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**COMMUNITY SUPPORT PROGRAM**

**Improving Economic  
Opportunities**

**Reducing Tensions in  
Vulnerable Communities**

**Enhancing the Delivery  
of Essential Services**

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## Outline (ملخص)

The presentation will cover the following:

1. Training's objective (هدف التدريب)
2. Safety Measures, Guidelines & Precautions (إجراءات السلامة والإرشادات والاحتياطات)
3. Grounding System (نظام التأريض)
4. Theoretical Study
  - a) Basics Electrical Systems Knowledge (أساسيات معرفة الأنظمة الكهربائية)
  - b) Basics Electrical Equipment Knowledge (أساسيات معرفة الأدوات الكهربائية)
  - c) Solutions for Typical Electrical Residential Problems ( حلول لمشاكل سكنية كهربائية )  
(نموذجية)
5. Description of an Audit (وصف التدقيق)
6. Real Case Studies (دراسات حالات حقيقية)
7. Tips & Guidelines for Low Cost/No Cost Energy Conservation Measures ( نصائح )  
( وإرشادات
8. Q & A (أسئلة وأجوبة)



## Safety Measures, Guidelines & Precautions (إجراءات السلامة والإرشادات والاحتياطات)

Safety measures are divided into two types:

### 1. Working Live (العمل دون قطع الكهرباء)



### 2. Working Offline (العمل بدون كهرباء)

- Disconnect the power source (مصدر الطاقة)
- Use a measuring device (جهاز تقيس) to ensure there is no voltage presence
- PPE safety tools (أدوات الحماية الشخصية)
- Safe working environment (بيئة عمل آمنة)



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## Working Live (العمل دون قطع الكهرباء)

### Have a safe working environment

- Avoid wet working conditions (الظروف الرطبة)
- Avoid body contact (احتكاك) with any object that can be grounded or underground
- Avoid touching any other person (تلامس)
- Avoid overheated power lines (خطوط الكهرباء)

### Use the PPE Safety tools (أدوات الحماية الشخصية)

- ESD boots (أحذية ESD)
- Electrical gloves (قفازات الكهربائية)
- Safety glasses (نظارات حماية)

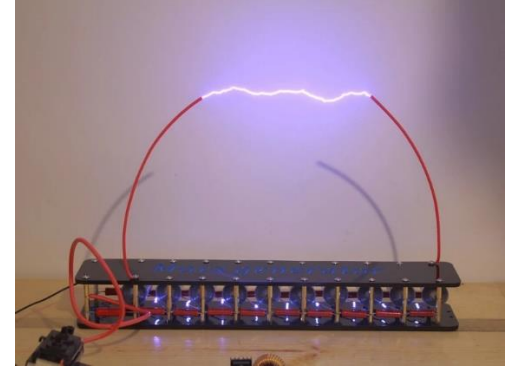
### Work with a buddy

In case of an emergency, the second person can perform CPR (الإنعاش القلبي الرئوي)

### Use & maintain isolated tools (أداة معزولة)

The isolated tools can lose the isolation level due to several working conditions

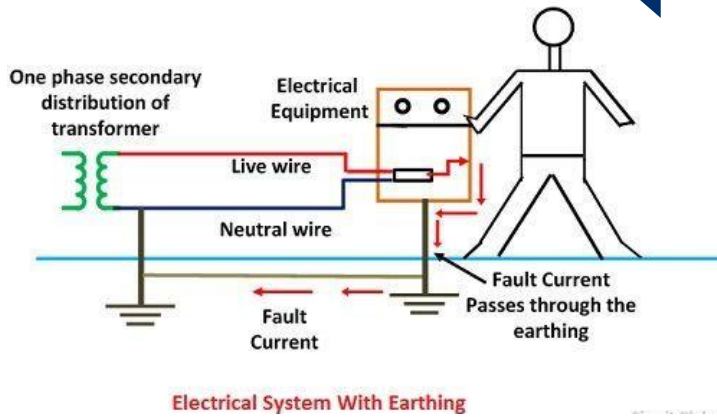
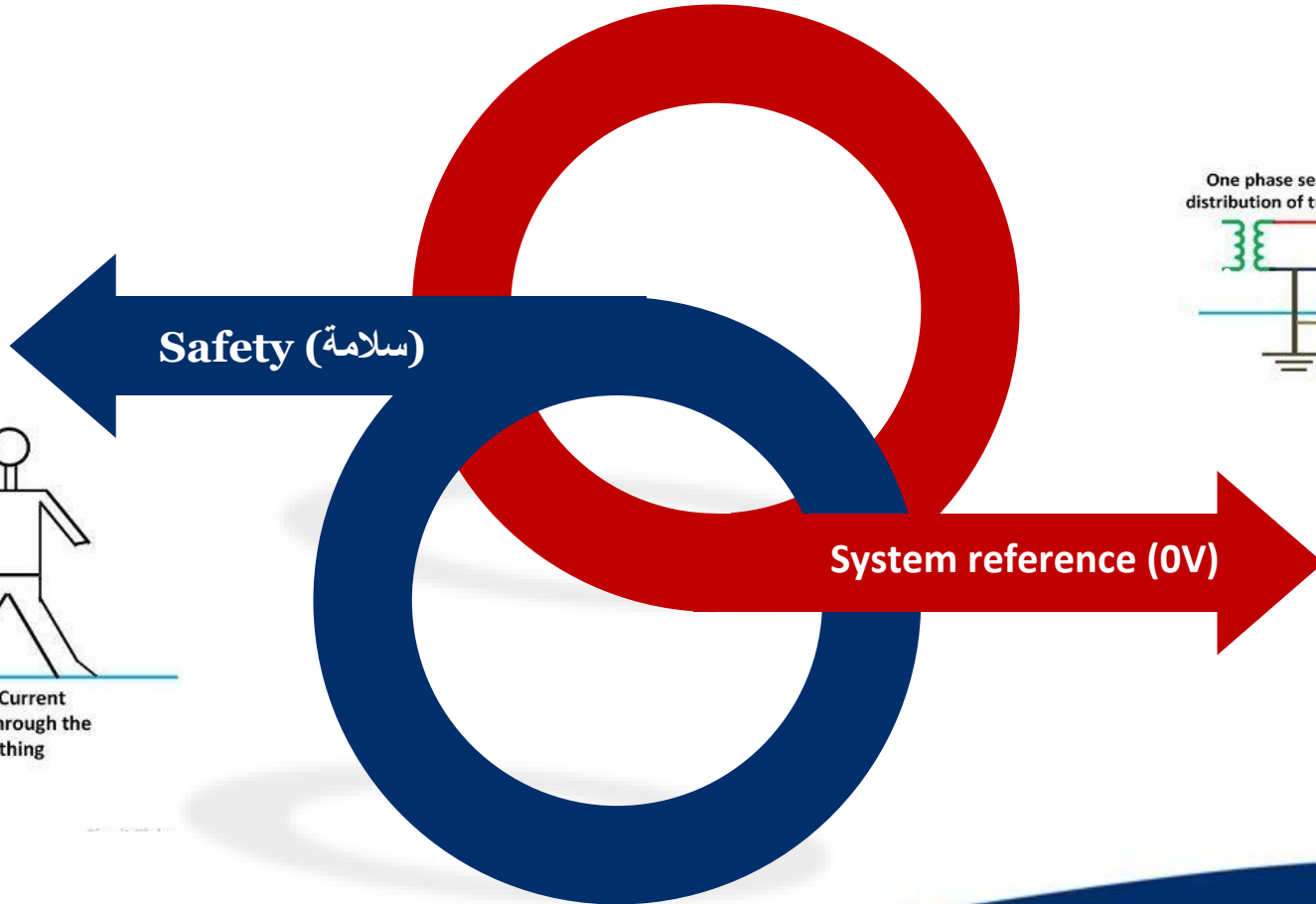
## PPE safety tools (أدوات الحماية الشخصية)



