



**NETWORKS**

# **Electricity The Hazards and Risks Encountered by the Emergency Services**

18 September, 2015

**ESB Networks 24 hr. emergency contact number 1850  
372 999**

**Give precise location of the incident.**

**Do NOT enter any electricity substation without  
authorisation from ESB Networks.**

**Do NOT approach electricity cables, wires, poles or  
pylons until ESB Networks have confirmed the  
electricity has been disconnected**

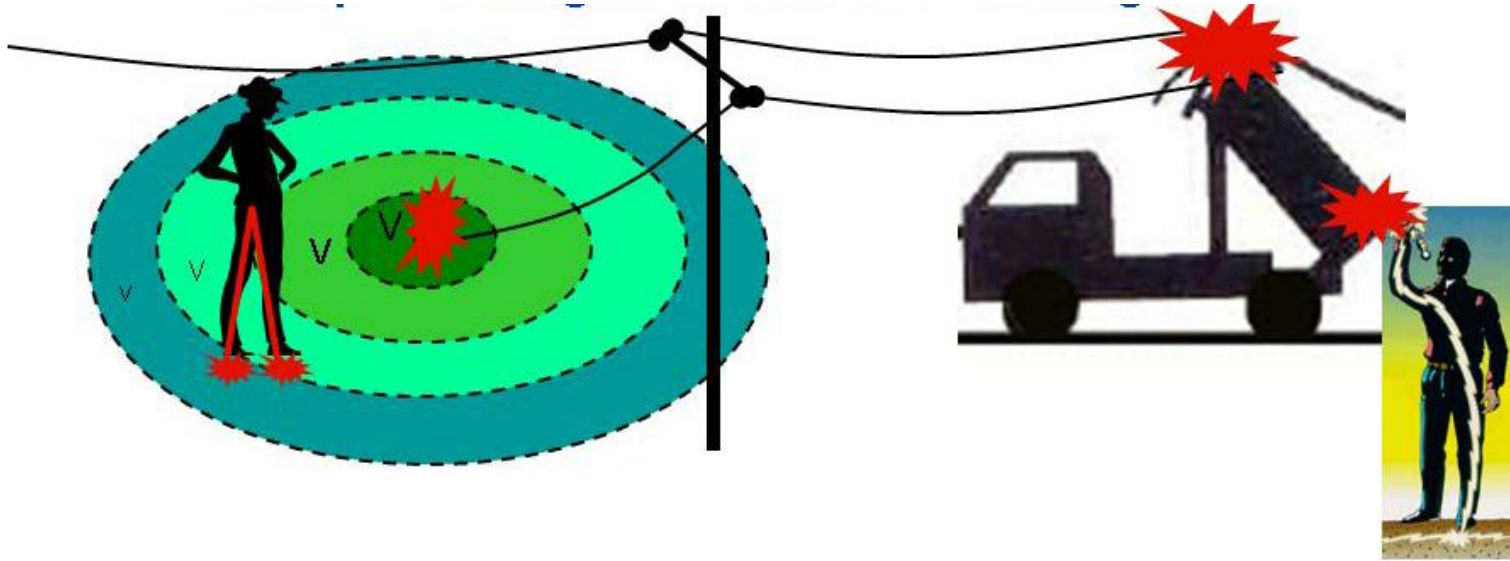
# Some Key Safety Messages

- Don't be tempted to start a rescue before electrical safety has been confirmed by ESN Networks staff when ESB Networks' assets are involved.
- Contact ESB Networks as soon as you know the incident involves electricity poles, wires or substations.
- Always assume the wires or equipment are live.
- Wires that may have automatically tripped out (mainly at higher voltages) may become live without notice – especially if ESB Networks are not aware of the incident.
- Always Look out and Look up for overhead wires when you arrive at the scene of an incident.

- Electricity systems carry voltages up to 400,000 volts (on wood poles/steel towers).
- 230 volts (domestic) can be lethal.
- Never assume electrical equipment is dead even if wires have fallen or are broken.
- Power can be switched back on at any time, without warning.
- Touching electricity wires or objects/persons/vehicles in contact with wires can be fatal.
- Electricity can jump gaps.
- Trees, strings, ropes, crash barriers can conduct electricity.

