حكومت رأس الخيمت Government of Ras Al Khaimah



Guidelines for Electrical Safety





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1. Introduction

As a source of energy/power, electricity is used in all aspects of life. In the homes and at work, electricity provides the power for everything from domestic appliances to industrial machines, from office equipment to electric tools. When compared to the potential dangers of machinery and chemical substances, electrical hazards can be easily overlooked. Unfortunately, this neglect often causes serious accidents and loss of property. Many of these accidents can be prevented as they are mainly caused by electricity users who lack basic safety awareness.

All electrical systems have the potential to cause harm. Electricity can be either **"static" or "dynamic."** Dynamic electricity is the uniform motion of electrons through a conductor (this is known as electric current). Conductors are materials that allow the movement of electricity through them. Most metals are conductors. The human body is also a conductor. This document is about dynamic electricity.

Note: Static electricity is an accumulation of charge on surfaces as a result of contact and friction with another surface. This contact/friction causes an accumulation of electrons on one surface and a deficiency of electrons on the other surface.

2. Scope

This guideline outlines the electrical safety program, aimed at reducing the risk of exposure to electrical hazards for employers, employees, visitors, and contractors. The provisions established within this document apply to all areas within the RAKEZ Jurisdiction.

3. Definitions

	Fig 3.1: Competent Person	Competent Person: A person who has the necessary practical and theoretical skills, acquired through training, qualification, experience, or a combination of these, to correctly and safely undertake the tasks prescribed by these guidelines.
	Fig 3.2: Electrical Appliance	Electrical Appliance: A device or apparatus that is connected to the electrical power supply through a general-purpose outlet in the form of a plug-in type.
খি	Fig 3.3: Electrical Installation	Electrical Installation: A system that supplies electricity to a building, including switchboards, distribution boards, fixed wiring, and socket outlets.
щ© V	Fig 3.4: Electrical Installation	Extension Lead : An assembly of a plug intended for connection to a mains outlet socket, a sheathed flexible cord, and a cord extension socket.
	Fig 3.5: Electrical Work	Electrical Work: Work involving: connecting electricity supply wiring to electrical equipment or disconnecting electricity supply wiring from electrical equipment installing, removing, adding, testing, replacing, repairing, altering, or maintaining electrical equipment or an electrical installation.
5P	Fig 3.6: RCD	RCD: A Residual Current Device is a mechanical switching device intended to isolate the circuit when the current imbalance attains the rated operating leakage current value of the device





4. Electrical hazards

The main hazards associated with the use of electricity are contacted with live parts causing electric shock and burns; faults that could cause a fire; and fire or explosion where electricity could be the source of ignition in a potentially flammable or explosive atmosphere.

4.1. Electric shock

Electric shock refers to the electricity passing through the human body, affecting the normal function of the heart, lungs, and nervous system. Ventricular fibrillation caused by electricity is the main reason for death from electric shocks. Electric shocks may indirectly lead to accidents, e.g. falling from heights and bruising due to body trauma, etc.



Fig 4.1: Electric Shock

Ventricular fibrillation involves a series of disordered contractions of the heart's ventricular muscle fibers, which



prevents regular heartbeat. Under normal conditions, the human heart rate is from around 60 to 100 times per minute. During an electric shock, the heartbeat may increase up to several hundred times per minute. When the heart cannot sustain such rapid contraction and relaxation, it may stop beating and cause death. **The effect of currents passing through various parts of the body** (See Fig 4.2 above)





4.2. Burns

During an electric shock, the current passing through the body may lead to burns on the skin, muscles, or internal organs. As electric shocks and burns are closely related, preventative measures should be considered together.

4.3. Fire and explosion

High temperatures caused by currents under abnormal conditions, may result in accidental fires and explosions. The common causes leading to high temperatures include:



Fig 4.3: Overloading of electricity



Fig 4.5: Improper contact of electrical circuit



Fig 4.4: Insulator breakdowns or short circuits



Fig 4.6: Improper maintenance of electrical appliances or wiring

5. Principles of Electrical hazards control

This document intends to provide guidelines regarding the reduction of the hazards associated with electrical energy by employing a combination of the six (6) elements of control: Elimination, Substitution, Engineering, Awareness, Administrative Controls, and PPE.