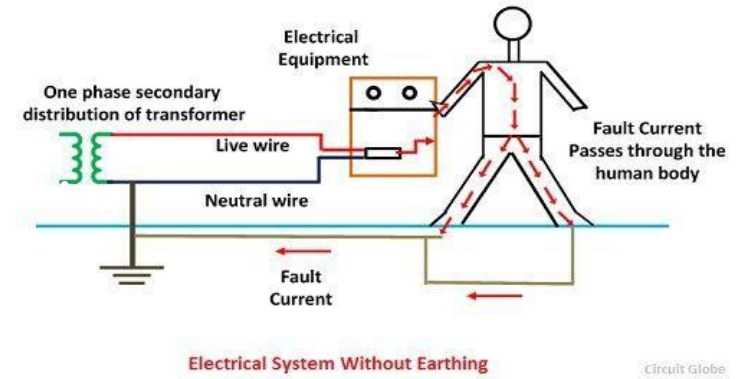


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# Grounding System (نظام التأريض)



Electrical System With Earthing



Electrical System Without Earthing

Circuit Globe





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# Basics Electrical Systems Knowledge (المعرفة الكهربائية الأساسية)

## Types of Voltages and Currents (أنواع التيار الكهربائي)

The sources of DC are below  
(المصادر) :



DC Applications (التطبيقات):



