



Central Office
Radio Frequency (RF) Radiation Safety

Purpose

This section identifies the health and safety program requirements to reduce or eliminate the risk of Radio Frequency (RF) Radiation exposure to field personnel during normal installation, use, or maintenance in areas with potential RF radiation exposure hazards.

This section applies to all field personnel.

The purpose of this section is to provide guidance for Field Operations to remain compliant with Federal, State, and Customer requirements concerning RF radiation exposure.

This section is designed to minimize technician health and safety risks through management of potential RF radiation exposure areas. This procedure is based upon relevant regulatory requirements established by, the Federal Communications Commission (FCC), Occupational Safety and Health Administration (OSHA), National Radiation Protection Board, Institute for Electrical and Electronic Engineers (IEEE), and the American National Standards Institute (ANSI).

RF Radiation Safety Summary

- RF radiation personal monitors will be worn by all personnel entering or while working in an unknown or posted Yellow or Red Zone.
- Prior to beginning work at a location with a potential RF exposure the RF Engineer, or site management must determine if the building has a RF Radiation Safety concern.
- All field personnel who may work at a location with potential RF radiation exposure must review the RF Radiation Safety Program prior to beginning work at that location.
- Site management will inform all personnel at the field location prior to beginning work that RF radiation levels significantly below the FCC's Maximum Permissible Exposure (MPE) levels have been found to cause interference in the operation of certain medical implant devices such as pace makers. Field personnel with such devices shall use caution when working at locations with RF radiation concerns.
- Field Operations will provide RF Radiation Safety Training for all its employees that will perform work within unknown or posted RF radiation zones.
- RF postings may be in place at most buildings, corresponding to color-coded exposure areas, where a RF radiation survey has taken place. However, this is not always the case; use caution and follow the program guidelines.
- Assume all antennas are active, and do not stop in front of any directional antennas.

Always maintain at least a 3-foot distance from all antennas

Responsibility

All field personnel must have a basic understanding of RF Radiation Safety prior to beginning work at any field location with a potential for RF radiation exposure.

All field personnel will maintain an understanding of RF Radiation Safety by reviewing this section and the RF Radiation Safety Training. After reviewing these materials, all field personnel should have a basic knowledge of RF Radiation Safety and be capable of identifying potential RF radiation hazards and understand RF warning signs posted in many work environments.

Guidelines for Working in an RF Radiation Environment

Applicable RF radiation signs shall be posted at the perimeter of each Safety Zone (either Green, Yellow, or Red). Other markings may also be used to identify the perimeter of a Safety Zone, such as painted areas, chains and fencing.

- RF radiation warning signs should be posted at all buildings with RF radiation exposure levels above the FCC's general population levels. All sign postings should be color-coded to correspond with exposure areas. Technicians will not work in areas where an RF survey has taken place and its results showed areas above the FCC's MPE levels

Federal requirements have standardized RF Safety Zones for all working environments.

Safety Zones should be identified and established for each building/tower/lab site based on distances determined by the type, power, placement, and number of radiating devices.

RF Radiation Personal Monitors

RF radiation personal monitors shall be worn by all field personnel anytime the RF radiation level is unknown or while entering designated Yellow or Red RF radiation posted zones. The RF radiation personal monitors provide advance warning of RF radiation exposure above the FCC's MPE level for frequencies between 300kHz-45GHz. The RF radiation personal monitors are designed to sound an audible alarm when 50% of the FCC's MPE level is reached.

Site Surveys Requirements

At the beginning of each new project the first field personnel at the job site shall be made aware by the customer, or building management of any potential RF radiation exposure hazards.

The first field personnel at the jobsite, either RF Engineering or the site management, must conduct a site walkthrough. At the time of the walkthrough the field personnel shall be wearing their RF radiation personal monitor and using general observation skills to detect any areas

of the jobsite that may have excessive RF radiation levels.

If at anytime the RF personal monitor does sound the audible alarm, the individual shall walk around the area to determine exactly what is the general area that the alarm is sounding and if that area will have an effect on the current project and personnel.

