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COMMITTEE *on*
ELECTROMAGNETIC
SAFETY

**IEEE ICES Subcommittee 2 Committee on Terminology, Units of Measurement,
and Hazard Communications**

June 9, 2011 Halifax, Nova Scotia, Canada

1300 – 1630 h

Meeting minutes

1. CTO 1315

2. Introduction of those in attendance. See Attendance Sheet.

3. Modifications and approval of agenda. No modifications.

4. Review and approval of DRAFT minutes of Plantation, Florida meeting (December 2010) Approved as is.

5. Old Business: Status reports/discussion on:

a) Resolution of request for interpretation from Dyberg

Tell: Summarized the issue.

Ziskin: Discussed issue with respect to environment.

Should the action level (lower tier) be considered an MPE?

Noted: Definition of action level in C95.1 refers to the existence of a safety program.

This issue was triggered by a question from a DOD contractor.

Motion passed to table this topic until after SC-4 meeting.

b) Status of resolving concerns of Joe Bowman (NIOSH) regarding C95.7 (Curtis to report)

Bob Curtis summarized issue:

Subject: RE: C95.7-2005; Date: Tue, 22 Jun 2010 16:36:29 -0400

From: "Bowman, Joseph D. (CDC/NIOSH/DART)" jdb0@cdc.gov; To: "Richard A. Tell" rtell@radhaz.com "However, the crucial difference with C95.7 is the OSHA Act's requirement that if exposures exceed the OEL, controls (engineering controls preferably) are required to achieve compliance."

Table 3 of C95.7 has generated confusion.



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See comment matrix from Curtis.

Discussed proposed changes. Remove the phrase 5xMPE wrt when to perform a 'formal' investigation of overexposure.

Don't permit exposures above the MPE.

Discussion: Does a two tier standard imply there is a need for an action level below the lower tier?

Motion passed to adopt changes recommended by Bob Curtis in attached table.

Bob Curtis was tasked to explore wording that articulates an alternative to numeric action levels.

c) Discussion of example RF safety programs:

Curtis and Tell discussed the information provided prior to the meeting. Information attached. This approach had been discussed and approved during prior meetings. Requested review by the committee.

d) Recommendation on how to proceed with development of an RF Safety Program for Low Frequencies. Not discussed due to lack of time.

e) Discussion of contact/induced current limits in C95.1 relative to practical aspects of RF safety programs. Not discussed due to lack of time.

f) Adequacy of RF alerting signs for compliance relative to C95.7

There is concern that signs are not sufficient to constitute a safety program.

Curtis recommends adding NCRP Letter report to Annex F. "Model Lease language for Wireless Tenants Relative to RF Compliance."

Curtis recommends for 4.3.2.1 In addition to signal word, RF sign should 1) identify the hazard, 2) location of the restricted area, and 3) what to do in order to obtain access to the restricted area. Suggestion made to incorporate this change into C95.2 rather than C95.7.

g) List of "RF users" (Johnson to report) Johnson not present to report.

6. New Business:

a) Is it time to rethink usefulness of an RF safety program workshop?

Suggestion to hold off for now until this revision is completed.

7. Time and Place of Next Meeting –TBD.

8. Adjournment –1645



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COMMENT MATRIX

Title of Document: C95.7 Recommended Practice for Radio Frequency Safety Programs

Date: 27 December 2010

Comments and Resolution

	Submitted by [Name]	Text Reference Location [Line number]	Technical (T) or Editorial (E)	Comment – Rationale or Error	Proposed Change:	Resolution of Comment by SC2 WG
1.	Bob Curtis		E	Abstract: IEEE C95.7-2005 describes the elements of a radio frequency (RF) safety program that provides reasonable and adequate guidance for preventing or controlling potential risks associated with exposure to the electromagnetic fields from RF sources that operate in the frequency range of 3 kHz to 300 GHz.	Abstract: IEEE C95.7-2005 describes the elements of a radio frequency (RF) safety program that provides reasonable and adequate guidance for preventing exposures in excess of recognized limits to electromagnetic fields from RF sources that operate in the frequency range of 3 Hz to 300 GHz..	