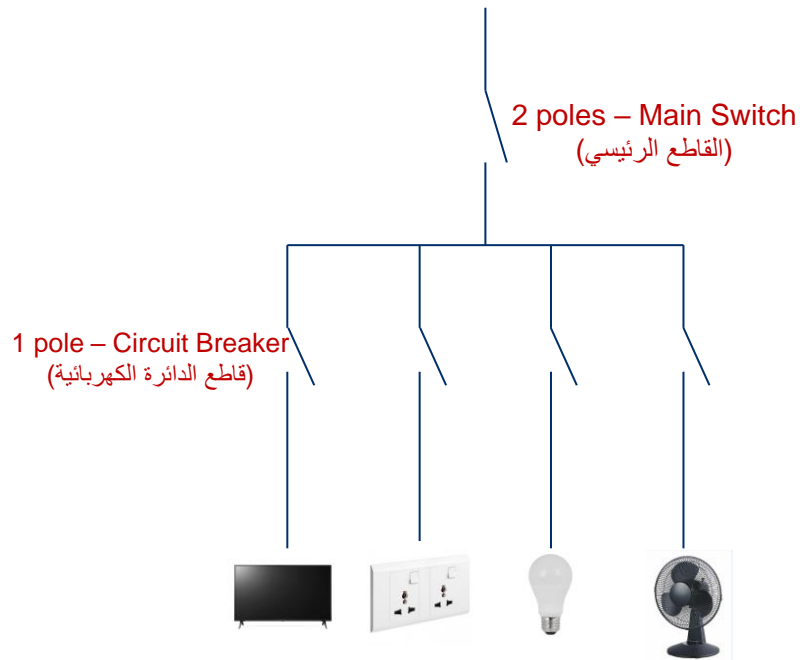


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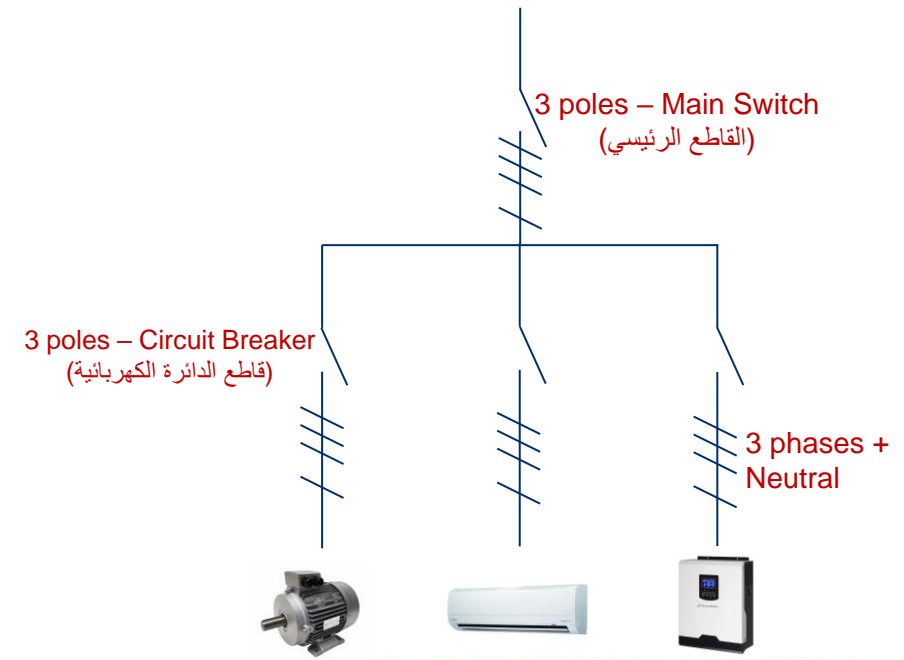
# Basics Electrical Systems Knowledge (المعرفة الكهربائية الأساسية)

## Types of Voltages and Currents (أنواع التيار الكهربائي)

### Single Phase AC Electrical Systems ( نظام كهربائي Mono )



### Three-Phase AC Electrical Systems ( نظام كهربائي 3 phases )







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## Basics Electrical Systems Knowledge (المعرفة الكهربائية الأساسية)

Types of Load & Their Impact on the Energy Consumption (أنواع الأحمال وأثرها على استهلاك الطاقة)

	Resistive Load	Inductive Load
Converts electrical energy (طاقة) into heat (الحرارة)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Store electrical energy (طاقة كهربائية)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Change the phase difference between voltage and current	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Same properties for AC and DC (الحماية)	<input checked="" type="checkbox"/>	<input type="checkbox"/>



## Basics Electrical Systems Knowledge

(المعرفة الكهربائية الأساسية)

Power Formula (معادلة الطاقة)

$$\text{Power (طاقة) (W)} = \text{Voltage (توتر) (V)} * \text{Current (A)}$$

Voltage is 220V



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## Basics Electrical Systems Knowledge (المعرفة الكهربائية الأساسية) Energy Equation (معادلة الطاقة)

$$\text{Energy (طاقة) (Wh)} = \text{Power (W)} * \text{Hours (h)}$$

When paying an electricity bill (فاتورة الكهرباء) for EDL (شركة كهرباء لبنان), the occupant is usually charged for his energy consumption (استهلاك الطاقة). Currently, most of the generator's (مولد كهرباء) owners have installed a meter (عداد) for their customers to charge them on their energy consumption.

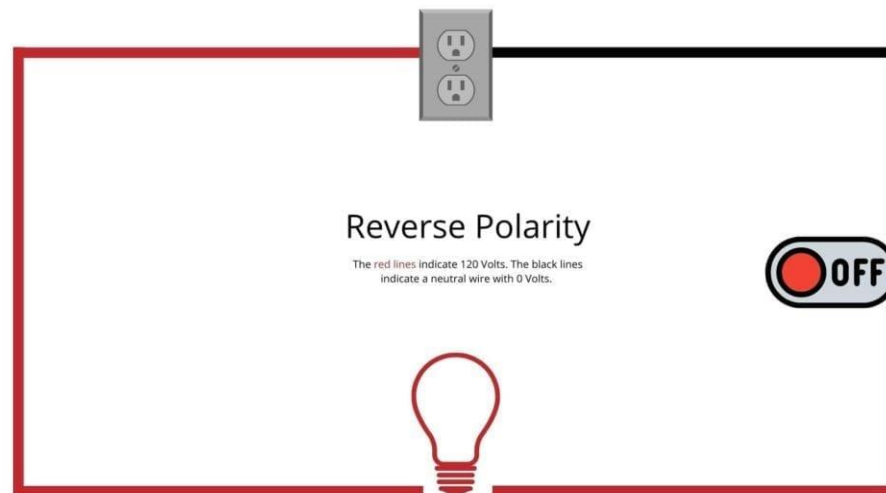
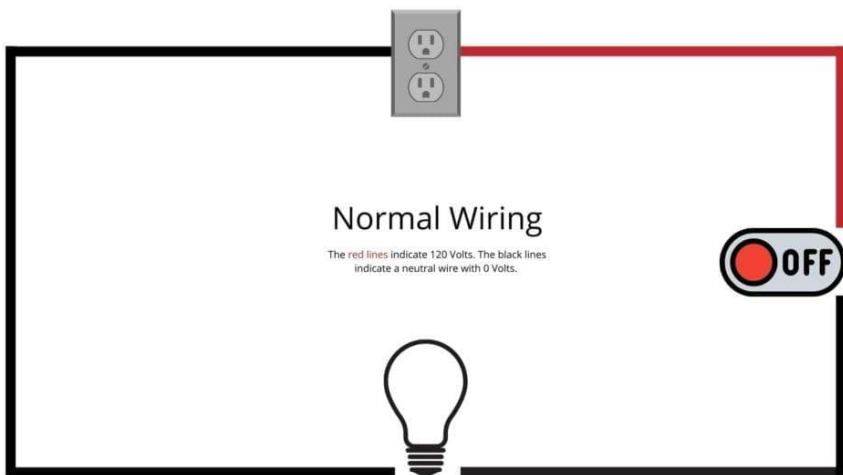


