IET WIRING REGULATIONS

Whom are we protecting?

Protection for safety
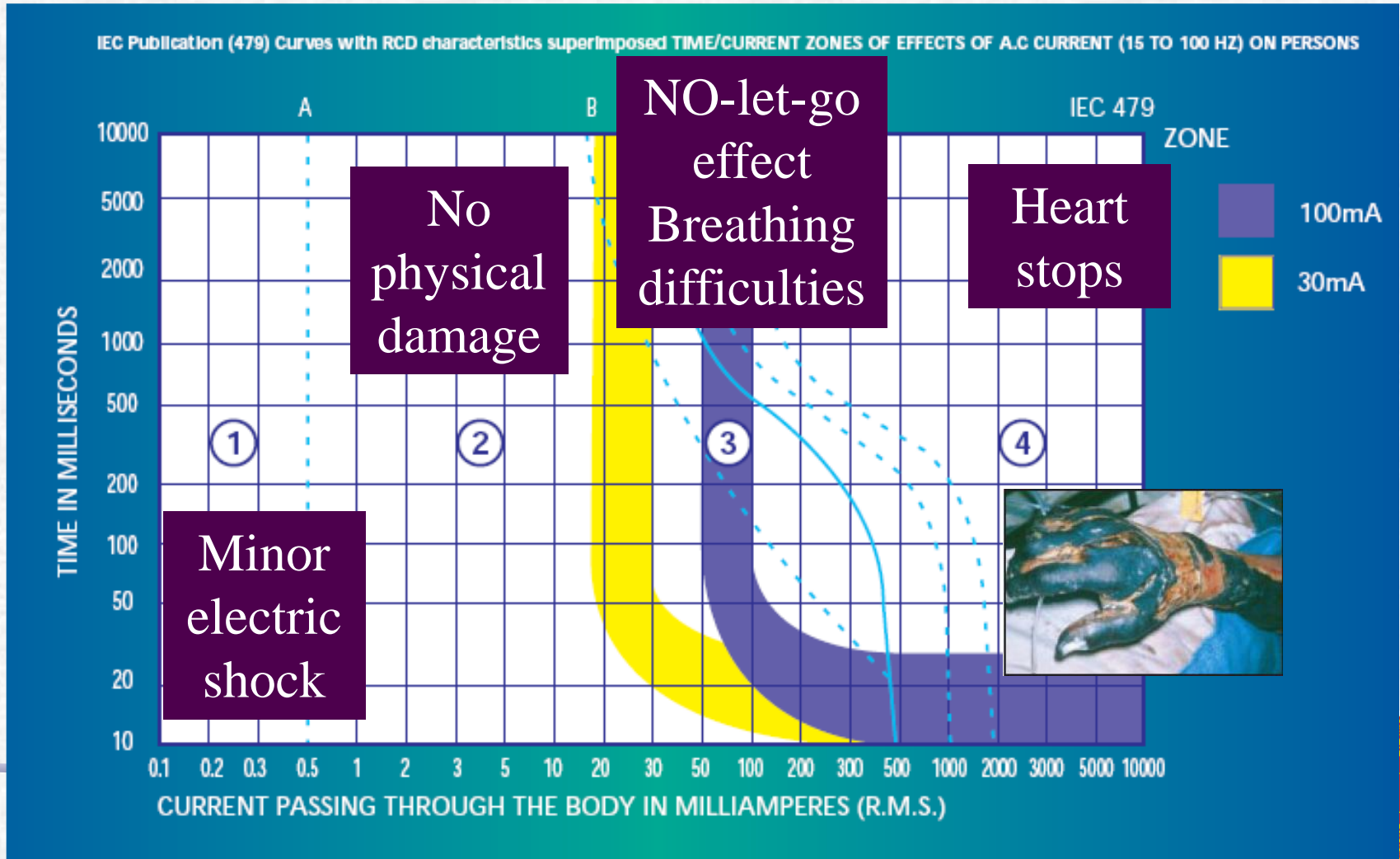
People and livestock

