Jules' Workshop

Standard

Unit 22
SAFETY

ACMA Syllabus February 2024

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Safety in the Shack

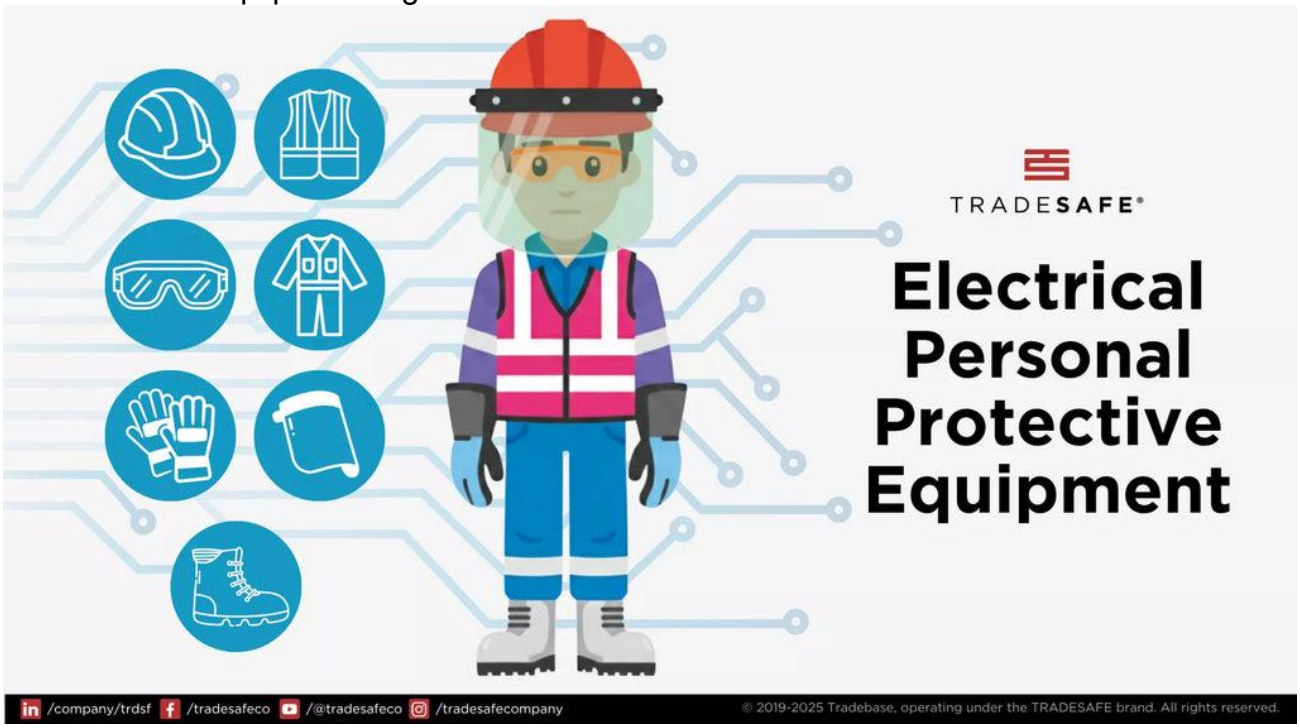
Electric shock

The Human body can be damaged by current flowing through the skin and muscles. The muscle can spasm severely.
If the heart muscle spasms severely, this may cause the heart to go into ventricular fibrillation. This can lead to death.
Our skin resistance will determine the amount of current which will flow through our body if we touch a live conductor. If the voltage is high enough, burns may also result.
Current level and affects.

- At 0.001 amps the sensation is discernible.
- At 0.01 amps pain is experienced.
- Between 0.01 amps and 0.1 amps breathing will become difficult and severe shock will be experienced.
- From 0.1 to 1-amp severe burns can occur, breathing stops and death almost certainly can result.

As radio operators, we need to be cautious when dealing with 230 V AC mains equipment. If the equipment also is fitted with valves and transformers, the voltages may be in the thousands.
Some tips when working with mains equipment are:

- Wear insulated shoes Not bare feet.
- Isolate the power.
- Ideally have a co-worker.
- Ensure the equipment is grounded.



Mains wiring

The standard power point (often referred to as a GPO- General Purpose Outlet) supplies 230 Volts at 50 Hz to our equipment. The standard GPO is rated at 10amps. Other GPOs with a wider earth pi can supply 15 amps. These are common in caravans and welders.
Loads on these power points should be monitored and overloading prevented.

Disconnected earths.

The mains earth connection is an important safety feature of the manis wiring. Deliberately disconnecting the earth is an extremely dangerous practice.
Mains powered radio equipment has an electrical earth. This is incorporated in the mains plug. When working on mains equipment, the earth is the last wire removed and the first wire to be replaced.

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Interlocks

When maintaining a piece of industrial equipment, access to the internals may be controlled by an interlock switch.

This switch usually prevents the device from being turned on while accessing the internals.

Batteries

Lead-acid batteries are generally safe when used correctly. They can present significant safety hazards can include the following.

- Exposure to highly corrosive sulfuric acid.
- Release of explosive hydrogen gas during charging. Only charge lead acid batteries in open spaces or well-ventilated areas.

Lead-acid batteries are considered hazardous waste, requiring proper handling, storage, and disposal.

Rechargeable lithium-ion batteries are used in all manner of devices. They are lightweight, energy dense and long lasting but can be more volatile than traditional batteries.

Occasionally, if a Lithium-ion Battery is improperly charged, handled, stored or disposed of there is a risk of overheating, catching fire or explosion.