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2.	Bob C	Introduction, 3rd paragraph	E	While RF exposure limits are prescribed in IEEE C95.1-1999, RF measurement techniques in IEEE C95.3-2002 and RF safety signs and labels in IEEE C95.2-2005, none of those documents provide specific insight on how to integrate the subjects of those standards with exposure assessment to arrive at practical measures for controlling exposure of persons subject to RF fields so that applicable RF limits.	While RF exposure limits are prescribed in IEEE C95.1-1999, RF measurement techniques in IEEE C95.3-2002 and RF safety signs and labels in IEEE C95.2-2005, none of those documents provide specific insight on how to integrate the subjects of those standards with exposure assessment to arrive at practical measures for controlling exposure of persons subject to RF fields so that applicable RF limits are not exceeded.	
3.	Bob C	1.1 Scope	E	1.1 Scope This recommended practice presents guidelines and procedures that could form the basis of a radio frequency safety program (RFSP) that provides reasonable and adequate guidance for preventing or controlling hazards associated with RF sources that operate in the frequency range of 3 kHz to 300 GHz under many circumstances.	1.1 Scope This recommended practice presents guidelines and procedures that could form the basis of a radio frequency safety program (RFSP) that provides reasonable and adequate guidance for preventing exposures above applicable RF limits associated with RF sources that operate in the frequency range of 3 Hz to 300 GHz under many circumstances.	
4.	Bob C	1.2 Purpose	E	1.2 Purpose	1.2 Purpose	



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				These guidelines are provided to assist in the development of RF safety programs for the safe use of RF energy-producing devices, equipment, and systems, and to prevent or control any potentially hazardous exposure of workers or the public.	These guidelines are provided to assist in the development of RF safety programs for the safe use of RF energy-producing devices, equipment, and systems, and to prevent exposures in excess of applicable RF limits of workers or the public.			
5.	Bob C	1.3 Application, 2nd par.	E	The term "controls" refers to both engineering and administrative controls for eliminating or reducing the potential exposure above defined RF exposure limits. (See section 4 for details on possible controls.)	The term "controls" refers to both engineering and administrative controls for preventing exposure above defined RF exposure limits. (See section 4 for details on possible controls.)			
6.	Bob C	Table 1	E	Exposure Condition¹	Exposure Condition¹			
				Operational characteristics of source(s) would not cause the action level to be exceeded.	Operational characteristics of source(s) would not cause the action level or lower tier limit			
				Operational characteristics of source(s) would not cause the exposure limit to be exceeded	to be exceeded.			
					Operational characteristics of source(s) may cause the lower			



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				in accessible areas.	tier exposure limit to be exceeded		
				Potential to exceed the exposure limit in accessible areas unless mitigating controls are applied.	in accessible areas.		
				Exposure will exceed exposure limit in accessible areas	unless mitigating controls are applied.		
					Exposure will exceed upper tier exposure limit in accessible areas		
7.	Bob C	Paragraph following Table 1	E	An effective RFSP can be used to ensure employees and the general public are provided adequate protection where RF exposure may exceed the exposure limits contained in present standards or guidelines,	An effective RFSP can be used to ensure employees and the general public are provided adequate protection against RF exposure in excess of applicable limits contained in present standards or guidelines,		
8.	Bob C	3.7 Controlled Area definition	E	Implementation of an effective RF Safety Program assures that persons are not exposed in excess of the “controlled environment” exposure limits.	Implementation of an effective RF Safety Program assures that persons are not exposed in excess of applicable exposure limits.		



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9.	Bob C	3.27 Over Exposure definition	E	Documentation of overexposure incidents are normally a requirement of an RFSP.	Documentation of overexposure incidents is a requirement of an RFSP.	
10.	Bob C	4.1.1 Policy	E	4.1.1 Policy If an RFSP is determined to be necessary, it should have a written statement of policy as to company or organization expectations regarding the control of human exposure to RF fields.	4.1.1 Policy If an RFSP is determined to be necessary, it should have a written statement of policy as to company or organization expectations regarding the control of human exposure to RF fields so that no person is exposed above applicable limits.	
11.	Bob C	Table 2	E	Table 2 – Minimum recommended elements of an RFSP based on the Categories in Table 1(see text for detailed descriptions of categories and elements)	Table 2 – The RFSP must ensure applicable RF exposure limits are not exceeded. In addition, the following are minimum recommended elements of an RFSP based on the Categories in Table 1. (Note that “Required” items are needed even if exposure limits are not exceeded.)	
12.	Bob C	4.5.5	T	4.5.5 Over-exposure incident response Category 2: Not Applicable	4.5.5 Over-exposure incident response Category 2: Required	



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13.	Bob C	Fig 1	T	Requirement for “formal exposure investigation” at 5 X limit.	Delete this portion of figure since some type of formal investigation is needed whenever a limit is exceeded. The investigation may be very limited or extensive depending on situation.	
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Annex B

Examples of Key Aspects of RF Safety Programs for Selected Exposure Scenarios.

The following represent examples of various scenarios in which an RFSP is relevant and highlights some of the key elements that might be part of the program. It should be noted that other program elements not mentioned here would likely also be appropriate.

B.1 Broadcast Site

Broadcast site with tower mounted high power antennas. Spatial peak RF fields at all points on ground are less than exposure limit for lower tier. Spatial average RF fields near antennas mounted on the tower, are greater than upper tier exposure limit.

