

Technician License Class



Tulsa Amateur Radio Club

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Images from ARRL, Wikipedia, Other Sources

21/08/06

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Shoot for 50 minutes presentation time.

Chapter 7

Radio Safety

21/08/06

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Electrical Hazards

- A commonly accepted value for the lowest voltage that can cause a dangerous electric shock is 30 volts.
- The lowest amount of electrical current flowing through the human body that is likely to cause death is 100 milliamperes.



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T0A01 What is a commonly accepted value for the lowest voltage that can cause a dangerous electric shock? 30 volts

T0A02 What is the lowest amount of electrical current flowing through the human body that is likely to cause death? 100 milliamperes

AC Wiring

- The green wire in a three-wire electrical plug is connected to ground.
- To guard against electrical shock at your station:
 - Always use 3-wire cords and plugs for all AC powered equipment.
 - Connect all AC powered station equipment to a common ground.
 - Use a ground-fault interrupter at each electrical outlet.

T0A03 What is connected to the green wire in a three-wire electrical plug? Ground

T0A06 What is a good way to guard against electrical shock at your station? Use 3-wire cords and plugs for all AC powered equipment; Connect all AC powered station equipment to a common ground; Use a ground-fault interrupter at each electrical outlet

Lightning

- If lightning storm is expected:
 - Disconnect the antenna cables from your station and move them away from your radio equipment
 - Unplug all power cords from AC outlets
 - Stop using your radio equipment and move to another room until the storm passes
- Lightning can destroy your radio.
- The most important danger with lightning is **fire!**

T0A08 What precautions should be taken when a lightning storm is expected? Disconnect the antenna cables from your station and move them away from your radio equipment; Unplug all power cords from AC outlets; Stop using your radio equipment and move to another room until the storm passes

T0A12 What is the most important reason to have a lightning protection system for your amateur radio station? Fire prevention

Lightning and Ham Radio



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<http://www.eng.toyo.ac.jp/~s-katoh/english/lightning2.html>



Don't let this
happen to you!



<http://www.astrosurf.com/lombry/qs1-lightning-protection.htm>

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Power Supplies

- You might receive an electric shock from stored charge in the large capacitors of a power supply.



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T0A13 What kind of hazard might exist in a power supply when it is turned off and disconnected? You might receive an electric shock from stored charge in large capacitors

Radio Frequency Energy and the Human Body

- There are two types of RF energy that can damage the human body:
 - Ionizing - can cause cancer
 - Non-ionizing - heats body tissue
- If the combination of signal strength and frequency cause excessive power to be absorbed, radio waves can cause damage to the body.

T0C01 What type of radiation are VHF and UHF radio signals? Non-ionizing radiation

T0C02 When can radio waves cause injury to the human body? Only if the combination of signal strength and frequency cause excessive power to be absorbed

T0C07 What could happen if a person accidentally touched your antenna while you were transmitting? They might receive a painful RF burn injury

Controlling Radiation Exposure

- The level of RF exposure of people near an amateur transmitter is affected by:
 - Frequency and power level of the RF field
 - Distance from the antenna to a person
 - Radiation pattern of the antenna
- These factors are how you control RF radiation exposure.
- The human body absorbs more RF energy at some frequencies than others.

T0C04 What factors affect the RF exposure of people near an amateur transmitter?

Frequency and power level of the RF field;

Distance from the antenna to a person;

Radiation pattern of the antenna

T0C05 Why must the frequency of an RF source be considered when evaluating RF radiation exposure? The human body absorbs more RF energy at some frequencies than others

T0C08 What action might amateur operators take to prevent exposure to RF radiation in excess of FCC supplied limits? Alter antenna patterns; Relocate antennas; Change station parameters such as frequency or power

Safety Levels

- You may safely use 50 watts PEP at frequencies above 30Mhz.
- If you use more than this, you must perform an RF exposure evaluation.
- To perform an evaluation, use one of the following:
 - Calculation based on FCC OET Bulletin 65
 - Calculation based on computer modeling
 - Measurement of field strength using calibrated equipment