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## Basics Electrical Systems Knowledge (المعرفة الكهربائية الأساسية)

### Polarity (استقطابية)

Reverse polarity is when a receptacle is wired backward. This happens when the “hot” wire, also known as the black or red wire, is wired on the neutral side (Neutre نوتر), and the neutral wire is wired on the “hot” side.

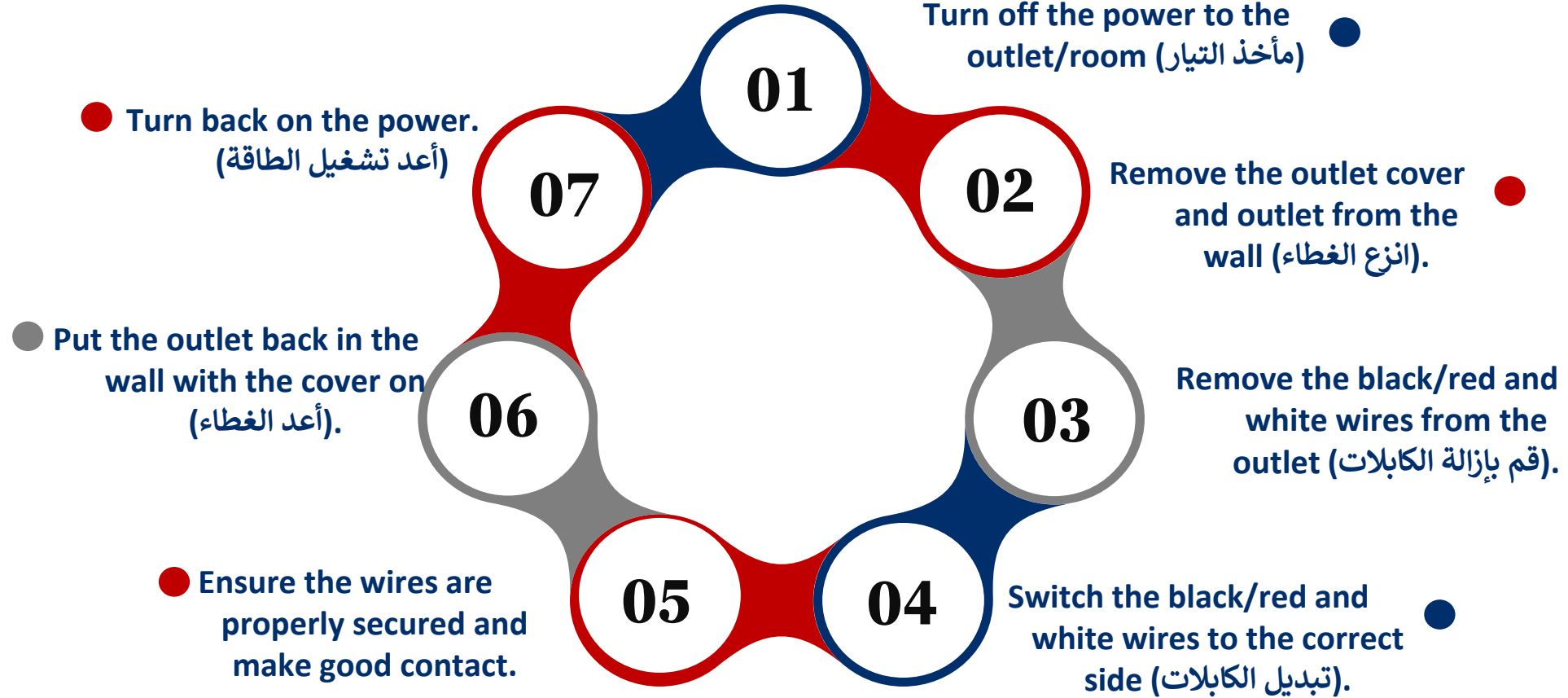




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# Basics Electrical Systems Knowledge (المعرفة الكهربائية الأساسية)

## Polarity (استقطابية)







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## Basics Electrical Systems Knowledge

### (المعرفة الكهربائية الأساسية)

#### Power Quality Problems (مشاكل جودة الطاقة)

##### Overvoltage (التوتر الزائد)

#### Definition



Overvoltage (الجهد الكهربائي الزائد) occurs when the supply voltage (مصدر التيار) rises above the rated voltage of the equipment or motor (الأدوات أو المحرك).

#### Causes



- Poor regulation of a power source from a utility company
- Oversized transformers (محول التيار)
- Uneven or varying circuit loading (تحميل الدائرة كهربائية)
- Close to the substation

#### Solution





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## Basics Electrical Systems Knowledge

### (المعرفة الكهربائية الأساسية)

#### Power Quality Problems (مشاكل جودة الطاقة)

##### Undervoltage (انخفاض التوتر)

#### Definition



Undervoltage (انخفاض التوتر الكهربائي) is defined as a condition where the applied voltage drops to 90% of rated voltage, or less, for at least 1 minute.