Appliances

Wiring system
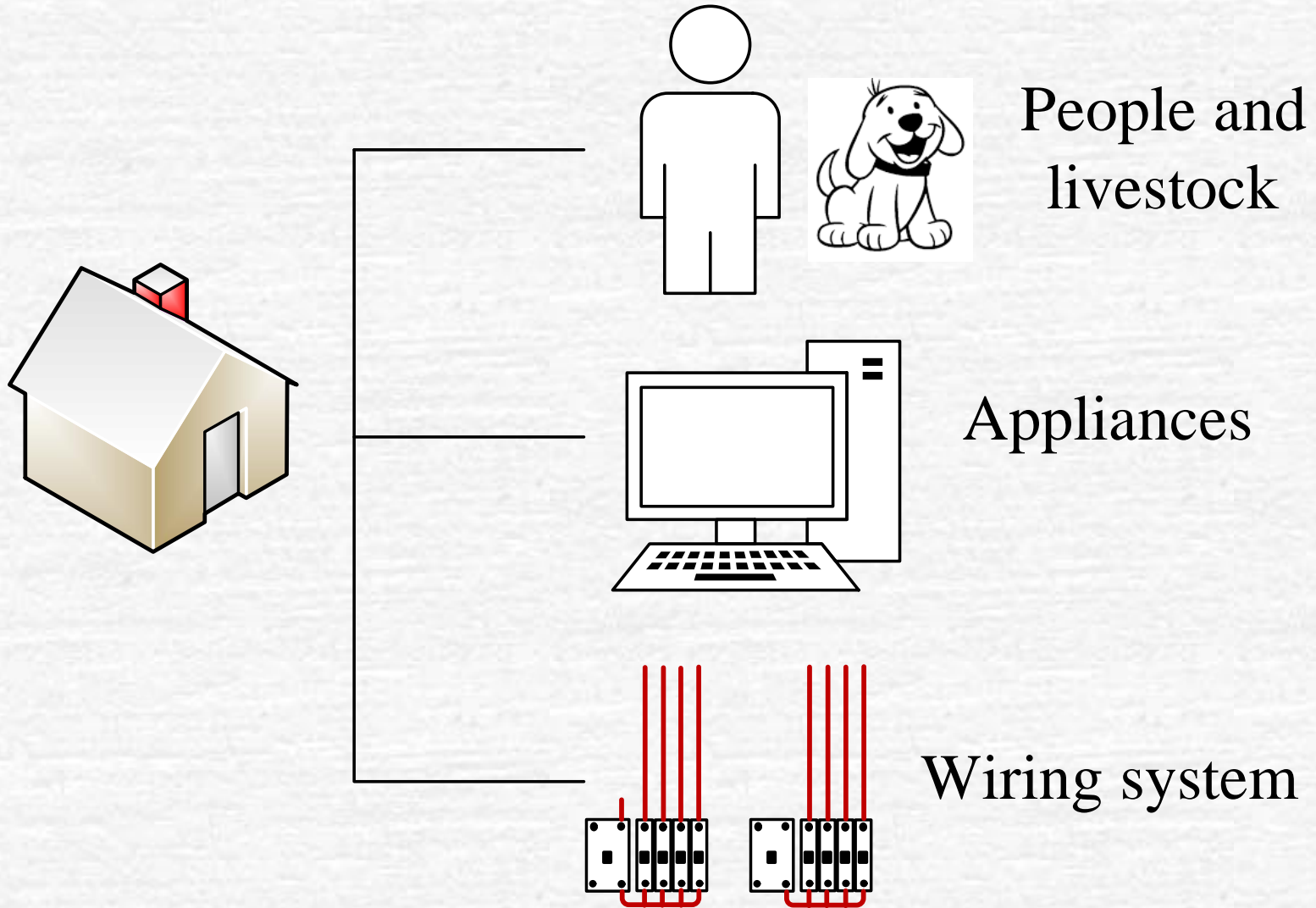