Incident Notification Procedures

In the event of an RF radiation exposure or injury while at a job site:

- call 911 or the local emergency response phone number if the incident involves fire or medical emergency
- call the Disability Service Center to report the incident if someone suffered an injury due to RF radiation exposure that involves a situation where the time-weighted FCC's MPE levels were exceeded by field personnel (i.e., working in an unknown environment, incorrect RF radiation postings).

RF Radiation Safety Training

All field personnel who work in areas with potential RF radiation exposure must have initial RF Radiation Safety Training. All field personnel will receive updated RF Radiation Safety Training annually or whenever there is a significant change in this procedure.

The RF Radiation Safety Training will include, at a minimum, the following elements:

- General principles of RF
- Effects of RF radiation exposure
- General precautions and work practices to avoid RF radiation exposure
- Review of RF radiation measurement equipment
- Annual refresher training will be required for all field personnel

Site Management

Site Management is responsible for:

- acquiring site-specific RF radiation procedures either from the customer or the building management
- ensuring that this procedure is implemented at each field location with a potential RF radiation exposure
- ensuring that safe operating practices are being followed according to site postings and relevant information supplied by the customer or building management.

Field Technicians

Field Technicians are responsible for:

- following the requirements of this section when entering or performing any work at a field location with potential RF radiation exposure
- being familiar with RF Radiation Safety procedures and aware of potential RF radiation hazards at each field location

Guidelines for Working in an RF Radiation Environment

Applicable RF radiation signs shall be posted at the perimeter of each Safety Zone (either Green, Yellow, or Red). Other markings may also be used to identify the perimeter of a Safety Zone, such as painted areas, chains and fencing.

RF radiation warning signs shall be posted at all buildings with RF radiation exposure levels above the FCC's general population levels. All sign postings shall be color-coded to correspond with exposure areas.

Field personnel will not work in areas where an RF survey has taken place and its results showed areas above the FCC's MPE levels.

All personnel shall be aware that RF radiation postings might be old or not available at all, use caution and follow these guidelines while working in these areas:

- Only authorized personnel may enter RF radiation posted areas
- Authorized personnel must have received and reviewed this section and the RF Radiation Safety Training before entering a job site with potential RF radiation exposure
- Obey all posted signs
- Assume all antennas are active and do not stop in front of any directional antennas and always maintain a minimum 3-foot distance in all directions from all antennas
- Have the customer or building management power down potentially dangerous transmitters when possible
- RF radiation personal monitors must be worn while working in unmarked or designated RF radiation exposure areas

- Never operate transmitters without shields
- Do not operate base station antennas in the equipment room

Safety Zones

Federal requirements have standardized RF Safety Zones for all working environments.

Safety Zones shall be identified and established for each building/tower/lab site based on distances determined by the type, power, placement, and number of radiating devices.

Safety Zones are established based on the highest estimated or measured RF levels assuming all RF emitters are operating at full power. Safety Zones are color-coded (Green, Yellow, Red) to represent the degree of safety afforded by the zone.

Green is the lowest RF exposure environment and Red is the most hazardous RF exposure environment.

Only skilled and knowledgeable personnel using calibrated and properly selected instruments shall perform RF Survey measurements. In order to ensure that the boundaries of these zones are within the specified limits, measurement uncertainty shall be taken into account when conducting RF Surveys and when working in designated RF Safety Zones.

Precautions and restrictions for Safety Zones are as follows:

Green Zone

- This level is less than the FCC's MPE for general population environments, but an RF radiation posting is still required.
- This level is a safe working environment and only requires that personnel entering this area be aware of the potential RF radiation exposure and the hazards associated.
- Field personnel are not required to wear RF radiation personal monitors in designated Green Zones that have been verified by field personnel.
- This level is represented on the RF radiation survey equipment by levels between 0-20% of the FCC standard.

Yellow Zone

- This level is considered to be an action limit – the measured levels are less than the FCC's MPE level for occupational environments (Red Zone), but greater than the FCC's MPE level for general population environments (Green Zone).
- Control of Hazardous Energy Procedures must be used to prevent accidental power-up of harmful transmitters while personnel are working in this environment.
- Only authorized field personnel and customers who have received RF Radiation Safety Training shall enter this area.
- RF radiation personal monitors are required to be worn at all times by all personnel when working in this area.
- This level is represented on the RF radiation survey equipment by levels between 20-100% of the FCC standard.