#### Causes



- Branch wiring
- Switch (مفتاح كهربائي) malfunction
- Thin cables (كبلات رقيقة)

#### Solution



- Adjust the section of the cable (عرض الكابل)
- Voltage regulator (منظم ضغط كهربائي)
- Minimize the load (تقليل الحمل)

## Basics Electrical Systems Knowledge

### (المعرفة الكهربائية الأساسية)

#### Power Quality Problems (مشاكل جودة الطاقة)

##### Current Peaks (ذروة التيار)

#### Definition

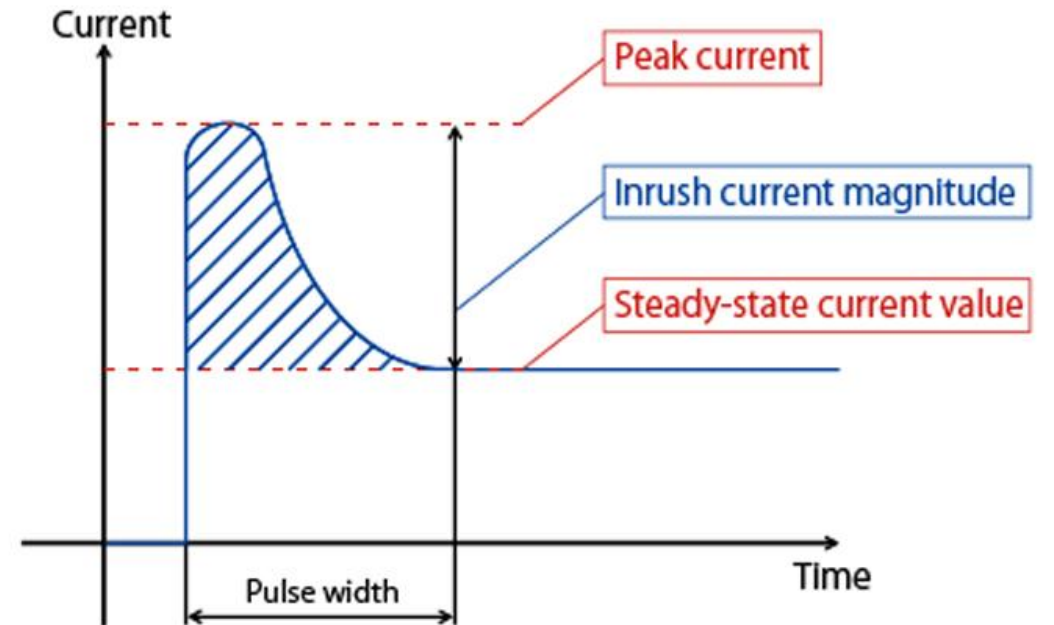


The peak current is the maximum amount of current that output is capable of sourcing for brief periods.

#### Causes



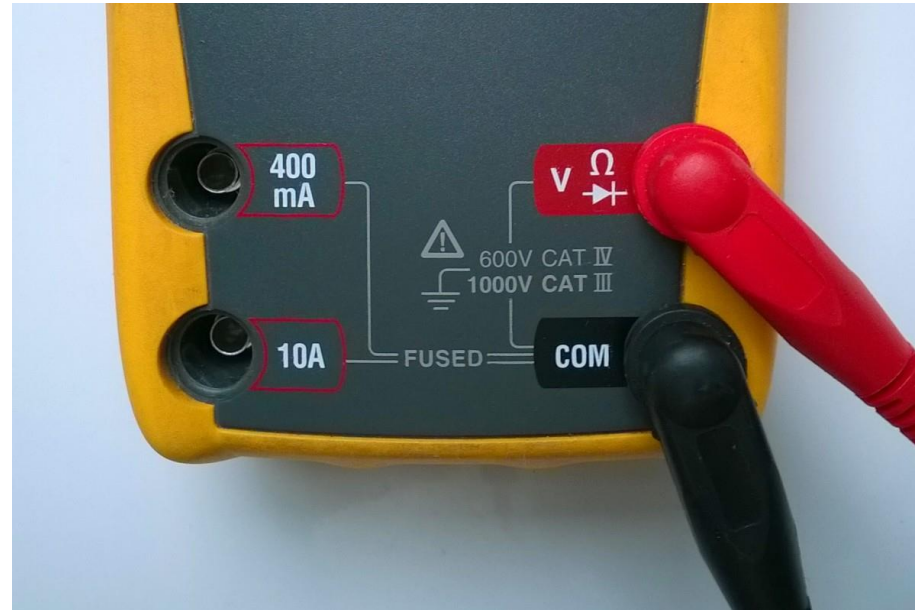
- Pumps (مضخات)
- Old refrigerator (ثلاجة قديمة)





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## Basics Electrical Equipment Knowledge (أساسيات معرفة الأدوات الكهربائية)



# Technical Practice



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## Solutions for Typical Electrical Residential Problems (حلول لمشاكل سكنية كهربائية نموذجية)

1

### Frequent Electrical Surges (ارتفاعات كهربائية متكررة)

Caused by the neutral's disconnection or some problems from the grid

2

### Light Switches (مفاتيح الاضاءة)

This might be a sign the switches have been superseded and fixtures removed, or it could be a fault in the outlet, circuit, or wiring. This can cause lightings burn out

3

### Circuit Breaker Tripping (قاطع الدائرة الكهربائية)

Limit the electrical usage on a single circuit while high-watt devices are in use.

4

### Circuit Overload (الطاقة الزائدة)

- Never daisy-chain power boards.
- Remove devices that aren't in use
- Spread the electrical needs around.





