



Electricity

Introduction

This information sheet gives employers and employees practical advice on electricity in the workplace and the type of precautions that can be taken to reduce the risk of electrocution (shock or burns) or of electrical fires.

Electricity in workplaces is generally supplied at three distinct voltages; 110 volts, 220 volts and 380 volts. In general, the higher the supply voltage the higher the level of risk presented by the electrical installation. However electricity at all voltages, if not managed in a safe way, can present significant hazards to those working with electrical installations or using electrically powered work equipment.

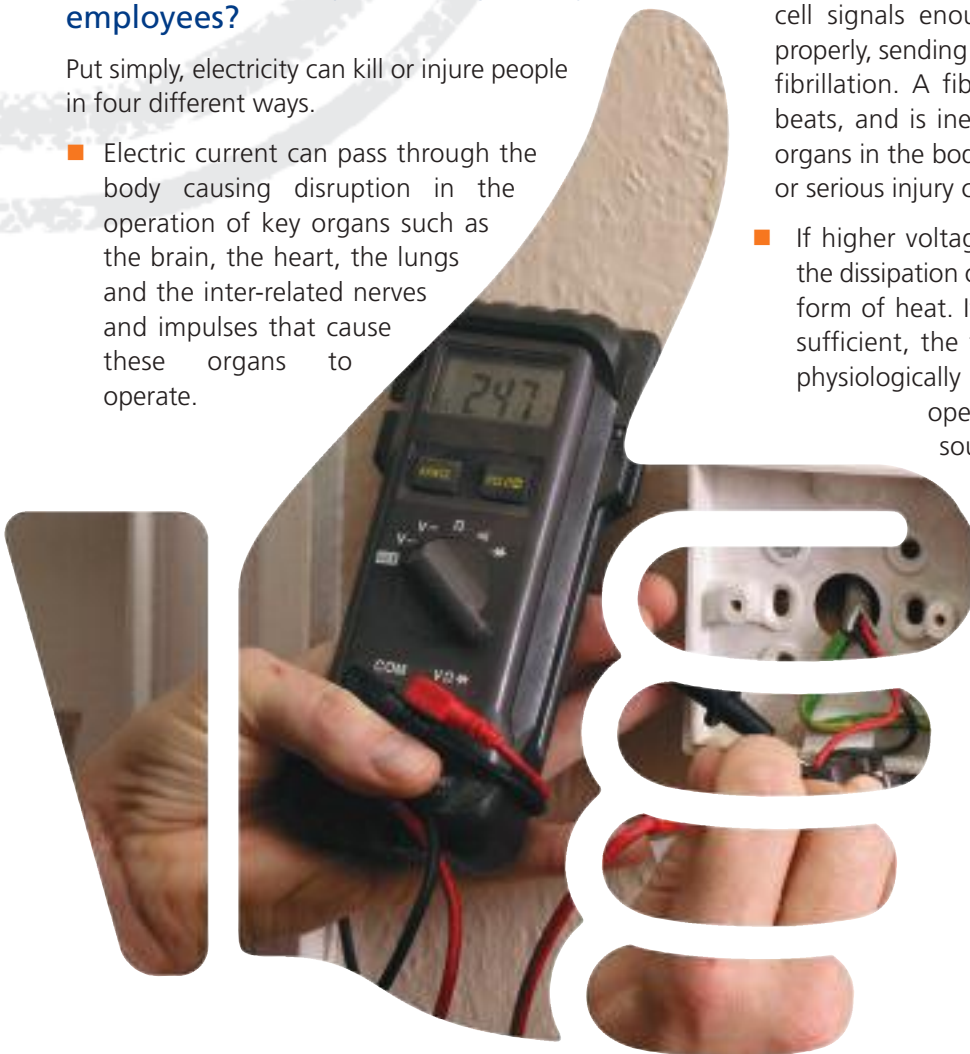
How can electricity kill or injure my employees?

Put simply, electricity can kill or injure people in four different ways.

- Electric current can pass through the body causing disruption in the operation of key organs such as the brain, the heart, the lungs and the inter-related nerves and impulses that cause these organs to operate.

Even relatively low currents can often scramble nerve cell signals enough so that the heart can't beat properly, sending the heart into a condition known as fibrillation. A fibrillating heart flutters rather than beats, and is ineffective at pumping blood to vital organs in the body. If this disruption is serious, death or serious injury can result

- If higher voltages or longer exposure is involved, the dissipation of power in the body is usually in the form of heat. If the amount of heat generated is sufficient, the tissue may be burnt. The effect is physiologically the same as damage caused by an open flame or other high-temperature source of heat, except that electricity has the ability to burn tissue well beneath the skin of a person, even burning internal organs causing irreparable damage or death



Electricity

- Muscles triggered by an external (shock) current will involuntarily contract, and there's nothing the person can do about it. This problem is especially dangerous if the person contacts an energised conductor with his or her hands, the forearm muscles responsible for bending fingers will clench the fingers into a fist forcing the hand to grasp the wire firmly, thus worsening the situation by securing excellent contact with the wire. The person will be completely unable to let go of the wire. This effect can only be stopped by cutting off the current
- Finally, the heating effects of electricity can cause local ignition of flammable or combustible materials, leading to fire in certain circumstances. A fire started in this way can go on to cause death or serious injury