Primary objectives of RFSP:

- a) ensure that changes at site do not result in ground level RF field changes that would exceed applicable exposure limits/MPE values (maintain information on addition of new antennas or increases in power);
- b) restrict personnel from climbing tower during operations (signage, training);
or
- c) require power reductions before tower work to meet upper tier exposure limits.

An example RF program is presented in Annex B.1 Example.

B.2 Cellular Site

Building rooftop antenna site with cellular antennas mounted to exterior surface (façade) of building (antenna location is considered not normally accessible). No other antennas are present.

Primary objectives of RFSP:

- a) provide for mechanism to alert operator of need for personnel to gain access to front of antennas during building repairs or maintenance work
- b) signage to alert personnel to possibility of RF fields directly in front of antennas that may exceed applicable exposure limits. (See Annex B.2 for RF Safety Sheet).



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- c) Upon notification, selected antennas should be shut down or powered down during immediate access.
- d) Necessary coordination with building manager.

B.3 Factory RF Heat Sealer Operation

Factory RF heat sealer operation where RF fields exceed lower tier but do not exceed upper tier assuming workers do not remain too close to the sealer table during the RF cycle

Primary objectives of RFSP:

- a) training of workers about RF field hazards, exposure limits, contact currents and work procedures to eliminate excessive exposures.
- b) Visitors must be restricted from factory floor area until briefed on RF safety issues.

B.4 Maintenance Contractor Dispatched to an RF Site

Electrical service contractor company dispatches electrician crew to a broadcast antenna site to replace emergency generator.

RFSP should include training of crew on RF safety awareness, use of personal RF monitors, need to check area for excessive RF fields prior to beginning work.

B.5 Exposures to the Public Exceed Lower Tier Limits Near Broadcast Site

Broadcast site where the spatially averaged RF fields caused by building reflections exceed lower tier exposure limits in a limited area but do not exceed upper tier values.

This represents a Category 2 scenario and the steps needed to be taken to restrict access to this area or reduce transmitter power to eliminate excessive field levels. If site is remote, signage is adequate to alert individuals to presence of RF fields exceeding lower tier limits and to keep clear of area. If site is frequently accessed by public, install fencing to restrict access.



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B.6 Testing Radio Equipment

Factory that manufactures radio communication equipment conducts testing of transmitters for performance. Transmitters are connected to dummy loads during operation. Ambient RF fields are less than lower tier exposure limit.

RFSP must establish that use of dummy load is required work practice (transmitters to never be operated without connection to dummy load).

B.7 Tower Crew Dispatched to a Broadcast Site

Tower service company dispatches crews that perform on-tower installation, maintenance, and rigging work at numerous sites.

RFSP must include RF safety awareness training for all tower workers and use of RF personal monitors. Work area on towers must be “cleared” prior to commencing work aloft. RF safety plan for site, if available, should be followed that prescribes power reductions or transmitter shut down during tower work. See Annex B.1 Example.

B.8 Vehicle-Mounted Radios

Vehicle-mounted VHF/UHF taxicab and police radios (typical 20-200 W EIRP) – an example of a situation where a transmitter is in close proximity to the operator but nearby persons are normally further away from the device.

RFSP would normally include a determination that RF fields associated with operation of the taxicab or police radio will not cause exposures in excess of the applicable exposure limit. While the operator may be in an occupational exposure situation if properly trained and aware, passengers will generally be considered members of the general public.

NOTE: Many vehicle mounted radios operate at low power, would fall into Category 1, and would not require an RFSP.



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Annex B.1 Example RF Safety Program for Broadcast Tower

Version 12.30.2010

1. Section: Policy Statement and Program Administration

- 1.1. Program Policy:** It is the policy of the property owner that this site be maintained and operated in compliance with all applicable RF (radio frequency) safety regulations to protect employees and the general public.

Secondarily, this Program promotes the use of safe alternative work-practices where feasible, which minimize service disruptions while still ensuring compliance with RF exposure limits.

- 1.2. Scope of Program:** This site RF Safety Program implements the CORPORATE RF Safety Program for this location. The reader is referred to the Corporate RF Program for policies and procedures which apply to all CORPORATE sites. Situations may require exceptions to certain procedures in the Program. Exceptions must be approved by the Site Manager with guidance of safety personnel.

Explanation: As part of their management duties, the "Site Manager" is authorized by the property owner to determine who is and is not allowed access to the property. Denying access is the ultimate control that only the property owner has to prevent excessive RF exposures. Under "premises liability" laws, the property owner is responsible for providing a reasonable level of safety to anyone allowed on the property.

This Program does not supplant or diminish in any way the legal responsibilities of other Employers to adopt policies and procedures to protect their own employees while working at this site, including incident response procedures to alleged RF over-exposures. At the same time, Employers must ensure that their Employees comply with the requirements of this Program as a condition of occupying the site. Therefore, Employers must resolve any conflicts between their own safety program and this Program prior to having Employees access the site.