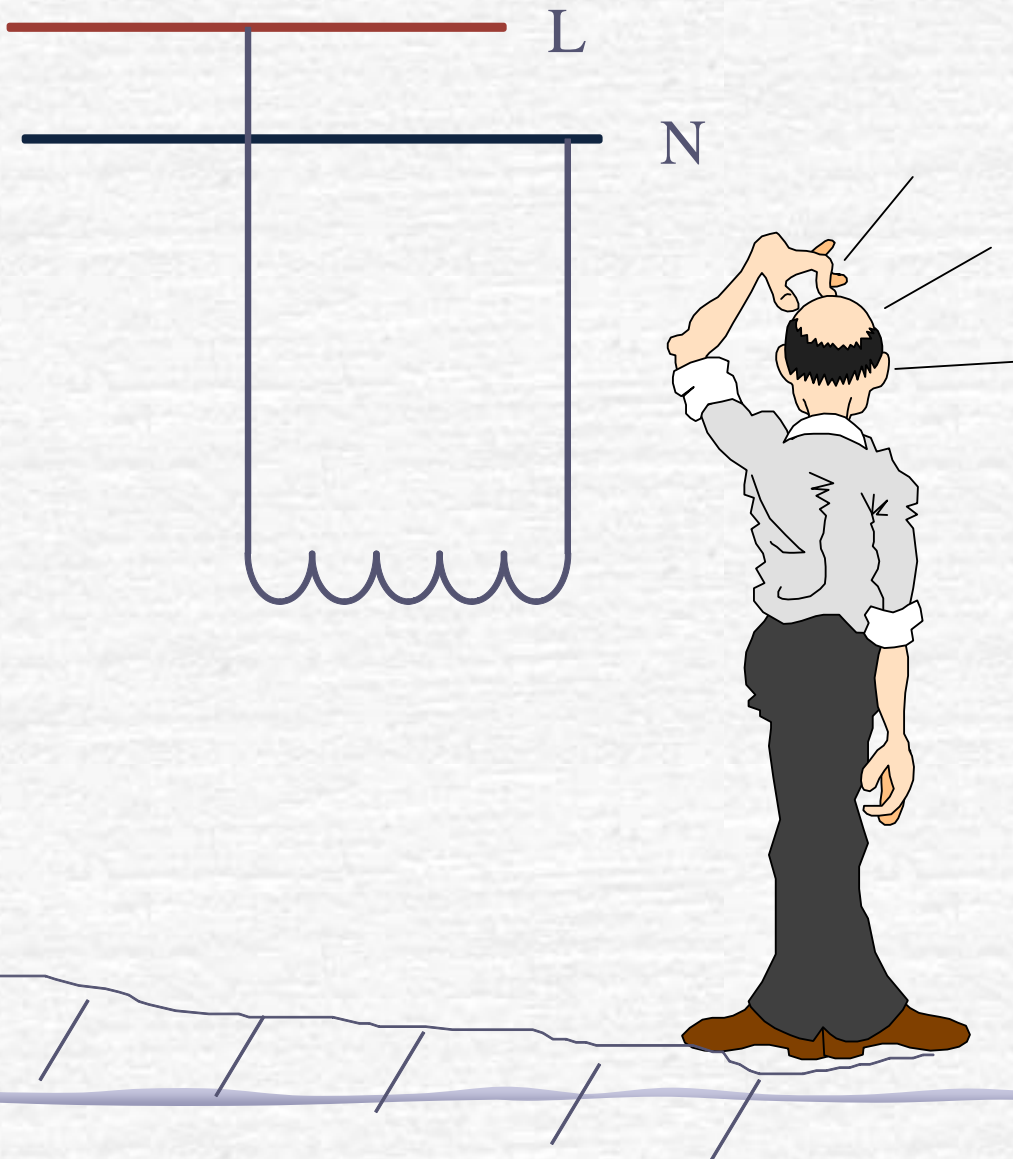
What is an electric shock?

