



Technical Bulletin

Using Water Pipe & Service Joints for RF Grounding -- Please Don't

It's probably done most often for the simple convenience of time and effort, but there's little to be gained and frequently a lot to lose by using cold water pipes, gas pipes, and electrical outlet box connections as RF or lightning protection grounds.

Good grounding is a critical and integral part of good telecommunication station design. Whether the application is receive only, transceiving, data delivery or otherwise, modern solid state equipment is internally delicate, and good grounding is a key factor in maintaining clean spectrum operating and overvoltage protection. Unfortunately, it is seen as a quick ten minute afterthought to many installations.

In their haste to finish ground connections are commonly made with a piece of "off the shelf" wire connecting radio equipment chassis to whatever is nearby that may eventually reach ground. But the most important factor in good neutral connections is length of lead from chassis to earth entry point -not the specific materials of wire sizes used. Here are a few guidelines to follow when installing ground connection systems:

1. Cold water pipes make poor grounds in most cases because the length of copper pipe to earth is often very long. Any lead over ten feet probably should be avoided for most applications. Additionally, pipes of this type connect through numerous solder-sweated joints, bends, and possibly even conversion to plastic pipe (a good insulator) before reaching ground. The fact that the pipe may have water inside is irrelevant. When such systems are used in transmitting service the piping becomes part of the radiating structure and ground level radiation will often be severe, causing interference to other services or neighbors.
2. Never, ever, ever use natural gas pipes for ground connections. In a lightning event a crack or rupture of a gas line can be explosive. Hot water lines used in conjunction with gas water heaters should be avoided for the same reason. Be sensible, stay well away from dangerous ignition sources!
3. When designing a telecommunication installation keep equipment at or below ground level if at all possible. Locate the equipment close to an

- outside wall where short grounding connections can be made. Or drive a ground rod through the floor downward into a crawl space if present where short distance ground can be found. Borrow or rent a hammer drill to drill a hole through concrete slabs or floors where a ground rod may be inserted. Ground underneath such places is nearly always moist and very conductive. If drilling through a slab, be sure to avoid pipes that may be in the concrete! Consult the builder or house plans.
4. If the facility must be elevated off the ground run ground wire straight down to keep the distance as short as possible, and be sure to route all antenna leads, rotator wires, etc. to ground first (where lightning protection devices are installed), and then up to the equipment.
 5. Electrical service box connections generally make poor grounds for the same reason as cold water pipes. The leads are lengthy, the wire size small, and the integrity of the earth connection is often compromised by age, poor initial installation, corrosion, dissimilar metal conversion, loose screws, etc.

The moral is simple - put some effort in good grounding. Keep leads short, wire size large, connections tight and weatherproof, and grounding electrodes wet.

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