- 1.3. Program Certification:** This site RF Safety Program has been approved by an independent Certified Industrial Hygienist (CIH) after an assessment of potential RF exposures at the site. The effective implementation of the Program will ensure workers and the public are not over-



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exposed to RF radiation from this site as defined by Federal Communications Commission (FCC) RF exposure limits. The RF assessment was partially based on transmitting information provided by the antenna operators (ref. **Appendix H**) and assumes the accuracy of that information.

Explanation: A CIH is given in this example, but program certification by any independent RF safety professional (e.g., Certified Health Physicist, Professional Engineer) with the appropriate expertise for the situation may add to its credibility. This may be particularly helpful in resolving concerns some may have about RF safety at the site.

The Program is based on industry “good work practices” as described in IEEE/ANSI C95.7-2005, “Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz”. This standard requires additional RF controls for areas of increasing levels of RF exposures as summarized in the following “Categories”:

Category 1 Areas: RF energy is too low to cause exposures above the Public limits. There are no restrictions for accessing these locations.

Category 2 Areas: RF energy may cause exposures in excess of Public limits, but not above Occupational limits (i.e., FCC limits for workers who are “RF aware” and in control of their RF exposures).

Category 3 Areas: RF energy may cause exposures in excess of Occupational limits unless workers utilize time-averaging controls (or wear RF protective clothing) to achieve compliance.

Category 4 Areas: RF energy levels are so high (e.g., 10 times Occupational limits) that practical time-averaging controls are not sufficient to achieve compliance.

1.4. Assigned Persons: Program assignments and contact information are provided in **Appendix B**.

2. Section: Identification of Potential RF Hazards



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- 2.1. **Inventory of Antennas:** A listing of the relevant antenna systems at this site is provided in **Appendix G**. Specific information regarding transmitting characteristics such as operating power and antenna gain was provided by the antenna operators and manufacturers.
- 2.2. **Identification of RF Restricted Areas:** A simplified representation of “RF Restricted Areas” (i.e., areas where exposures can exceed FCC RF limits) is provided in the RF Safety Sheet. The Areas are conservative since they assume no spatial or time averaging, and that all antennas are transmitting at full power.
 - 2.2.1. **Category 2 and above Areas** are shaded in yellow on the RF Safety Sheet. The General Public must be restricted from these areas at all times. Workers who have been approved by their employer for FCC Occupational RF limits must still be restricted from these areas until they have been trained in the relevant control procedures specified in this site RF Safety Program.
 - 2.2.2. **Category 1 Areas** occur at all locations outside the RF Restricted areas. There are no restrictions for access to these areas.

3. Section: Access Controls and Signs

- 3.1. **Access Control:** Periodic access to RF Restricted Areas is required for maintenance of the structure and antenna systems. Access Control procedures are presented in **Appendix C**.
- 3.2. **RF Signs:** RF signs are used to alert workers of RF Restricted Areas and when to implement certain safety procedures. The RF signs designed for this site and their posting locations are described in **Appendix F**.
- 3.3. **Antenna Power-Down Procedures:** It is recognized that transmitting antennas will need to be powered-down at times to enable work within the RF Restricted Areas. Power-down procedures are presented in **Appendix D**.
- 3.4. **Alternative Work Procedures:** As shown in the RF Safety Sheet, alternative access methods are to be used whenever practicable as an alternative to powering-down antennas.
 - 3.4.1. Note that FCC rules do allow persons who do not qualify for FCC Occupational exposure limits to transverse through Category 2 Areas. For example, a worker who has been informed of the RF Restricted Areas can climb through a Category 2 area without stopping.
 - 3.4.2. “RF Workers” (i.e., workers who qualify for FCC Occupational Limits) may occupy Category 2 areas indefinitely. It is recommended that routine maintenance work near RF Restricted Areas be performed by RF Workers to minimize the need for antenna power-downs.



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3.4.3. RF Workers must restrict their time within Category 3 areas and/or restrict the percentage of their body exposed if possible (e.g. partially outside the beam of directional antennas) to ensure their average exposures are in compliance. The use of RF protective clothing may also be appropriate to achieve compliance.

3.4.4. Use of alarming personal RF monitors is recommended for work within RF Restricted Areas.

4. Section: Program Reviews and Audits

4.1. Incident Reports are used to document potential problems with the site RF Safety Program (e.g., gate was left unlocked, damaged signs, non-RF Worker in RF Restricted Area). Credible concerns from the public or workers are to be referred to the Site Manager for resolution (ref. **Appendix B** for contact information).

4.2. Periodic Audits of the site RF Safety Program are conducted to ensure the Program is current and effective. They occur at least annually and whenever changes are made which affect RF Restricted Areas, such as the installation of new antennas. Specific review items are listed in the Audit Check List (ref. **Appendix E**).