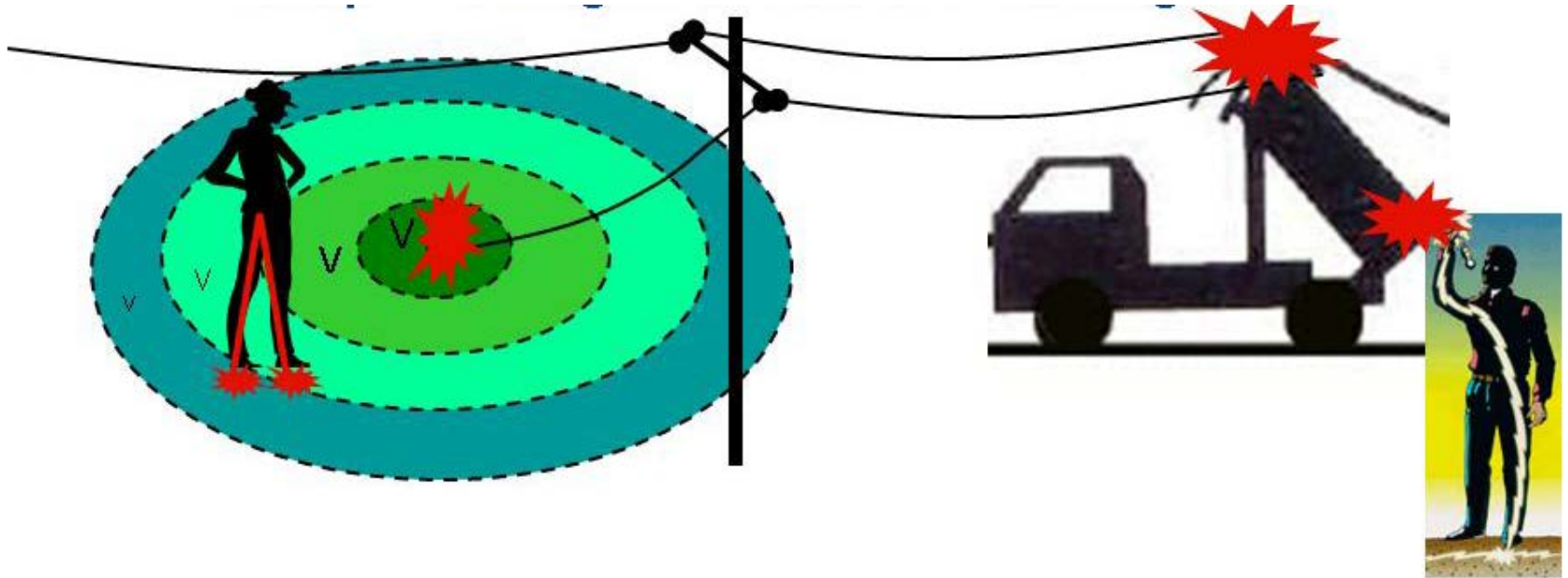
- Coming into contact or near contact with fallen wires can be fatal.
- Electricity can travel through the ground – stay back 5 metres.
- Treat all overhead lines and cables as live.
- The majority of overhead lines are not insulated
- Wearing rubber boots will not protect you.
- Look out and Look up for overhead wires before you start. This should be part of your Risk Assessment.
- Always carry long objects such as ladders horizontally.

- Road Traffic accidents involving collisions with electricity poles or ground mounted equipment.
- Vehicle tipping or loading near an overhead line.
- Operating construction and agricultural machinery or cranes near overhead lines.
- Person who has climbed electricity towers, substations or poles and come into contact with electricity.
- Contact with overhead lines whilst scaffolding, fishing, moving or erecting long objects near lines.
- Contact due to damage to underground cables whilst excavating.



## Step Voltage

- When a live wire lies on the ground, the electricity will fan out from the point of contact like ripples in water.
- Electricity is at full line voltage at the point of ground contact
- As you move away from the contact point, the voltage drops progressively.
- There is a voltage between both legs (Over 50 Volts can KILL)



## Touch Voltage

- Making contact or near contact with an energised source will result in current flowing through your body to ground
- Depending on the voltage an arc can jump across from the energy source to your body.



# Contact with Overhead Electric Wires

- ❑ Cement delivery truck with extendable concrete chute makes contact with overhead wires.
- ❑ The metal chute and truck body will become live and anyone touching it will receive an electric shock.
- ❑ Contact ESB Networks to switch out electricity before approaching the vehicle or attempting a rescue



# Fire in Substation

- ❑ Fire at a high voltage substation.
- ❑ Never enter an ESB Substation until ESB Networks have disconnected the electricity supply



## Burns caused by electricity may be of three types:

- Electrical burns
- Arc burns
- Thermal contact burns

- Arc blast - explosive release of molten material from equipment caused by the high-current arcs.
- Arcing gives off thermal radiation (heat) and intense light, which can cause burns and other injuries. Temperatures as high as 35,000°F have been reached in arc-blasts.
- A high-voltage arc can produce a considerable pressure wave blast. A person 2 feet away from a 25,000-amp arc feels a force of about 480 pounds on the front of the body.