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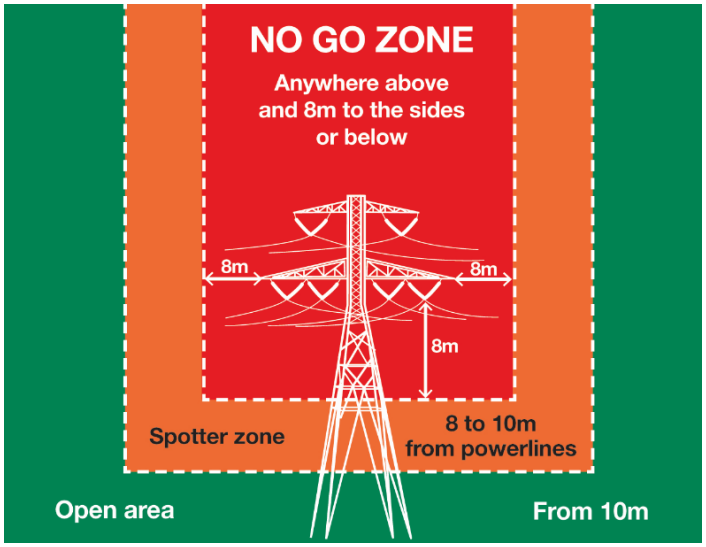
Capacitors

Capacitors look innocuous but can still retain a deadly charge. A charged capacitor which can supply sufficient current to kill. Discharge any unknown capacitors with an insulated screwdriver before handling.

Polorised capacitors will explode if connected incorrectly.

Mobile or Portable antennas

Before erecting any antenna at a mobile of portable site, look up. Ensure the antenna will not contact any overhead power lines.



Flexible Mains Cords

Regular checks identify insulation wear, frayed wires, and continuity issues that cause dangerous, intermittent faults. Specialized flexibility tests also verify that cables can withstand continuous flexing, high-current, or extreme conditions without failing.
Fix frayed cables.

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Fuses

A fuse is designed to melt when the current exceeds the fuse ratings. This will open the circuit and stop the supply of electricity. If you house or shack is fitted with main fuses, have them replaced with circuit breakers.
Never replace a fuse with a device that can handle higher current.
The image is of a slow blow fuse.

Circuit breakers (CBs) and Residual Current Devices (RCDs)

CBs come in various names and types. They are quicker to operate than fuses and require far less leakage current.

CBs protect infrastructure by preventing overload and short circuits, whereas RCDs (safety switches) protect people by immediately detecting electrical leaks to ground. Together, they prevent fires and deadly shock

Lightning

Lightning is not friendly to antennas and radio equipment and can cause extensive damage. If lightning is predicted in our area, close the station, disconnect radios from antenna and earth all the antenna cables coming into the shack.

Lightning arrestors can be installed if lightening is a constant hazard.

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Surges or spikes from a lightning strike can induce spikes in cabling and wiring. Insulation breakdown and damage can often be caused this way. Damaged antenna.

RF hazards

The high RF power levels in transmitters and amplifiers are a risk in themselves.

Shielding of the high-power compartments helps to contain the RF energy and to prevent unwanted exposure.

At Microwave frequencies, RF fields can become a hazard to eyesight as the concentrated energy can affect the eyes.

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Hazardous chemicals and gases

There are many hazardous chemicals in and around the radio shack.
Items include the following.

- Acids such as sulphuric acid in batteries.
- Alkalis such as caustic soda.
- Polychlorinated Biphenyls. (PCB) in transformer insulating oils.
- Etchants like ferric chloride and Ammonium persulphate.
- Insulators like beryllium oxide.
- Asbestos
- Charging a lead-acid battery generates gases.

Precaution should be taken when handling any chemical.

- Wear gloves.
- Wear eye protection.
- Wear breathing apparatus if needed.
- Have soap and water on hand in case of a spill.

Cathode ray Tubes (CRTs)

Working with Cathode Ray Tube (CRT) monitors is dangerous due to high-voltage capacitors (20-25kV) that hold charges for days. CRTs can implode from the vacuum and release toxic materials like phosphor and glass shards.
Always discharge the CRT anode before touching.
Wear safety glasses, use one hand, and wear insulated rubber gloves.

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Working at Heights

Falls are Australia's leading cause of injury hospitalisation and death, representing 43% of injury hospitalisations and 42% of injury deaths.

Falls requiring hospitalisation occur more frequently in adults with increasing age and are most likely to occur in the home.

Over half of injuries from falls involve hospitalisation with a fracture.

Working at heights is a high-risk activity, and a leading cause of death and serious injury in Australia. Where possible, you must ensure your work is carried out on the ground or on a solid construction.

If that's not possible, you must provide and maintain a safe system of work to provide adequate protection from falls. This includes providing:

- a fall prevention device – for example, barriers, scaffolding, elevating work platforms.
- if that's not possible, a work positioning system – for example, an industrial rope access system.
- if that's not possible, a fall arrest system – for example, a safety net or catch platform.

Work with a risk of falling more than 2 metres is high risk construction work. You must prepare a Safe Work Method Statement (SWMS) for high-risk construction work.

Remember, you are important to your loved ones.

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Antenna Heights

Australian Building Regulations 2018
97 Masts, poles etc.

(1) a mast, pole, aerial, antenna, chimney, flue or service pipe—

(a) when attached to a building, must not exceed a height of 3 m above the highest point of the roof of the building: or

(b) when not attached to a building, must not exceed 8 m above the ground level.

(2) The report and consent of the relevant council must be obtained to an application for a building permit in relation to a design that does not comply with this regulation.

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