4.3. Audit and Incident Reports are available from the Site Manager.

Appendix A: RF Safety Sheet

Appendix B: Assigned Persons and Contacts

Appendix C: Access Control Procedures

Appendix D: Antenna Power-Down Procedures

Appendix E: Audit Procedures

Appendix F: RF Signage and Barriers

Appendix G: Inventory of Antennas



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Company		RF SAFETY SHEET	Site ID Number N/A										
Ver 07.26.2010													
Site Address: 123 Elm Street Anywhere, USA	Contact Information Property Owners: XXX Site Managers: XXX Tenants: XXX												
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: yellow;"> <th style="text-align: center; padding: 5px;">Actions Performed at Heights on the Tower (Marked by RF Signs)</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"> 925 ft. If climbing up: Call for and verify shut-down of Main antennas and activation of Aux antennas. If climbing down: Call to activate Main antennas. Call for and verify shut-down prior to going within 5 ft. of FM single-bay antenna. </td> </tr> <tr> <td style="padding: 5px;"> 822 ft. If climbing up: Call for and verify shut-down of XXX Aux antenna. If climbing down: Call to activate XXX Aux antenna. </td> </tr> <tr> <td style="padding: 5px;"> 775 ft. If climbing up: Verify shut-down of XXX Aux antenna. </td> </tr> <tr> <td style="padding: 5px;"> 610 ft. Stay on ladder. Call for and verify shut-down prior to going within 5 ft. of Communications antennae on NW tower leg. </td> </tr> <tr> <td style="padding: 5px;"> Platform Maintain 3 ft distance from antennas. Call for and verify shut-down prior to going within 3 ft. </td> </tr> <tr> <td style="padding: 5px;"> 390 ft. Stay on ladder. Call for and verify shut-down prior to going within 5 ft. of TV antennas. </td> </tr> <tr> <td style="padding: 5px;"> 190 ft. Call for and verify shut-down prior to going in front of dish antennas 150'-outside the tower. </td> </tr> <tr> <td style="padding: 5px;"> 65 ft. Call for and verify shut-down prior to going in front of antennas outside the tower. </td> </tr> <tr> <td style="padding: 5px;"> 5 ft. Verify communications with Site Manager. </td> </tr> </tbody> </table>			Actions Performed at Heights on the Tower (Marked by RF Signs)	925 ft. If climbing up: Call for and verify shut-down of Main antennas and activation of Aux antennas. If climbing down: Call to activate Main antennas. Call for and verify shut-down prior to going within 5 ft. of FM single-bay antenna.	822 ft. If climbing up: Call for and verify shut-down of XXX Aux antenna. If climbing down: Call to activate XXX Aux antenna.	775 ft. If climbing up: Verify shut-down of XXX Aux antenna.	610 ft. Stay on ladder. Call for and verify shut-down prior to going within 5 ft. of Communications antennae on NW tower leg.	Platform Maintain 3 ft distance from antennas. Call for and verify shut-down prior to going within 3 ft.	390 ft. Stay on ladder. Call for and verify shut-down prior to going within 5 ft. of TV antennas.	190 ft. Call for and verify shut-down prior to going in front of dish antennas 150'-outside the tower.	65 ft. Call for and verify shut-down prior to going in front of antennas outside the tower.	5 ft. Verify communications with Site Manager.
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5 ft. Verify communications with Site Manager.													



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(Back of RF Safety Sheet)

SUMMARY OF RF SAFETY RULES FOR WORK AT THIS SITE (See Site RF Safety Program for more information.)

- Use procedures which ensure compliance with FCC RF exposure limits.
- Specific requirements include:
 1. Be certified by employer as qualifying for FCC Occupational RF limits.
 2. Prior to climbing the tower, register with Site Manager and describe work and locations to be accessed.
 3. Maintain constant communications with the Designated Transmitter Operator during the climb.
 4. Call in at the identified climbing points to have antennas de-activated prior to climbing into an RF restricted area. Call in to activate antennas after leaving their RF Restricted Area to minimize down time.
 5. When off the ladder, call for power-down prior to entering RF Restricted Areas in front of directional antenna (e.g., MW dish) or near omni-directional antennas.
 6. Utilize a personal RF instrument with alarm selected by your Employer and used as directed by your Employer to verify antennas have been de-activated and that you are in compliance with FCC RF limits.
- Use procedures to minimize deactivation of antennas, but only if RF compliance is maintained. For example:
 7. Stay on the ladder to climb through the RF Restricted Areas of the TV antenna communication antennas without shut-down (See Figure 1).
 8. Stay on the ladder or otherwise behind the Cellular and dish directional antennas to climb behind their RF Restricted Areas without shut-down (See Figure 2).
 9. It is possible to reach into RF Restricted areas with tools with extended non-metallic handles (See Figure 3).