This document does not provide formal training on the theory of electricity or these hazards, however, the following section contains details regarding each of these hazards to provide a brief insight into the effects of these hazards and the importance of following these guidelines.

6. General requirements

- Verify that all electrical equipment is "approved" with recognized approval markings to ensure they meet the electrical safety requirements.
- Electrical equipment that is plugged into a power source should NEVER be handled if your hands or feet are wet.
- Do not allow cables and plugs to get wet. Thus, keep liquids away from electrical equipment.
- Electrical equipment used in wet locations must be protected with a GFCI (Ground-Fault Circuit Interrupter).
- Unplug equipment by pulling on the plug, not the cord.
- Damaged electrical equipment that constitutes an electrical hazard is not to be used until properly repaired/or replaced.
- Never connect electrical cords in series.
- Multiple outlets and power bars should have an automatic circuit breaker, surge protector, and on/off switch.
- All electrical circuit disconnects or panels must not be blocked.
- Know the manufacturer's recommended limits on the use of the electrical product and follow those recommendations precisely. These limits may be found in written instructions that accompany the electrical product.
- Ground pins on the plugs and the devices plugged into the receptacles must be intact.
- Do not use any personal electrical equipment without proper approval from your supervisor.
- Do not store flammable liquids near electrical equipment.

For qualified personnel only

- Evaluate the risk before initiating any electrical work.
- Before working on electrical equipment, de-energize the power source. Lock and tag the disconnect switch.
- Ensure that operating procedures are up to date and appropriate for the working conditions.
- Never leave unprotected systems unattended.
- Use protective equipment such as safety glasses, a hard hat, and electrically insulated gloves when working on live circuits. Consult the Personal Protective Equipment document for appropriate personal protective equipment.

7. Training and education to conduct electrical works

No worker other than a qualified/certified electrician or a person with equivalent qualifications by training and experience shall connect, maintain or modify electrical equipment or installations.

8. Protective measures for the prevention of electrical hazards

Insulation - Shield the electrical conductor with an insulator to prevent direct contact.



Obstacles - Place obstacles to prevent any accidental contact with the electrical conductor.



Fig 8.3: Protection by obstacles

Barriers or enclosures - Create barriers or enclosures that prevent any direct contact with the electrical conductor.



Fig 8.2: Enclosure

Placing out of reach - This prevents accidental contact with the electrical conductor.



Fig 8.4: Conductors out of reach





9. Safety devices

9.1. Fuse

Normally, a fuse is a copper wiring with a set current fusion value. If the current exceeds the set fusion value, the fuse will blow and the current is cut-off, thus preventing overloading.

A fuse must be installed on "live" wires. When replacing a fuse, the new fuse must be the same current fusion value as the old one.

9.2. Circuit breaker (MCB)

Circuit breakers are based on the principle of the electromagnetic field. The current entered may enable the coils of the circuit breaker to magnetize. When the current exceeds the set value (i.e., overloading), the magnetization intensifies, switching off the circuit breaker and disconnecting the electric source.

9.3. Earthing



Fig 9.1: Fuse



Fig 9.2: MCB Enclosure

Earthing provides a low resistance way of discharging electricity to the

ground in case of current leakage. This means that during an electric shock, the current passes through the "earth" wire and is prevented from entering the human body and causing injury. See Fig 9.3 below for the illustration of the principles of the earth.



Fig 9.3

9.4. Earth leakage circuit breaker (ELCB or RCD)

Current leakage protection is also called residual current protection or earthing fault current protection. Earth leakage circuit breakers monitor the operation of the "neutral" or "live" wires in the electrical circuit. During an imbalance in the electrical circuit, or when not all the current flows to the electrical appliance through the "live" wire and returns through the "neutral" wire, part of the current flows away (leaks) into other sources. The earth leakage circuit breaker will immediately detect such an imbalance and cut off the electrical source in 0.4 seconds. The rating of the tripping current shall not exceed 30mA. See Fig 9.4 below for the illustration of the principles of the earth leakage circuit breaker







- **1.** Current travels through the body
- 2. CT picks up current imbalance
- **3.** Sensor detetcts current imbalance and opens circuit Fault is clear and personnel are protected

9.5. Double insulation

An electrical appliance with double insulation is protected by a supplementary insulation layer in addition to basic insulation. Electrical appliances with double insulation bear the " \square "mark. No earth connection is required for such appliances since double insulation provides sufficient protection.



