

Earth bonding & electricity in the bathroom

Make sure you have isolated any circuit you are working on and see our [electrical safety project](#)

What is earthing?

■ The earth, or ground in America, in electrical terms, carries no current, and it is this that electricity will make a dash for when it is allowed to escape from its secure home in an electric cable or flex. This is because one side of the electrical supply, the neutral, is intentionally connected to earth. If someone touches a live conductor then a current will flow through the person, their shoes, the floor, the wall, via earth and back to the supply transformer via one or more earth connections of the transformer neutral. The person has completed the electrical circuit. Should any fault develop in an electrical system the electricity will always head for earth, taking the easiest route there. The electrical appliances and supplies in the home are of a much higher potential and if any of these become available to touch and are electrically charged at a different voltage to earth the possibility of an electric shock exists, with the current passing through the connection between the charged parts and earth.

If, for instance, a person comes into contact with a conductive part that is at a potential difference to earthed metalwork and that metalwork; then a very serious shock can result. In order to eliminate this possibility, all electrical earths of circuits supplying equipment in the bathroom and all extraneous conductive parts are bonded together. In this way, even if a potential does develop, such as during an earth fault on one of the electrical circuits, all the conductive parts that someone could touch will be at substantially the same voltage. No dangerous shock current can then flow.

On its way to earth, leaking current may pass through walls, floors or anything capable of carrying it. This is made much easier when the connecting substance is wet. Water is an excellent conductor of electricity which is why special care must be taken in the bathroom.

Bathrooms carry special rules as far as electricity is concerned. Water and electricity do not mix, so the utmost care has to be taken when electrical supplies run in or near the bathroom. To this end, in the 16th Edition of the IEE (Institution of Electrical Engineers) Bathrooms carry their own, very specific, rules. We will deal with the use of earth bonding first and the rest later.

Should any electrical "leakages occur" in the bathroom the leaking current will try and find a passage to earth. It will travel down any damp in the walls or any metal or other conductors available. It is therefore important that precautions are taken to ensure these parts are not allowed to retain this current and diffuse it.

This is done by connecting all of the metal parts together with an earth cable. This will collect the current/voltage from the leak and equalise it around the pipes and metal parts. Each metal part in the bath or shower room must be connected by one of the following means. We suggest the use of a specific 4mm earth cable for these connections. This is a minimum requirement without conduit and larger earth cable can be used.

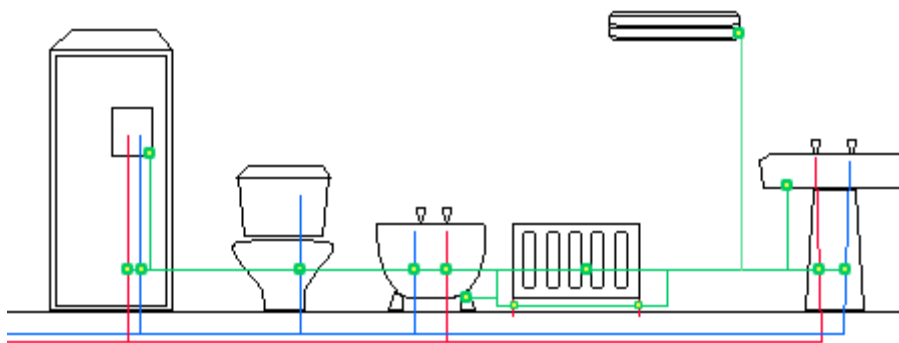


■ The earth tags (above right) should be connected to all pipes and can be bought from most diy stores and electrical merchants. They are proprietary connections reading **ELECTRICAL CONNECTION DO NOT REMOVE**.

The earth wire, after all bonding is complete should be connected to a local earth which could be a close socket, immersion heater or the connection unit for a heater or shower. This is in accordance with BS7671 which reads:

All electrical earths of circuits that supply equipment in the bathroom should be connected to the equipotential bonding, not just one local earth.

The cable should not be taken back to the main fuseboard or consumer unit as this can be dangerous.



■ The above layout shows a typical bathroom and its cross bonding layout. **Red** = hot water supply. **Blue** = cold water supply. **Green** = earth bonding cable. Plastic pipes and casings do not need to be bonded. The earth bond required to metal parts of a bathroom heater and shower can be very unsightly if taken to their next connection in the line, and it is permissible to connect the earth wires from these directly to the earthed electrical connection from which they are wired. **Please note that if a bath is used for medical treatment or disabled people special considerations may apply and expert help should be sought.**

Under IEE regulations the bathroom is now divided into zones for electrical purposes. The zone qualifications are quite complicated and professional guidance should be sought for any proposed electrical work in the bathroom. The basic rule is that no source of electrical supply should be accessible from a position where one can be in contact with water at the same time. Insulated operating cords of pull switches are permissible but they must be in accordance with BS 3676, which in most cases will be stamped or labelled on them.