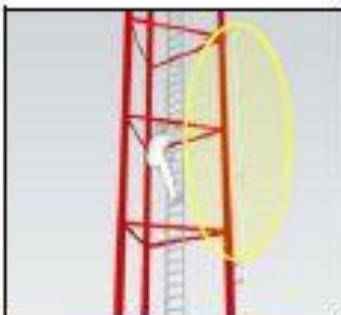


Fig 1 Climbing pass TV antenna.

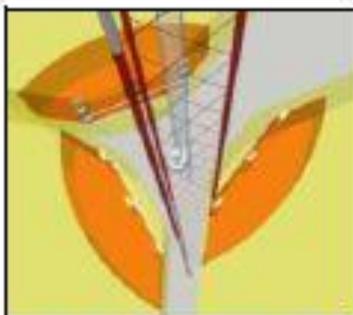


Fig 2 Climbing behind Cellular directional antennas.

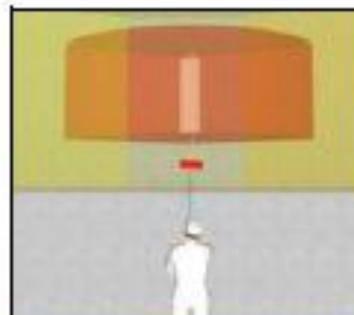


Fig 3 Using extended handles to work below RF restricted area.

The indicated "stand-off" distances assume maximum transmitting power for common cellular and telecommunication antennas. Additional RF analysis, such as time and spatial averaging, or RF measurements would normally show that persons can approach much closer than these distances, particularly for RF trained workers who qualify for FCC occupational limits as certified by their employer.

Compliance Certification Statement

The information provided by this RF Safety Sheet was accurate as of _____. Assuming no significant changes are made to the transmitting antennas, including the installation of new antennas, I certify that following the rules described in this RF Safety Sheet and its associated site RF Safety Program will assure compliance with FCC exposure limits.



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Appendix C: Access Control Procedures:

C.1. Site Access

- 1.1.** Access to the site is achieved via an entrance gate across the service road on the SW section of the property. An RF Notice sign will remain posted at the gate and the gate will be locked at all times. The Notice sign provides contact information for persons needing access to the site.
 - 1.1.1. At the Site Manager's discretion and control, persons registered to work at the site may be provided the combination/key to the lock at this gate.
- 1.2.** Access to the tower and certain transmitting equipment is achieved through a gate near the bottom of the tower. An RF Notice sign will remain posted at the gate and the gate will be locked at all times.
 - 1.2.1. Persons needing access to the tower must contact Site Manager for Registration prior to unlocking the gate.
 - 1.2.2. At the Site Manager's discretion and control, persons registered to work at the site may be provided the combination/key to the lock at this gate.
- 1.3.** It is required that bid-requests for work within the site and agreements with tenants occupying the site include a copy of the RF Safety Sheet and require compliance with the site RF Safety Program.

C.2. Registration of Access

- 2.1.** Access Registration is used to distribute the current RF Safety Sheet, determine the need to implement power-down or alternative work procedures, and to document that persons have been provided the information.
- 2.2.** Registration consists of reading the current site RF Safety Sheet and signing a log declaring an understanding of, and agreement to, the rules described in the Sheet. The registrant will specifically be asked if access to any RF Restricted Area is required. If so, the Site Manager will review the request and implement power-down procedures as needed.
 - 2.2.1. The Site Manager may need to make special arrangements for scheduling shut-down of the transmitting microwave dish and communication antennas which are normally operated remotely for the rare situation when a worker needs access to the RF Restricted Area in front of these antennas.



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- 2.3. Workers accessing the tower must present authorization from their employer that they are medically fit and adequately trained for the work, including any special considerations for RF sensitive medical devices. It is recommended that workers also be qualified and approved by their Employer for FCC Occupational limits.
- 2.4. The Site Manager will store Registration Logs and employer authorizations indefinitely to document training.

Appendix D: Antenna Power-Down Procedures

D.1. General Protocol for Antenna Power-Down

In lieu of traditional “lockout/tagout” procedures, this site utilizes the following combination of controls to ensure persons are not over-exposed to RF fields from active antennas.

- Only RF trained persons are allowed on the tower.
- While persons are on the tower, the activation of antennas is performed by a single person, the Designated Transmitter Operator (DTO) for the climb, who follows strict shut-down and tag-out procedures.
- The DTO is in constant communications with climbers on the tower.
- Protocol and RF signs inform climbers when to request the DTO to power-down specific antennas prior to entering the antennas’ RF Restricted Areas.
- Climbers use continuous RF personal alarms to verify antenna de-activation and ensure compliance with FCC exposure limits.