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## Solutions for Typical Electrical Residential Problems (حلول لمشاكل سكنية كهربائية نموذجية)

6

**Lights too bright or Dim**  
(الأضواء شديدة السطوع أو خافتة)

- Different types of lights with different wattage
- Bad main neutral connection

7

**Electrical Shocks**  
(الصدمة الكهربائية)

The issue could be with the appliance, or it could be in the wiring. A solution might be to install a differential breaker (قواطع تفاضلية)

8

**High Electrical Bill**  
(فاتورة كهرباء عالية)

- Switching to a more cost-effective provider
- Identifying electrical devices that may be causing power surges
- Unplugging appliances and chargers when not in use

9

**Light Bulbs Burning out**  
(إضاءة محروقة)

- Voltage is too high
- Insulation is too close to the light
- Bad wiring on the circuit
- Bad wiring on the mains
- If flickering, there is probably a poor connection on the circuit.

10

**Recesses Light "Goes out" and Comes Back**

It's caused by the lighting's transformers

## وصف للتدقيق (Description of an Audit)

### خطوات التدقيق (Steps for an Energy Audit)

#### Phase 1, Data Gathering (جمع البيانات)

- Lighting (إضاءة)
- Heating/Boilers (سخان)
- Ventilation (تهوية)
- Cooling (تبريد)
- Water pumping (ضخ المياه)
- Miscellaneous (غير)

#### Phase 2, Energy Analysis (تحليل الطاقة)

- Lighting & Electrical Systems (أنظمة الإضاءة والكهرباء)
  - A take-off of the existing lighting
  - Suggestions (اقتراحات)
- HVAC/Boilers & Heat Water Systems (أنظمة تبريد, سخان وتهوية و سخان)
  - Check on the performance (أداء)
- Water Pumping (ضخ المياه)
- Electric Supply and Explore Potential Solutions (حلول)
- Inventory of High Impact Energy Consuming Equipment (تسليط الضوء على أدوات عالية استهلاك الطاقة)

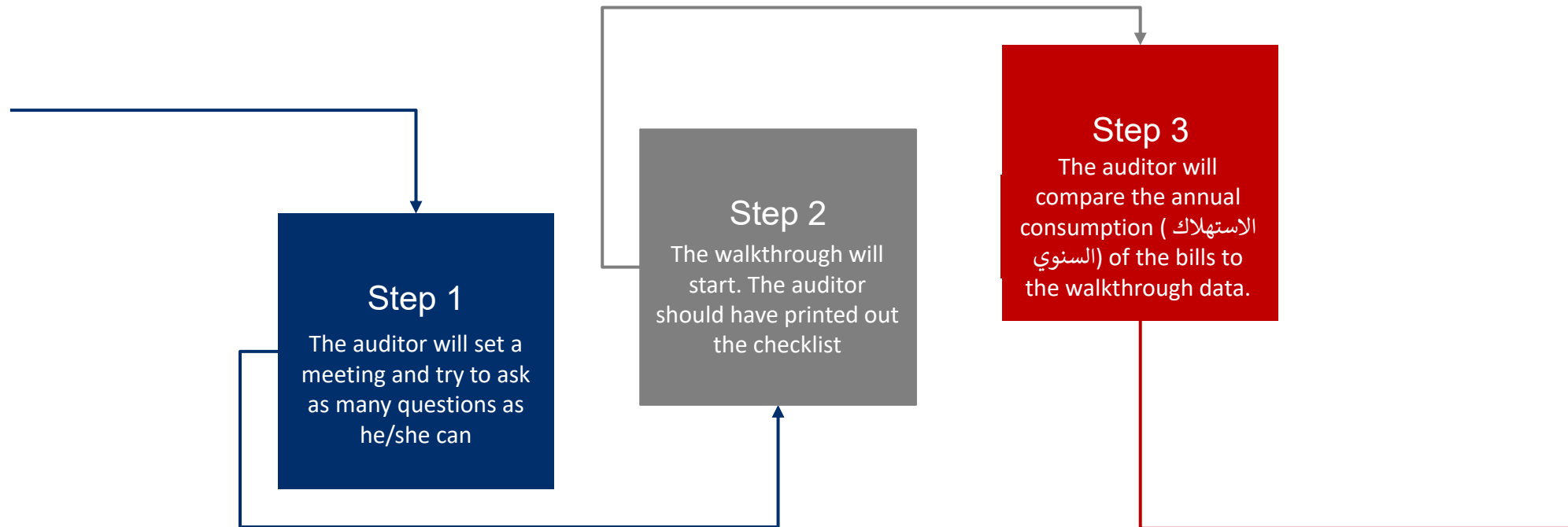
#### Phase 3, Interpretation and Evaluation (التفسير والتقييم)

- Calibrate the malfunctioning equipment (قم بمعايرة الأدوات المعطلة)
- Suggest ECM's and RE solutions (Low Cost / No cost and Capex) in each: (اتخاذ تدابير لي تحفظ الطاقة و الطاقة)
  - Lighting (إضاءة)
  - Heating – Ventilation – Air conditioning (أنظمة تبريد, تهوية و سخان)
  - Water heating (سخان الماء)



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## Description of an Audit (وصف للتدقيق) Walkthrough Assessment



## Energy Efficient Solutions (حلول توفير للطاقة)

01



This can reduce around 50%  
of their lighting  
consumption

LED Fixtures  
(إضاءة LED)

AC Split Unit – Inverter Type  
(مكيف - انفرتر)

This can help them save  
around 40% of their space  
cooling consumption



02

03



It will save around 80% of  
their electric water heater  
consumption

Solar Water Heater  
(سخان ماء شمسي)

Other Solutions

VFD on pumps, monitoring  
systems, etc.