T0C03 What is the maximum power level that an amateur radio station may use at frequencies above 30 MHz before an RF exposure evaluation is required? 50 watts PEP at the antenna

T0C06 How can you determine that your station complies with FCC RF exposure regulations? By calculation based on FCC OET Bulletin 65; By calculation based on computer modeling; By measurement of field strength using calibrated equipment

Safety Evaluation

- Milliwatts per square centimeter is used to measure RF radiation exposure. This can be calculated or looked up in a table.
- The duty cycle is factored in to RF radiation exposure levels because it takes into account the amount of time the transmitter is operating.
- Whenever an item of equipment is changed, you can make sure your station stays in compliance with RF safety regulations by re-evaluating the station.

T0C09 How can you make sure your station stays in compliance with RF safety regulations? By re-evaluating the station whenever an item of equipment is changed

T0C10 Which of the following units of measurement is used to measure RF radiation exposure? Milliwatts per square centimeter

T0C11 Why is duty cycle one of the factors used to determine safe RF radiation exposure levels? It takes into account the amount of time the transmitter is operating

Tower Safety - Working on the Tower

- You should always wear a hard hat and safety glasses if you are on the ground helping someone work on an antenna tower to protect your head and eyes in case something accidentally falls from the tower.
- Always put on your safety belt and safety glasses before climbing an antenna tower.
- Before you climbing a tower:
 - Arrange for a helper or observer
 - Inspect the tower for damage or loose hardware
 - Make sure there are no electrical storms nearby

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T0B01 Why should you wear a hard hat and safety glasses if you are on the ground helping someone work on an antenna tower?
To protect your head and eyes in case something accidentally falls from the tower

T0B02 What is a good precaution to observe before climbing an antenna tower? Put on your safety belt and safety glasses

T0B03 What should you do before you climb a tower? Arrange for a helper or observer; Inspect the tower for damage or loose hardware; Make sure there are no electrical storms nearby

Tower Safety - Placement

- Always consider the maximum allowed height when erecting an antenna near an airport. This may be less than the usual 200 feet.
- The most important safety precautions to observe when putting up an antenna tower:
 - Look for and stay clear of any overhead electrical wires.
 - Position the antenna far enough away so that if the antenna falls unexpectedly, no part of it can come closer than 10 feet to the power wires.
- Make sure people cannot accidentally come into contact with the antenna.

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T0B05 What must be considered when erecting an antenna near an airport? The maximum allowed height with regard to nearby airports

T0B06 What is the most important safety precaution to observe when putting up an antenna tower? Look for and stay clear of any overhead electrical wires

T0B08 What is a safe distance from a power line to allow when installing an antenna? So that if the antenna falls unexpectedly, no part of it can come closer than 10 feet to the power wires

T0B04 What is an important consideration when putting up an antenna? Make sure people cannot accidentally come into contact with it

More Tower Safety

- The guy wires for an antenna tower should always be installed in accordance with the tower manufacturer's instructions.
- A crank-up tower should never be climbed unless it is in the fully lowered position
- Stainless steel is commonly used on antennas because the parts are much less likely to corrode.
- Separate 8 foot long ground rods for each tower leg, bonded to the tower and each other are considered to be an adequate ground system for a tower.

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T0B07 How should the guy wires for an antenna tower be installed? In accordance with the tower manufacturer's instructions

T0B09 What is the most important safety rule to remember when using a crank-up tower? A crank-up tower should never be climbed unless it is in the fully lowered position

T0B10 Why is stainless steel hardware used on many antennas instead of other metals? Stainless steel parts are much less likely to corrode

T0B11 What is considered to be an adequate ground for a tower? Separate 8 foot long ground rods for each tower leg, bonded to the tower and each other

Chapter 7

The End