

## 4.0 DOMESTIC ELECTRICITY

Domestic electricity is that electricity which is supplied to homes under specific conditions of current and voltage. Voltage, measured in volts (V), causes electric current, measured in amperes (A), to flow in a conducting material such as copper wire. For practical and commercial reasons a “harmonized” 230-V system is used in homes in member countries of the European Union. In the United States, domestic voltage is 120 V. Various sizes of cable are used, depending on the circuit requirements. Typically these are: 6 A for lighting; 16 A for water heaters; 32 A for sockets (the “ring main”); 40 A for ovens; 63 A for showers.

Electric current flows when a circuit is continuous and unbroken—for example, when a switch is closed to the “on” position, enabling an electrical appliance to be operated. Because conductors carry electric current, they must be insulated in order to prevent potentially fatal contact with them. The usual insulating material is PVC (polyvinylchloride), a plastic that is flexible and mechanically strong, and can be made thick enough to prevent a short-circuit between the conductor and any adjacent metal parts.

For identification purposes, insulation is colour-coded. In the permanent “hidden” house wiring, “live” cables are coloured red and are used for the supply to the appliance. Neutral cables are coloured black and are used to complete the circuit from the appliance back to the supply. A third cable, identified by green and yellow stripes, is used to connect the exposed metallic parts of the appliance to earth, so that if a fault develops in the appliance, any small fault current will flow to earth, and the

exposed parts will remain at earth potential. If there is a more serious fault, the current flowing to earth will operate a protective device. The three cables are grouped together and further insulated by a grey PVC outer covering. Flexible cables running from an appliance to its plug are also colour-coded. The live cable is brown, the neutral one is blue, and the earth is again green and yellow.

Electric current can cause fires in property, and electric shock to human beings and animals. Fires are caused by overloading circuits—attempting to take more current from the circuit than it is designed to support. Electric shock is experienced when current passes through a living body. The result is, at best, an unpleasant experience; or burns (which can be both external and internal), or death.

While a current of a few amperes is sufficient to cause a fire, voltages in excess of 50 V and current in excess of 50 mA (1 mA, or milliamperes, is one-thousandth of an ampere) can prove fatal to human beings. (A 25-V shock for domestic pets can be fatal.)

Consequently, the electrical installations in homes require some form of protection to safeguard property and lives. This is the function of the consumer unit, which is used to divide the incoming electrical current between circuits, each carrying an appropriate current, and to provide protection in each individual circuit against the hazards of shock and fire. Protection devices are designed to sense the development of a dangerous situation and operate to cut off the electrical supply to that circuit before the danger reaches an unacceptable level.

Such protective devices include miniature circuit-breakers (MCBs), which prevent circuits from being overloaded; and residual-current devices (RCDs), which protect against earth faults, which can cause an electric shock. An earth fault is a condition in which current flows to earth through a conducting pathway, which could be a human body.

Consumer units with these protective devices have superseded outdated fuseboards, although many older properties still have fuseboards (*see Fuse*).

Some appliances do not include an earth wire. This is because the appliances are double-insulated to prevent accidental contact with the live parts inside. It is a legal requirement in the United Kingdom for appliances to be supplied with a 13 A plug connected. These plugs have rectangular pins and are fitted with a fuse in order to protect the appliance from damage. It is essential that the correct rating of fuse is used.

The power used by an appliance (the rate at which it consumes energy) is measured in watts (W). The amount of power used by a particular appliance must be shown on it. Appliances rated up to 720 W must be protected by a 3-A fuse; between 720 W and 1,200 W by a 5-A fuse; and from 1,200 W to 3,000 W by a 13-A fuse.