04

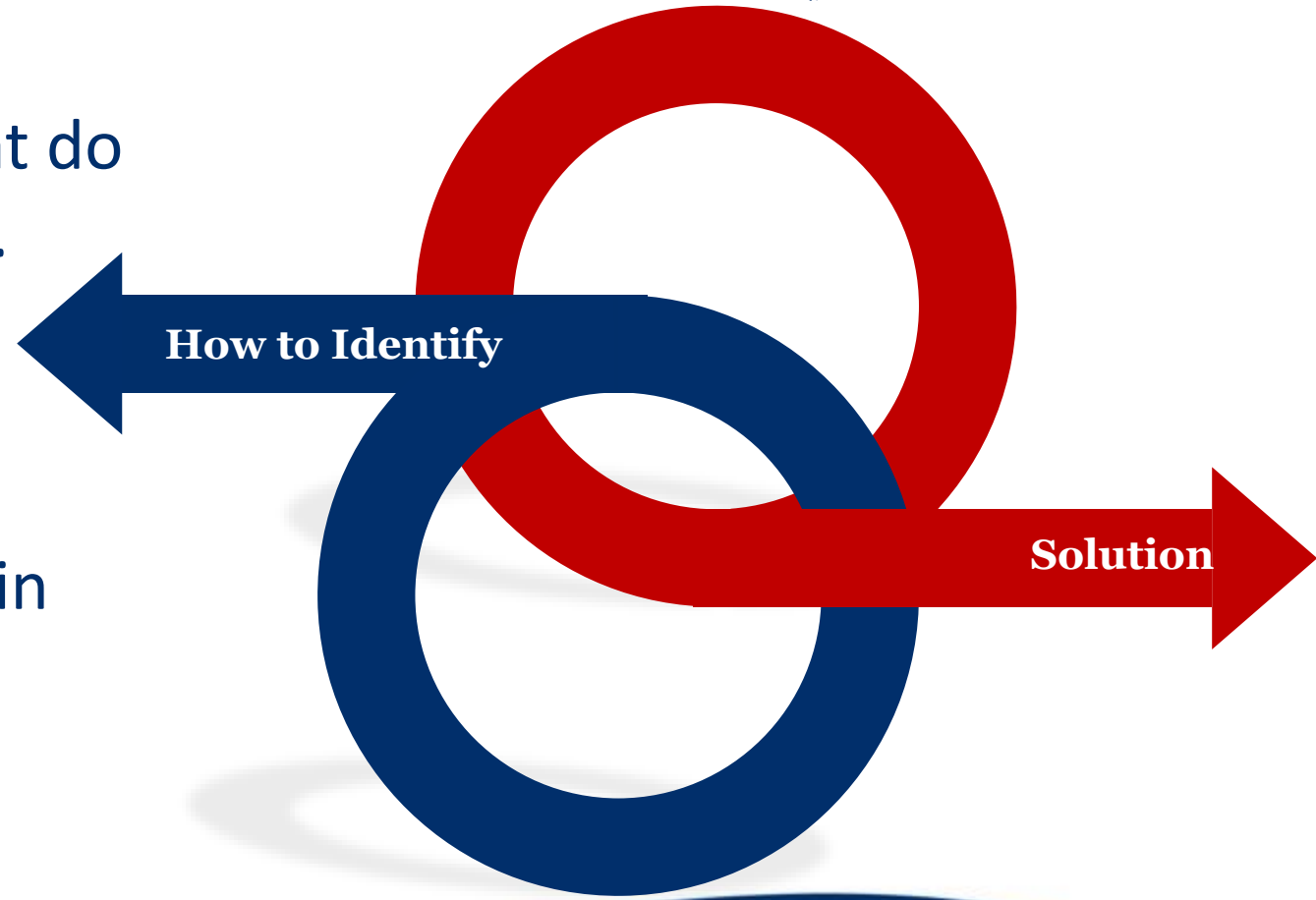


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## Real Case Studies (دراسات حالات حقيقية)

Case #1: Salty Water Injection in a Breaker (مياه مالحة في قاطع الدائرة الكهربائية)

- It only works for apartments that do not have an energy meter (عداد).
- It is based on disabling the mechanical mechanism in the breaker by injecting salty water in the breaker; this will cause the breaker to not trip on the rated current.