Red Zone

- Most restrictive zone. RF radiation levels are greater than the FCC's MPE level for occupational environments.
- Entrance is prohibited while RF radiation transmitters are operating. No field personnel will work in an active Red Zone for any period of time.
- Prolonged activity in a designated Red Zone is only permitted after the power to the emitter has been disabled or reduced to a measured level below the general population MPE standard. On the RF radiation survey equipment the measured RF levels must be reduced to below 100% before any entry into this area is authorized.
- Control of Hazardous Energy Procedures must be used to prevent accidental power-up of harmful transmitters while personnel are working in this environment.
- Depending on the position of a directional emitter sites may have Red Zones at ground level, well away from the RF radiation emitter. These areas must have the necessary RF radiation postings and measures in place to restrict access.
- Only authorized field personnel, including customers who have received RF Radiation Safety Training shall have access to these zones.

RF Radiation Personal Monitors

RF radiation personal monitors shall be worn by all field personnel anytime the RF radiation level is unknown or while entering designated Yellow or Red RF radiation posted zones.

The Field Operations RF radiation personal monitors provide advance warning of RF radiation exposure above the FCC's MPE level for frequencies between 300kHz-45GHz.

The RF radiation personal monitors are designed to sound an audible alarm when 50% of the FCC's MPE level is reached.

When an audible alarm sounds it does not automatically mean that the field personnel are at an immediate health risk, but it does notify the personnel in that area that they are in an area that is above 50% of the FCC's MPE level.

RF radiation personal monitors are not considered a protective device and their use is intended only to act as a measure of detecting potentially harmful RF radiation levels. When an audible alarm sounds, first move around the area to determine what exactly is the area that is making the monitor alarm. If the area that the alarm is sounding is avoidable then do so. Mark the area using the proper RF warning signs and inform all personnel of the hazardous area and continue with the necessary work while staying outside of that area.

If the area is unavoidable and it is necessary to access for prolonged project work, leave the area and follow the Site Survey Requirements listed below.

Site Surveys Requirements

At the beginning of each new project the first field personnel at the job site shall be made aware by the customer, or building management of any potential RF radiation exposure hazards.

The first field personnel at the jobsite, either RF Engineering or site management, must conduct a site walkthrough. At the time of the walkthrough the field personnel shall be wearing their RF radiation personal monitor and using general observation skills to detect any areas of the jobsite that may have excessive RF radiation levels. If at anytime the RF personal monitor does sound the audible alarm, the individual should walk around the area to determine exactly what is the general area that the alarm is sounding and if that area will have an effect on the current project and personnel.

If the area is avoidable to continue work, document the area so that it can be communicated back to other field personnel and continue on with the site walkthrough. If the area is unavoidable based on customer requirements or building design, then a RF Survey must be conducted.

The field personnel that first discovered the area shall obtain the necessary RF radiation measurement devices. Once the RF survey equipment is obtained and a survey is conducted of the area, the results must be documented for that site so that they can be communicated to other field personnel. The documented RF Survey shall become a part of that jobsites documentation package.

All field personnel will review and comply with current RF Survey information provided by the customer or building management. If an RF personal monitor sounds in an area not designated as a Yellow or Red Zone, on the information provided by the customer or building management, then an RF Survey shall be conducted by field personnel to ensure that conditions have not changed in the working environment since the last survey.

In instances where field personnel have been working in an environment and their RF personal monitors did not go off, but they are now, an RF Survey must be conducted to ensure that during a break in work at that location conditions have not changed.

In addition, RF Surveys of the work environment may be conducted in response to difficulty with equipment transmissions or when ordered to investigate RF radiation exposure incidents involving field personnel.

Depending on the type of work to be performed, this equipment may include, but is not limited to:

- RF personal monitors
- RF survey equipment
- Hard hats
- Outdoor Safety Glasses
- Safety Boots
- Lockout/Tagout equipment and supplies
- Fall Protection (lanyards and harnesses)