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ELECTRIC SHOCK

Intensity of an electric shock depends on the magnitude of the electric current flowing through the body and duration

DIRECT CONTACT

An electric shock result from contact with a conductor which forms a part of a circuit and would be expected to be live.
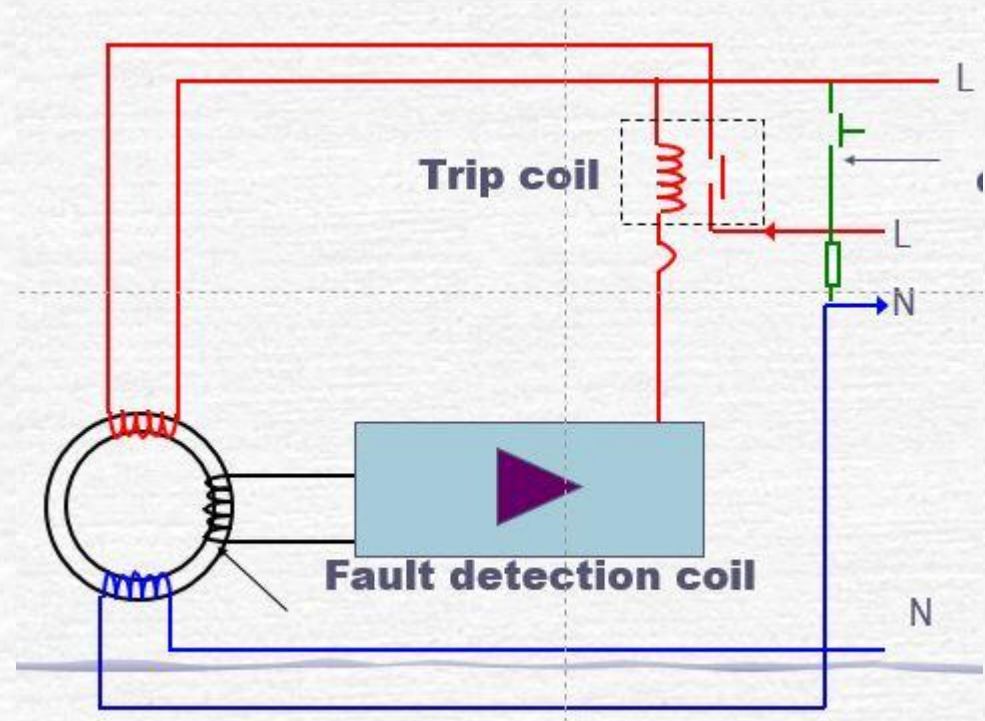
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BASIC PROTECTION

- The insulation of live parts
- The provision of barrier, obstacles or enclosure to prevent touching
- Placing out of reach

What is this?

Alex
RCCB

In: 40 A
I Δn: 100mA
Un: 415V~50 Hz
Im: 500 A

Trip coil

Fault detection coil

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RESIDUAL CURRENT CIRCUIT BREAKER (RCCB)

- RCD cannot prevent direct contact, but it can be used as additional protection provided that I_r is 30 mA

- In this case:

  - $R_A \times I_r \leq 50$ V

  - R_A is the sum of the resistance of the earth electrode and their protective conductor connecting it to the exposed conductive parts