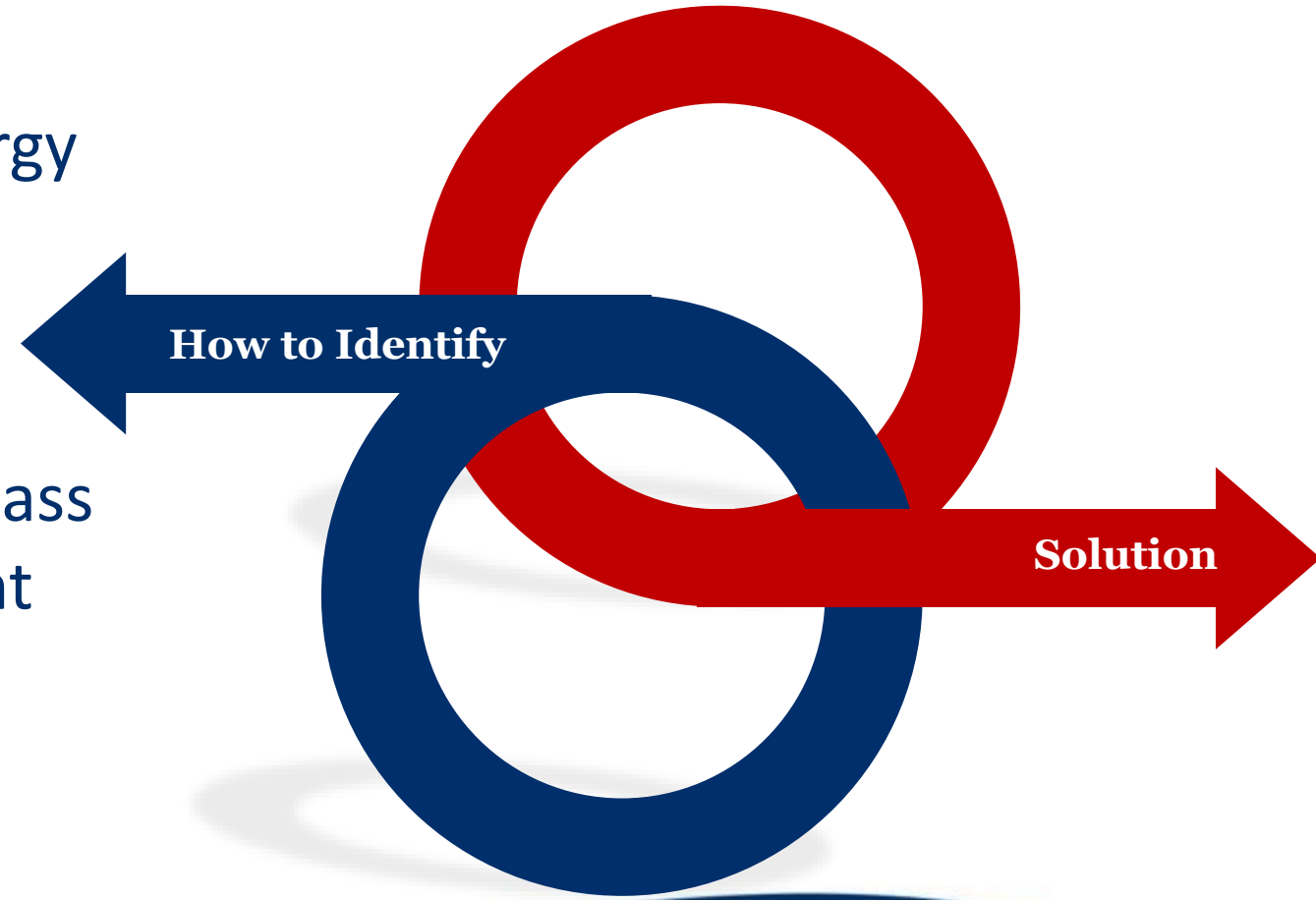


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## Real Case Studies (دراسات حالات حقيقية)

Case #2: Bypass the Energy Meter (تجاوز العداد)

- The simplest way to trick an energy meter is to bypass its current measuring point.
- It can be done by installing a bypass wire over the meter sensing point (the meter itself or an external current transformer).





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**Real Case Studies (دراسات حالات حقيقية)**

Case #3: Locating Infringements

# Locating Infringements (تحديد مكان الانتهاكات)



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## دراسات حالات حقيقية (Real Case Studies)

### Case #4: Electrical Safety (السلامة)

A worker was attempting to correct an electrical problem involving two non-operational lamps. He examined the circuit in the area where he thought the problem was located



He had not shut off the power (قطع الكهرباء) at the circuit breaker (ديسجونكتور Disjoncteur) panel and did not test the wires to see if they were live. He was electrocuted when he grabbed the two live wires with his left hand.



He collapsed to the floor and was found dead (توفي).



1. What is the first thing the operator should do?
2. List the procedures and steps (الإجراءات والخطوات) that should have been implemented to prevent this accident
3. What PPE should have been used? (أدوات الحماية الشخصية)



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## نصائح وإرشادات (Tips & Guidelines)

### Electric Water Heater (سخانات المياه الكهربائية)

Try to minimize the usage of the electric heater. It doesn't need to be ON all-day



**LED**

Change the light bulbs to LED

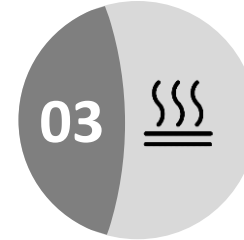
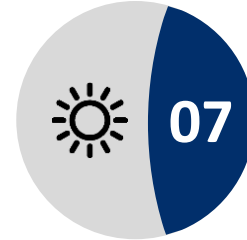


### Clothes Washing (غسيل الملابس)

Wash the clothes in cold water if possible

### Natural Light (ضوء طبيعي)

Use natural light when possible

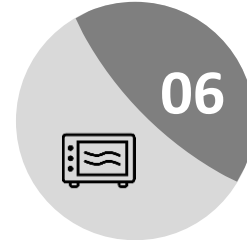


### Air Sealing & Insulation (عازل)

Air sealing the home and adding insulation can save up to 10% on home heating and cooling costs.

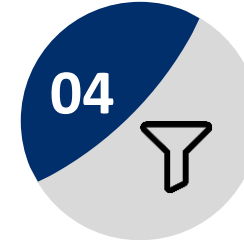
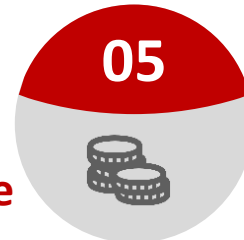
### Apartment's Temperature (درجة الحرارة)

During warmer months, close blinds, shades, and drapes on the sunny side of the apartment to help keep the apartment's temperature cooler and reduce the work for the AC. Open shades during cooler months to let the sun warm the home.



### Microwave

Use the microwave instead of the electric stove



### Filters

Clean or replace all filters in the home regularly. Dirty filters make the system work harder and run longer than necessary.



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