D.2. Antenna Deactivation/Activation Action Points

- 2.1. Prior to persons climbing the tower, the Site Manager will assign a single competent person to act as the “Designated Transmitter Operator (DTO)” for the duration of the climb. Only the DTO can operate transmitter controls while persons are on the tower.
- 2.2. The front of the RF Safety Sheet describes when persons climbing the tower ladder must call the DTO to have antennas deactivated prior to entering RF Restricted Areas. In addition, climbers must call for antenna deactivation prior to entering RF Restricted Areas while off the ladder, such as areas in front of directional antennas (e.g., MW dishes) and near omni-directional antennas.
 - 2.2.1. As part of the antenna deactivation process, the DTO will disable remote control of transmitters, including auxiliary transmitters, so that they cannot be turned on remotely. A “climber alert” tag (see Appendix F) will be placed by the DTO over applicable Enable Remote switches indicating power-down procedures are in process (see figure below). Only the DTO can apply or remove the tags.



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2.2.2. Likewise, the DTO will apply “climber alert” tags over switches [Alternatively: locked cabinet] used to power down transmitters (see figure above). Only the DTO can operate the transmitters and apply/remove the applicable locks and tags.

2.2.3. Prior to activation, the DTO will be notified by each climber on the tower that they are clear of the RF Restricted Area of the antenna to be energized.

2.3. The Employer of tower climbers must establish and implement safety procedures which protect their employees from RF exposures in excess of FCC limits. The procedures must include the selection and use of an RF detector/instrument with an alarm to verify antenna de-activation and compliance with exposure limits.

D.3. Maintenance work performed in RF Restricted Areas

The use of Alternative Work Procedures (ref. Appendix A) makes it possible to perform some maintenance tasks within RF Restricted Areas without de-energizing nearby antennas. These are most practical near the relatively low-powered antennas located below XXX feet on the tower.

D.4. Transmitters and RF Conductors

4.1. Improperly maintained transmitters and related RF conductors can result in excessive RF exposures to nearby persons. Therefore, all transmitters and related equipment shall be maintained as specified by the manufacturer and “industry best practices”.

Appendix E: Audit Procedures

Audits of the site RF Safety Program will be performed by the site RF Safety Officer annually and whenever changes affecting the RF Restricted Areas are made, such as the installation of new antennas. The audits will include reviews of the following items plus any other issues which are relevant to the effectiveness of the Program. The RF audits may be integrated with other audits for efficiency, such as fire and tower inspections.

- Current RF Safety Sheet, Antenna Inventory and RF Analysis reflecting any changes to the transmitting antennas (e.g., numbers, location, power levels).
- Testing and update of contact information.
- Condition of fence, lock and RF sign posted near the gate.
- Condition of signs posted on the tower.
- Review of access Registration Log and procedures used.



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- Resolution of any incident reports or deficiencies reported previously.
- Review effectiveness of distributing RF Safety Sheets to maintenance and antenna operator workers.
- Review effectiveness of power-down procedures if used during the year.

Appendix G: Inventory of Antennas (and related RF Signs)

G.1. Transmitting Antennas and RF Signs on the XXX Tower

Height(ft)*	Mount	Station	Frequency	ERP	Antenna
950-1025	Top Mast	Main (2 stations)	95.1 MHz/96.1 MHz	100 kW	8 Bay FM
925	Warning	Radiofrequency Hazard. If climbing up: Call for and verify shut-down of Main antenna and activation of Aux antennas. If climbing down: Call to activate Main antenna.			
925	N Leg	N/A	102.1 MHz	50 W	Single Bay FM
925	Caution	Radiofrequency Hazard. Stay on ladder. Call for and verify shut-down prior to going within 5 ft. of FM antenna.			
831-886	W Leg	XXX/Aux/HD	95.1 MHz	700 W	5 Bay FM Aux
822	Warning	Radiofrequency Hazard. If climbing up: Call for and verify shut-down of XXX Aux antenna. If climbing down: Call to activate XXX Aux antenna and shut-down XXX Aux antenna.			
789-822	W Leg	Renda Aux	96.1 MHz	700 W	4 Bay FM Aux
775	Warning	Radiofrequency Hazard. If climbing up: Verify shut-down of XXX Aux antenna.			
613	W Leg	Communications	450 MHz	100 W	Dipole
610	Caution	Radiofrequency Hazard. Stay on ladder. Call for and verify shut-down prior to going within 5 ft. of antenna.			
Platform	Platform	Communications	N/A	100 W	2-way



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Platform	Caution	Radiofrequency Hazard. Maintain 5 ft distance from communications antennas mounted on platform.			
444	N Leg	Communications	N/A	6 W	2 MW Grids
394-416	W Leg	TV Antenna	N/A	1 kW	Dipole
390	Caution	Radiofrequency Hazard. Stay on ladder. Call for and verify shut-down prior to going within 5 ft. of antenna.			
354	E Leg	Communications	N/A	N/A	Dish
234	E Leg	Communications	N/A	N/A	Grid
190	Caution	Radiofrequency Hazard. 190 ft - platform: Call for and verify shut-down prior to going in front of antennas outside the tower.			
65	3 120° Sectors	Cellular	850-1900 MHz	~400 W	Panel
65	Caution	Radio Frequency Hazard. Call for and verify shut-down prior to going in front of cellular antennas outside the tower.			
5	Notice	Radiofrequency fields can exceed FCC limits at locations on this tower. Verify communications with Site Manager prior to climbing.			
Site Gate	Notice	Radiofrequency fields can exceed FCC limits at locations on this site. Register and Obtain RF safety information prior to entering at (123) 123-4567.			