  - I_r is the residual operating current of the RCD

INDIRECT CONTACT
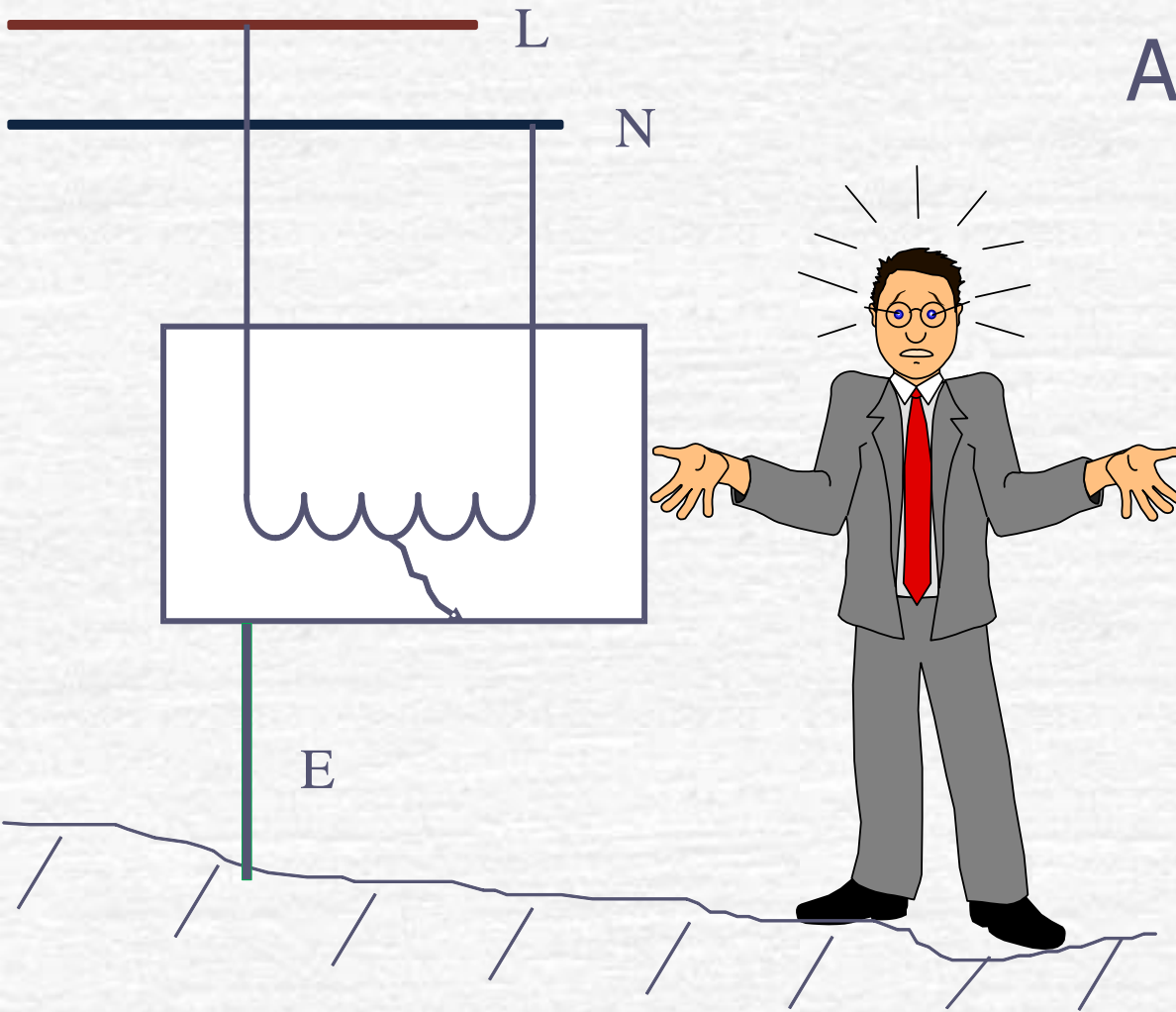
An electric shock is received from contact with something which would not normally be expected to be live but has become so as a results of a fault.
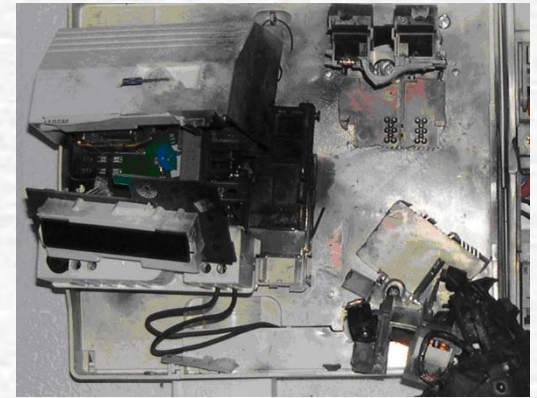
POSSIBLE FAULTS