- **ESB called Fire Brigade to attend a fire at 110,000 volt (110kV) station.**
  - **ESB isolated the Station from all sources of electricity.**
  - **Fire crew then entered the station accompanied by ESB persons.**
  - **No risk from Electricity.**

- Fire Brigade hosed down fire in trees due to fallen 10kV Line that was still Live. **The electricity can flow through the stream of water back to the Fire Officers.**



- Fire Brigade opened protective screen around a transformer to remove victim. **Never remove screens or approach electrical equipment. Always contact ESB Networks to switch out electricity first.**



- A Fire Officer climbed a ladder to enter the cage on a Live 38kV pylon to remove a victim.
- Always contact ESB Networks to switch out the electricity before approaching.
- Electricity at high voltage can jump across air – you do not need to touch the wires to receive an electric shock



- Emergency Services attended the scene of an accident where a truck had damaged a 10kV pole.
- Emergency Services parked their vehicles under the wires attached to the damaged pole.
- The overhead wires subsequently fell onto the vehicles, setting them on fire.





## Voltage (Volt) V.

Voltage can be compared to water pressure. It is the force that causes the flow of electricity.

## Current (Amp) I.

Current can be compared to the rate of flow of water in a pipe.

## Resistance (Ohm) R.

Resistance is similar to the effect of friction on the flow of water in a pipe.

Different materials have different resistances to the flow of electricity. The human bodies resistance will allow current to flow

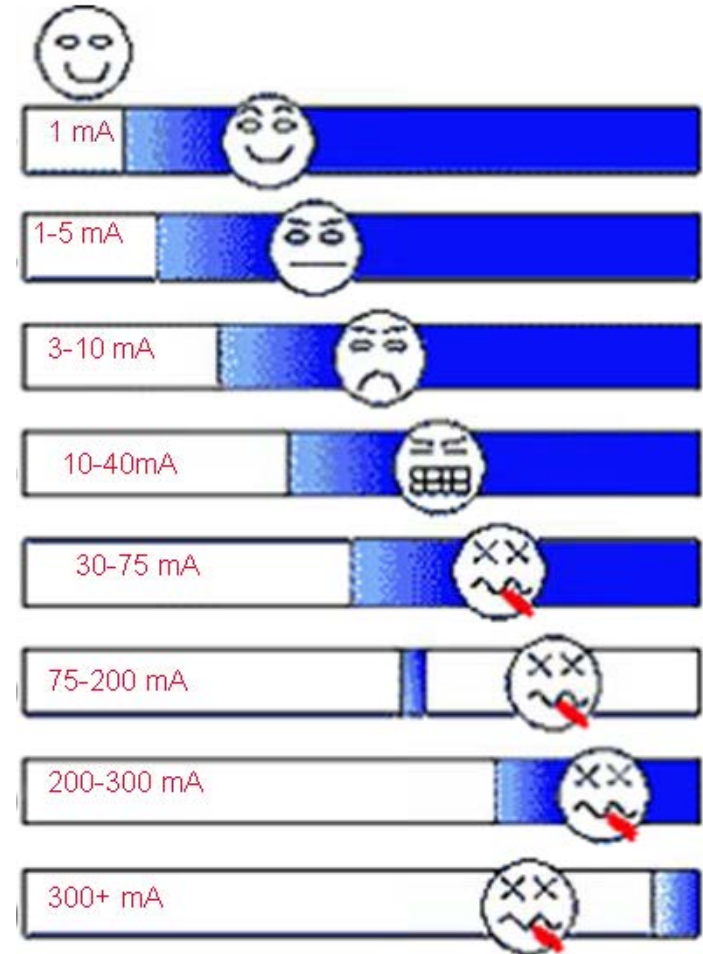
The lower the Resistance the greater the Current flow