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Annex B.2 Example RF Safety Sheet for Cellular Site

Compliance Site ID
N/A

RF SAFETY SHEET FOR XXX ANTENNAS

Ver 10.30.2010

Site Address:
123 Elm Street
Anywhere, USA

Contact Information
Property Owner: Hospital
(123) 456-7890



Figure 1: Photo showing Sector B antenna high on East wall.

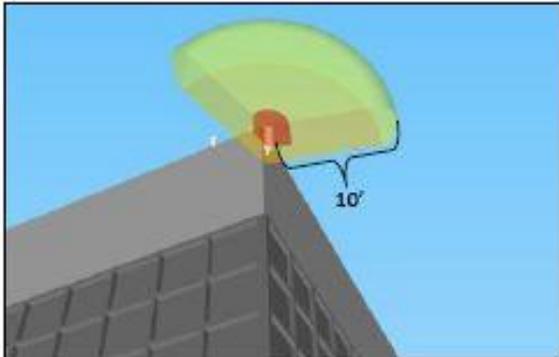


Figure 2: Graphic of Sector B antenna showing RF Restricted Area.

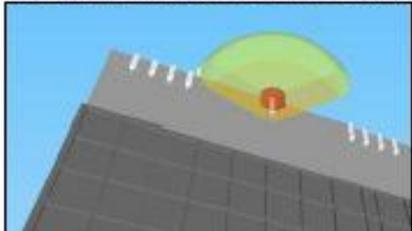


Figure 3: Sector A antenna on North wall.



Figure 4: Sector C antenna on West wall.



Figure 5: Rooftop View

**DO NOT ENTER RF RESTRICTED AREAS WITHIN 10ft
IN FRONT OF ANTENNAS WHILE TRANSMITTING**

Call (123) 456-7890 to shut down power to antennas before entering these Areas.



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(Back of RF Safety Sheet)

It is expected that antennas will rarely be shut-down since access to the RF Restricted Areas is only needed for infrequent maintenance tasks occurring on the upper sides of the building (e.g., window washing, painting, etc.).

When possible, use procedures which minimize the time power to the antennas must be turned off while still complying with RF exposure limits. For example:

1. You may reach into RF Restricted Areas using tools with extended wood or plastic handles (See Fig 6).
2. If your employer has certified that you qualify for FCC Occupational RF limits, you may work as close as 4 ft. of the antennas while they are transmitting (See Figure 7). When doing so, you should use an RF personal monitor to ensure compliance with FCC RF limits.

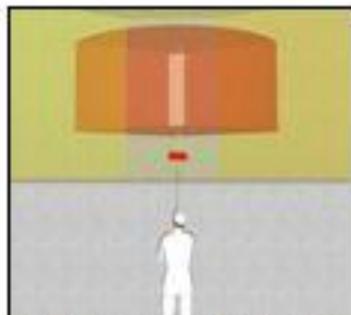


Figure 6 – Reach into RF Restricted Areas with extended tools.

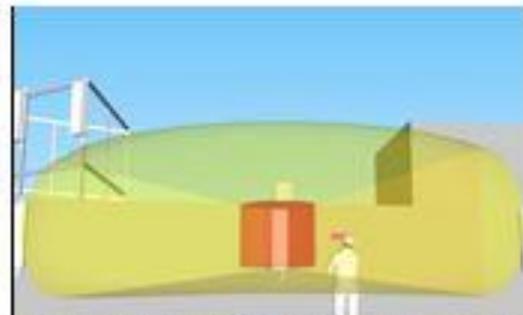


Figure 7 – Employer certified RF trained workers may work as close as 4 ft of antennas.

The indicated "stand-off" distances assume maximum transmitting power for common cellular and telecommunication antennas. Additional RF analysis, such as time and spatial averaging, or RF measurements would normally show that persons can approach much closer than these distances, particularly for RF trained workers who qualify for FCC occupational limits as certified by their employer.

Compliance Certification Statement

I certify that following the guidance of this RF Safety Sheet will ensure compliance with FCC exposure limits from the specified antennas.

Signed By John Doe, BS, CE, CH

Date



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