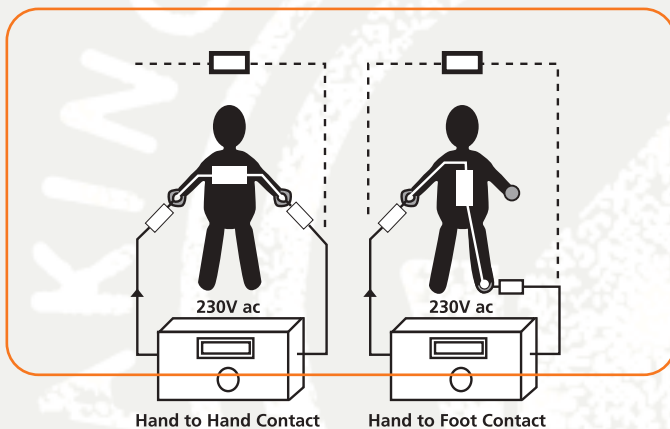


Figure 1 Current passing through the body from one hand to the other or from hand to foot will pass through the area containing the hearts and lungs

Most of us have experienced some form of electric "shock," where electricity causes our body to experience pain or trauma. If we are fortunate, the extent of that experience is limited to tingles or jolts of pain from static electricity build up, discharging through our bodies. When we are working around electric circuits, capable of delivering high power to loads, electric shock becomes a much more serious issue and pain is the least significant result of shock.



Figure 2 Dangerous electrical outlet giving rise to risk of electrocution

How do Electrical Installations Start Fires?

Any electric current passing through an item can generate heat. In many instances this temperature increase is intended and is used for electric heating, lighting, welding and drying. However if electrical connections are loose, electrical outlets are overloaded or in certain other fault conditions such as a short circuit, heat can be generated to the point where unintended ignition occurs.



Figure 3 Potential ignition source from electrical equipment

Electricity

This ignition can quickly develop into a fire with the associated risks to safety and health. An additional risk arises in the case of electrical fires in that they can be particularly tricky to put out. Since they involve electricity, using water to put out the fire can cause electrocution. Many fire extinguishers are not suitable for use on electrical fires. Until the power has been shut off, only extinguishers containing non-conducting extinguishing agents should be used.

The rule is: Never douse energised electrical equipment with water.

Extinguishers which are suitable for use on fires associated with electricity are:

- Carbon Dioxide
- Dry Powder
- Halon Replacement (be careful not to select a halon extinguishant which contains halon which is banned because of its eco-toxic risk)

Only use these types when selecting extinguishers to combat the fire risks where the building or room mainly houses electrical apparatus or plant.

How can I Prevent Danger from Electricity?

Electricity is inherently dangerous and the dangers associated with it cannot be completely removed. However, if the original electrical installation is to a high standard and a regular regime of inspection and testing is maintained then the risk from electrocution and fire can be greatly reduced. The National Rules for Electrical Installations published by the Electro Technical Council of Ireland sets out rules for the safe installation of electrical equipment and for inspection and testing to maintain the safety of the installation.

Live electrical equipment or parts must be adequately covered or enclosed to prevent contact. Work areas with a high voltage electricity supply, e.g. switch rooms, must be secured to prevent unauthorised access and warning signs should be in place on access doors.



Figure 4 Installations like these can lead to inadvertent contact and electrocution.



Putting in place a system for checking electrical appliances, leads and sockets on a regular basis and reporting any defects, e.g. scorch marks or frayed leads, will assist in identifying any potential problems. If damage or wear and tear has occurred, then a replacement or repair must be effected immediately. Depending on the equipment or installation involved, repairs or extensions should generally be undertaken by a competent electrician who should test and certify the works undertaken. In any event it is advisable to have the entire installation periodically checked and certified by a competent electrician and a record of this test should be maintained by the employer in control of the installation.

A means of cutting off power to electrical installations, e.g. fuses or trip switches, must be provided and employees should be made aware of their location.

Electricity

What are Residual Current Devices (RCDs)?

RCDs save lives. They are or should be in almost every workplace in Ireland. An RCD protects you against serious electric shock if there is an electrical fault in your workplace.

Circuits requiring RCD protection include the following:

- Socket outlets feeding portable appliances
- Supplies feeding water services such as immersion heaters and electric showers

RCDs **detect 'leaking' electricity from a circuit** (e.g. a damaged cable) and respond by disconnecting the electricity supply from the circuit.

Most modern workplaces have RCDs fitted in their distribution/fuse board. They are a legal requirement.



Figure 5 Typical distribution board - MCB (Miniature Circuit Breaker) type

You should check that your RCD is working correctly by pressing the test button marked 'T' or 'Test'.

If it is working, the power socket circuits will immediately switch off. If the RCD fails to trip, it should be replaced immediately by a registered electrical contractor.

What are the requirements for ongoing inspecting and testing?

Testing and certification should only be carried out by persons competent to do so.

Every new installation and every major alteration or extension to an existing installation, after completion and before being made live, must be inspected and tested. However, certain types of test may only be made after an installation has been made live. All the appropriate information, including diagrams of connections, wiring diagrams, charts, tables, schedules, equipment ratings and the like, must be available to the person or persons carrying out the verification. Precautions must be taken to ensure the safety of persons and to avoid damage to the installation and equipment during inspection and testing.

Where the installation is an extension or alteration of an existing installation, it must be verified that the extension or alteration and does not impair the safety of the existing installation.

