

Plumbing Currents - Mystical & Dangerous



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Every residential and commercial ELF EMF survey is a new adventure. Generally, the ELF EMF survey inspector measures the fields in every room, selected appliances, and around the outside property. Whether one performs a comprehensive contour or spot measurement survey, the process is rather straightforward: measure and record the magnetic field levels, note significant levels, identify sources, and recommend mitigation solutions when necessary. The magnetic fields from nearby electrical power line sources (transmission, distribution, and service) are easy to measure and identify. Appliance sources usually jump right out of the display as you walk by. But magnetic fields from plumbing and ground currents can mystify and perplex the most experienced professional. If there is an elevated magnetic field near a metal water pipe, especially next to the shut-off valve at the point of entry, then plumbing currents are probably the source. Horizontally polarized magnetic fields perpendicular to the water pipe axis radiate out from the pipe diminishing in magnitude at a linear $1/r$ rate. The current on the pipe can be calculated as follows:

$I_{\text{amps}} = 0.15(B_{\text{mG}})(R_{\text{feet}})$ where B_{mG} is magnetic flux density in milligauss.

However, it is much easier to use a clamp-on amp meter around the water pipe, preferably near the entry point.

In a residence, the typical plumbing current measures between 0.25-2.5 amps, depending on the local neighborhood electrical conditions. Place the clamp-on meter around the water pipe and monitor the current which normally fluctuates (sometimes dramatically) over several minutes. Now determine the source and path by de-energizing the electrical power. Measure the current on the water pipe, electrical service (around the sheath, not in the electrical panel), and the grounding conductors to the water pipe, ground rod, telephone & CATV. If current is detected on the water pipe, then the plumbing current source is external, and usually exits via the neutral conductor (verify by measuring an equal net current on the electrical service). The local utility should be notified if the external plumbing current exceeds 3-4 amps.

Next energize all circuits, plug a high current reference load (hair drier, heater, etc.) into an outlet, and record the current on the water pipe, electrical service, and grounding conductors. If under loaded conditions both the water pipe and net electrical service currents significantly increase (30-100% of the reference load current), then there is a serious problem with the neutral conductor. Fortunately, the water pipe is providing an alternative conductive path back to the transformer secondary neutral via a neighbors water pipe and neutral. Do not disconnect the grounding conductor to the water pipe, it is energized and potentially lethal. Immediately call the local utility- they will inspect the electrical service and repair the neutral. If the problem is in the electrical panel, you must call a licensed electrician.

Plumbing currents can migrate from the water pipes into HVAC ductwork, metal conduits, BX metal sheaths, and grounded equipment housings (sink disposal, coffee machine, etc.) emanating magnetic fields everywhere. To eliminate an external plumbing current source, a licensed plumber must install a high-quality dielectric coupler a few inches from the water meter near the street. Do not install the dielectric coupler inside the house! The National Electrical Code (NEC) requires a ground conductor from the electrical panel to an underground water pipe in direct contact with the earth for a minimum of 10 feet as specified in section 250-81(a). Remember, safety is paramount when testing, evaluating, and correcting any known plumbing current problems.