$$I = V/R$$

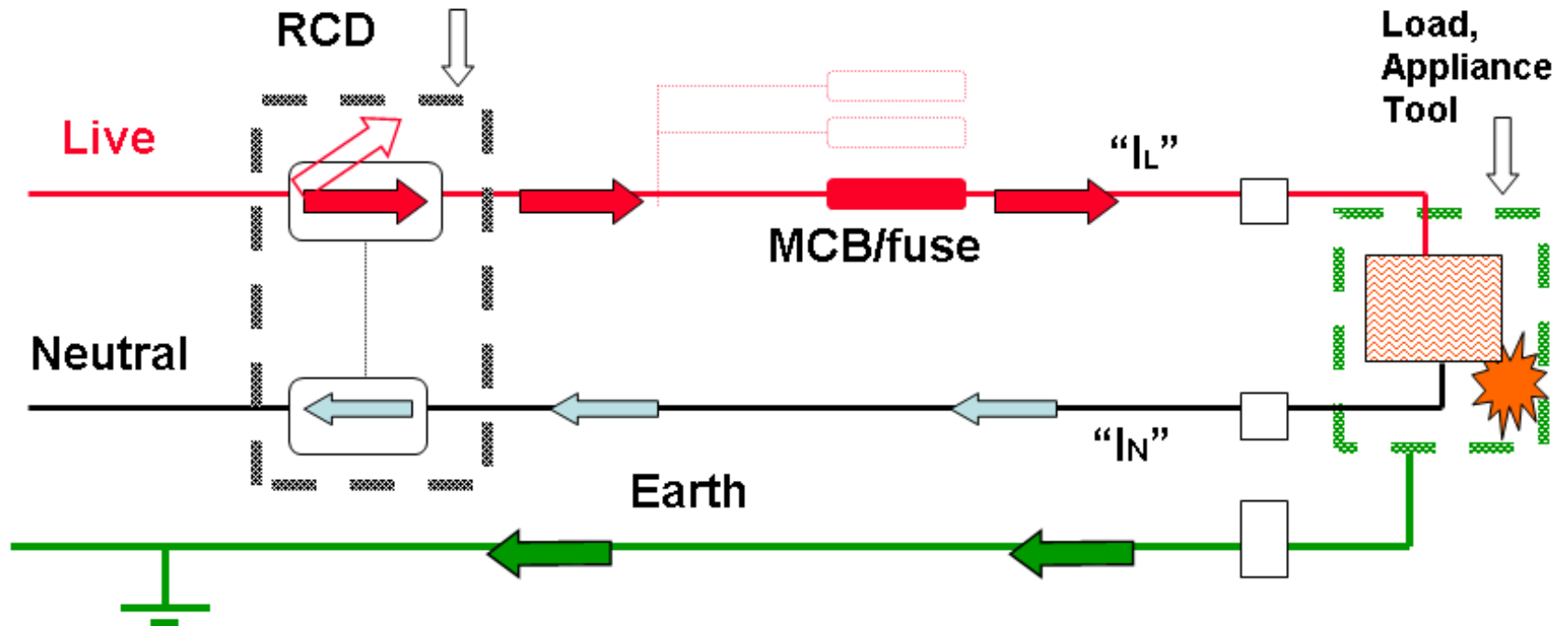
# Impact of Electrical Current

- 0.5-1.5 mA Perception**
- 1-5 mA Muscle Contractions**
- 3-10 mA Pain, half of people freeze**
- 10-40 mA Let-go Threshold**
- 30-75 mA Pain, breathing difficult, asphyxiation**
- 75-200 mA Possible ventricular fibrillation**
- 200-300 mA Certain ventricular fibrillation**
- 300+ mA Severe burns, heart stops**

100 Watt bulb = 500mA



- In some domestic and low voltage commercial installations the plug socket circuits may have safety protection provided by Residual Current Devices (RCDs).
- These devices have contributed to reducing fatalities on the customer side of the meter.
- It should be remembered however that some older installations may not have these devices.
- Lighting circuits in both new and old installations are not protected by RCDs.
- It is not possible to have comparable protection on ESB Network's overhead lines, cables and other equipment.



If  $\rightarrow$  is not equal to  $\leftarrow$ , there is a fault.

If  $\rightarrow - \leftarrow$  is  $> 30\text{mA}$ , the RCD opens its contacts  
RCD should operate in 0.3sec or less.

# Danger from Contact with Overhead Electric Wires

- Do not approach closer than 5 metres. If driver is in cab and there is no risk from fire he/she should remain there until ESB Networks advise it is safe.
- If it is possible to lower the truck/machine or to drive away **without damaging the line** then ask/guide the driver away from the wires.
- If there is risk from fire, tell the driver to jump clear with both feet together.
- Hop or take short steps away.
- Once on the ground do not return to the vehicle.



**Do not enter** High Voltage Transformer stations unless accompanied by ESB staff.

**Do not approach** fallen ESB Networks wires. Stay at least 5 metres away until ESB has advised that the wires have been made safe.



**THANK YOU**

