcast TV and radio transmitters have extensive physical security and signage to ensure public safety, two-way and other wireless antennas, which operates at much lower power than broadcast systems, may be situated in more accessible locations and may lack appropriate signage. Still, they represent a potential hazard because people can get very close to them without realizing it. Rooftops with multiple antennas, and there are many of them, are even more likely to contain areas where RF levels exceed FCC regulation.

Stand 15-20 feet from even the highest power wireless or 2-way system antennas and you are below the Maximum Permissible Exposure (MPE) levels defined in the FCC regulations. But exposure levels increase dramatically as you get closer. The exposure level is four times higher if you cut the distance in half. At a fourth the distance, the exposure level is 16 times higher. At a tenth the distance the levels are *100 times higher!*

When you put antennas on towers, it is easy to restrict access. The big problem is with rooftops, to which large numbers of people require access. Think about who might need access to your building's rooftop: HVAC and elevator repair people, exterminators, painting contractors, window washers, building maintenance & security staff, property managers, etc. Most have little or no knowledge of RF radiation.

What is the potential result of overexposure to RF radiation? Under certain conditions, it is possible to become ill or, even worse, suffer prolonged health effects. In today's litigious society, employers, system operators and site owners can face lawsuits even when there is no proof of permanent biological damage. Just having someone prove (or claim) that they were exposed to RF field levels that exceed the FCC regulations may be more than enough to fuel costly legal battles. (Ironically, the very invisibility that shielded non-ionizing radiation from public knowledge can become a weapon for litigation.)

Some simple actions will allow you significantly reduce the likelihood that someone might be overexposed, as well as reduce the risk that someone would seek legal remedy for an exposure claim. First, and most important, you must develop a RF Safety Plan and implement it. That means a **written** plan. If it isn't written, it is useless. An inspector from any federal, state, or local agency will always start by asking if you have a plan. If you answer yes, they will want to see a copy. Your plan does not need to be complicated. All health and safety plans have the same basic components. The following eleven program elements form a complete RF safety program.

1. **Written Documentation of the Program.** If it isn't written, you **do not** have a safety program.
2. **Management Support.** A safety program must have the full backing of management if it is going to work.
3. **Education and Communication.** The safety program must be communicated to your employees and they must understand the work rules, procedures, and policies that they are expected to follow. For rooftops, the simplest training is to have first-time visitors watch a 20-minute video and a handful of slides that explain the rules specific to the site. Then, have them sign a document that states that they understand and promise to follow the rules. Attorneys will use more precise language but this is what you are after. Only then are these people *authorized* to go onto the rooftop.
4. **Enforcement of Your Safety Program.** A safety program filed away in a drawer is not a safety program. You must use it!

5. **Identification of Hazard Areas.** You should have a reasonable idea where the field strengths may exceed the Maximum Permissible Exposure (MPE) levels for both Occupational/Controlled areas and for General Population/Uncontrolled areas. However, this is often not practical since conditions can change. Today, most operators have taken the approach that everyone who works in or visits a rooftop area must wear an RF personal monitor.
6. **Marking and Control of Hazard Areas.** Once potential hazard areas have been identified, i.e., by making some measurements, they have to be marked. Signs and perhaps physical barriers, such as chains and fences, are needed. If you require the use of RF personal monitors, a sign can be placed at the point(s) of access. This sign basically states that certain areas of the rooftop *may* exceed FCC guidelines and that only authorized visitors wearing the proper safety equipment are allowed.
7. **Controls and/or Work Practices.** Establish work practices. For example, have both visitors and employees wear RF personal monitors whenever they are on the roof, or install area monitors that can serve to notify any personnel in a given area that RF level are approaching or exceeding FCC limits. Both groups must understand how to react to an alarm condition. A short video will prevent overreaction as it informs them of what to expect and how to respond. For example, if the monitor starts to “beep” they should not panic because biological problems do not happen instantly. That, in fact, exposure is typically averaged over six minutes since the problem is heat-based..
8. **Employee Involvement in the Structure and Operation of the Safety Program.** Adherence to the safety program starts with the employees. First, they must believe in the need for a safety program. Then, they must understand the rules and procedures of your safety program. Get them involved.
9. **Medical Program.** No, you do not need to send employees for routine physicals. But, there are two things you do need to do. First, all employees who are expected to work in areas with potential exposure to RF fields above a modest level, i.e., the General Population/Uncontrolled MPE levels, should be screened to identify those with medical implants that contain electronic circuitry. Pacemakers are only one of many implants routinely used today. Unfortunately, there is a substantial risk that devices will malfunction at field strengths far below the FCC MPE limits. Such people need to know that their potential exposure risks are greater, not from a purely biological response but for electromagnetic compatibility (EMC) which may result in erratic functioning of their implant. Second, the safety program must have provisions to handle overexposure incidents, whether real, or ultimately found to be unsubstantiated. Severe

situations will require a physical exam. All incidents should be documented using a standard form that helps you quantify and record the level of the exposure. Often, a reported overexposure incident is found to be fully within the FCC regulations once the elements of whole body averaging and time averaging are considered.

10. **Scheduled Reviews of Your Safety Program.** Your safety program should be reviewed annually so that deficiencies can be identified and resolved. In some cases, such reviews may lead to procedural changes that improve operations without compromising employee safety. A review of all incident report forms (see #9) is crucial.
11. **Assignment of Responsibility.** Someone in your organization must be clearly identified as the RF safety person. This individual will normally have other duties but must have the necessary authority and resources to implement and enforce all aspects of the safety program (see #2).

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