

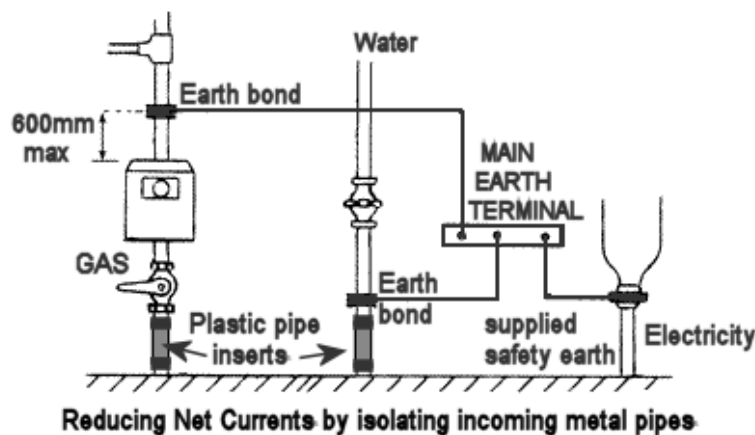
## Stray Currents

'Stray' currents are caused by faults in the neighbourhood electricity system that cause electric currents to flow on metal gas and/or water pipes and give rise to higher than usual magnetic fields. When you are checking the magnetic field levels, if you find high fields that get stronger as you get closer to internal gas or water pipes, then stray currents are the likely cause.

Stray currents are surprisingly common. They can be stopped, although not always easily, and there is a cost involved.

The procedure usually involves inserting a short section of plastic pipe into the metal gas or water pipe close to where they appear from under the ground and come into the house, as shown in the figure below.

This is a job for the professional. Metal pipes inside the house still need to be earth bonded – or 'earthed' – to prevent electric shocks, as specified in the UK Wiring Regulations. The incoming pipe should be isolated as near the ground as possible, and any exposed pipe must be covered with insulating tape or sleeving, as under fault conditions it could give rise to a voltage shock hazard.



Sometimes stray currents come into metal-framed buildings through the girders that extend into the ground. This needs professional help to deal with.

In the UK and Germany and possibly some other European countries we practice Protective Multiple Earthing (PME) on our low-voltage (230 volt) distribution wiring around districts. This involves 'earthing' or 'grounding' the neutral every 100 metres around the distribution circuit. It is to prevent gross over-voltage problems if the neutral gets broken.

We use three-phase plus neutral. If all three phases are balanced then there is zero current flowing in the neutral. However, houses are wired to the supply in phase sequence and some phases end up more highly loaded than others. The imbalance current flows along the neutral. If the neutral isn't there, then you can get 40 volts on one phase and 330 volts on another and blow up all the bulbs and electronics in affected properties. By earthing the neutral every 100 metres

there are always reasonable return paths available to the houses with a broken neutral in their feed so all three phases usually keep within the regulations (216.5 to 253 volts).

The downside is that if the neutral conductor isn't in perfect condition, then the out-of-balance current transfers itself into the real earth, also on to any neighbouring metal water or gas pipes. This causes elevated magnetic fields over extended areas and, as everyone's electrics continue to work OK, nobody knows and nobody does anything to correct the fault. We have measured whole streets that have fields over 2 microteslas. The problem was due to a broken neutral conductor and the electricity company had used a type of distribution cable that doesn't have an earth conductor and the armoured wire around the cable is used as the neutral. The steel armour cable is less conductive than copper or aluminium and is hard to make a long-term reliable connection to at the regular jointing boxes in the circuit where it is also connected to an earth/ground stake.