10. Extra low voltage

Using electrical tools with an extra-low voltage of less than 50 V may minimize injury in case of electric shock. When extra-low voltage is used, an earthing connection may not be required.

11. Safe use of electricity.

11.1. Safe use of plugs

Plugs for electrical equipment shall match the power/current rating as illustrated in the specification of electric plugs below.











Rating	5-Ampere Plug	13-Ampere Plug	15-Ampere Plug
Standard	BS 546	BS 1363	BS 546

11.2. Plug safety tips

Use the correct plugs. Never insert the core of the cord directly into a socket.	ر المراجع ممراجع المراجع المراجع المراجع ممراجع المراجع ممراجع ممراجع ممراجع ممراجع ممراجع ممر مراجع المراجع م	Unplug by pulling the plug - not the cord.	Fig 11.3
Do not touch the plug with wet hands, as wet skin reduces the resistance of the body, resulting in more serious injuries.	Fig 11.4	Broken plugs must be replaced immediately.	Fig 11.5
Avoid overloading! Never put too many plugs into the same socket.	Fig 11.6		

11.3. Safe use of electricity

Inspect electrical tools before use. Stop using unsafe tools.

Place trailing cables well to avoid tripping.





Fig 11.8





Use the mobile working platform with proper grounding or use a light-duty working platform (step platform and hop-up platform) made of non-conductive materials.

Electrical-based work must not be carried out near flammable substances: especially electric arc welding.

In a wet working environment or when working outdoors, waterproof plugs and cables must be used.

- Before maintaining electrical appliances, all switches must be turned off and relevant cables unplugged.
- Before carrying out high-risk or large-scale machinery maintenance, the main switch should be turned off. The power source must be locked and labeled with warning signs, to avoid any confusion when reconnecting the power. Implement the "Pointing and Calling" procedure to counter check the safety measures must be properly executed.

Ensure that all electrical installations, equipment, and appliances are regularly repaired and maintained by registered electrical workers.

12. Installation and maintenance of electrical work

The installation and maintenance of electrical work must be carried out in accordance with The Electricity Wiring Regulation" of Etihad WE. "Electrical work" means the work in relation to the installation, commissioning, inspection, testing, maintenance, modification, or repair of relevant projects or work of high or low-voltage fixed electrical installation. Those engaged in projects of non-fixed electrical installation (e.g. repair of table lamps, televisions, refrigerators, etc.) are not required to be registered.

13. Emergency response to electric shock.

If anyone suffers an electric shock, the electricity source should be cut off immediately. Only conduct the first-aid when the victim is in a safe place. Check the victim's breath and pulse. If the person is unconscious but is breathing normally, he or she should be placed in a recovery position. If the victim is not breathing and has no pulse, cardiopulmonary resuscitation should be conducted.











Fig 11.12



Fig 11.13





Note: Cardiopulmonary resuscitation should be carried out only by competent first-aid personnel.

Stop!! Do not touch the person. Look for the hazards



Fig 13.1: Casualty

Shut up of power and/or rescue the person with a non-conducting object if it is safe to approach.

See if the chest rises and



Fig 13.2 Switch Off

Lift the jaw and tilt the head back to open the airway. Clear any obstacles.



Fig 13.3: Open the AIRWAY

(CIRCULATION) Use your fingers to feel the pulse.



Fig 13.5: Check the pulse

Recovery position

If the casualty is unconscious but is

figure below)

Listen for breathing.

Feel breathing on your

falls.

cheek.





Fig 13.6: Recovery position

(Mouth-to-mouth expired air resuscitation: If the person is not breathing, mouth-to-mouth resuscitation should be used to help the resumption of breathing.pulse.



Fig 13.7: Resuscitation

External chest compression

breathing normally, place them in the recovery position. (as shown in the

If the casualty has no pulse, cardiopulmonary resuscitation should be carried out (combining expired air resuscitation and external chest compression).



Fig 13.8: Chest compressions