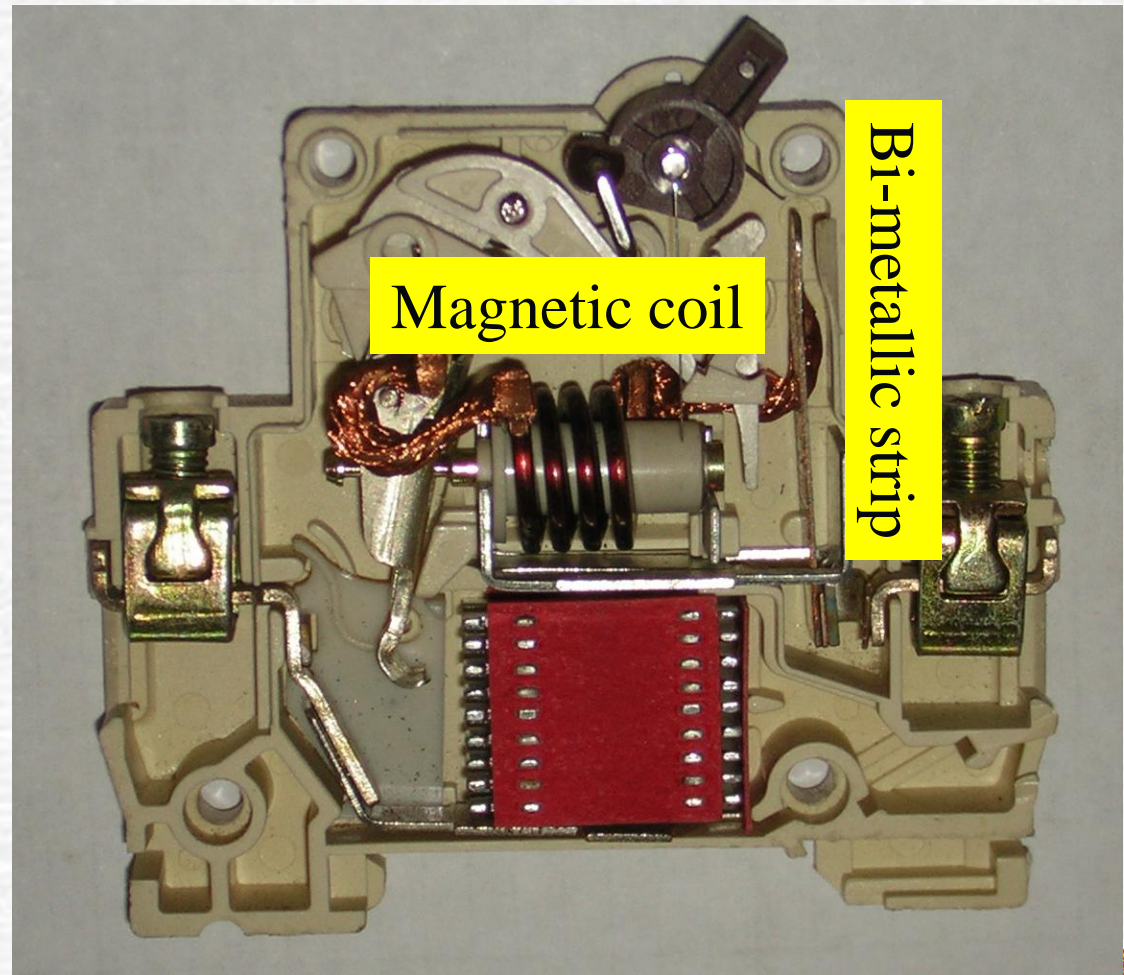Over-current: current higher than that is intended to be present in the system

Short circuit current: Occur under fault conditions and may be very high

Lightning surges: could be disastrous

What is this?

Magnetic coil

Bi-metallic strip

Miniature circuit breaker (MCB)

What will happen if there is a direct short circuit?

Length of the 70mm^2 line section = 500 m

70 mm^2 = 0.262 mΩ/m

From the distribution board to the short circuit is 25 m, and the wire is 1.5 mm^2

Calculate the current drawn by the fault?

How is MCB operating?

What will happen if there is a fault?

Length of the 70mm^2 line section = 500 m

70 mm^2 = 0.262 mΩ/m

From the distribution board to the socket is 25 m, and the wire is 1.5 mm^2

The device connected to the power socket is a 1 kW immersion heater

What is the current drawn by the device?

What will happen if there is a fault?

The **resistivity of Nichrome wire** is 100 x 10^{-8} Ωm at 20 °C. However, as temperature increases, so does resistivity. Tungsten has a temperature coefficient of resistivity of 0.0004 (C°)$^{-1}$.

How long wire is required for the heater if the diameter of the wire is 0.1 mm^2?

If there is a short in the neutral and the live inside the immersion heater 2 m from the neutral end, what is the resulting current?

How the MCB is protecting in this case?