UNDERSTANDING ELECTRIC AND MAGNETIC FIELDS

EPCOR

ELECTRIC AND MAGNETIC FIELDS

We recognize that people are concerned about Electric and Magnetic Fields (EMF), which exist everywhere there is electricity. We treat those concerns very seriously. We are guided by EMF research that is compiled and reviewed by national and international health agencies, including Health Canada and the World Health Organization. We provide information to people who have questions to keep them informed about the status of EMF research and typical levels of EMF from various sources.

After more than 40 years of research that includes thousands of studies and numerous reviews by health agencies, neither Health Canada or the World Health Organization have concluded that typical exposures to EMF from power lines have any known health consequences.

What is EMF?

Electric and magnetic fields are sometimes jointly referred to as electromagnetic fields, or EMF. Sources of EMF are part of our manmade (e.g., electricity) and natural environments (e.g., the earth's magnetic field). Different forms of electromagnetic energy are distinguished by their frequency (i.e., the number of times it changes direction back and forth per second), that is measured in Hertz (Hz). Frequency is strongly associated with the energy level of the fields, which determines how they may interact with objects and living tissues. Static fields and extremely low frequency fields are at the lower end of the electromagnetic spectrum and have very low energy levels. Higher in the electromagnetic spectrum are radiofrequency fields including, microwaves, visible light, and ionizing radiation, such as X-rays, that have increasingly higher energy levels. Microwaves, for example, can heat tissues at high intensity levels, while X-rays can damage cells and break up molecules. EMF associated with the electricity we use (60 Hz in North America) is part of the extremely low frequency range of the spectrum with very low energy level that has no tissue heating or cell damaging effects. EMF discussed in this brochure refers exclusively to 60 Hz EMF.

EMF is found wherever electricity is generated, transmitted, or used, including electric wiring in the home, electrical household appliances, electric power tools, and power lines. While the fields generated by electricity are commonly referred to collectively as EMF, they are actually distinct components of electricity.

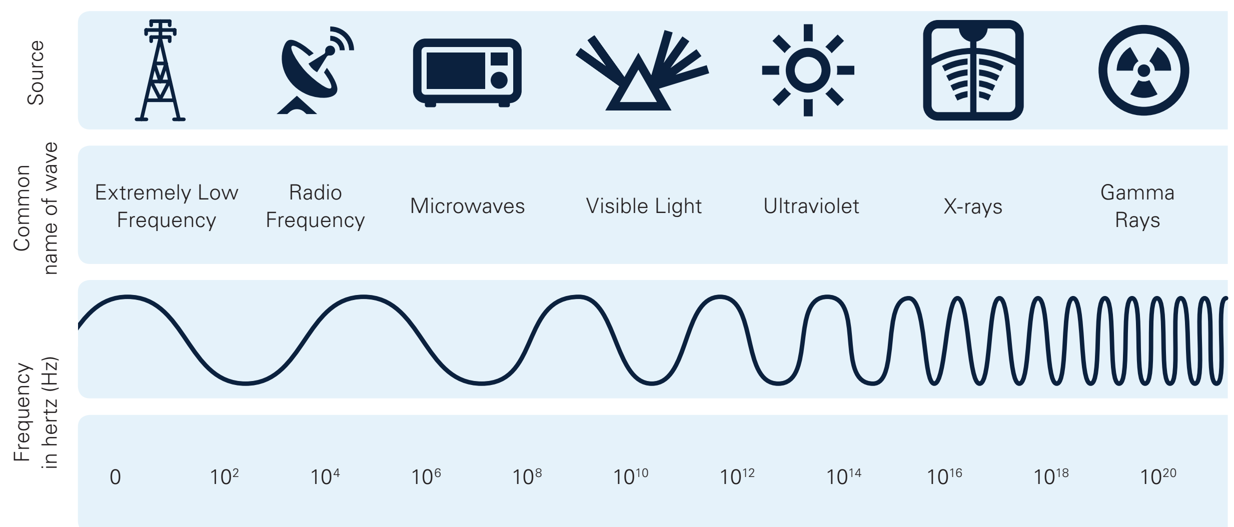
- Electric fields are created by voltage—the higher the voltage the stronger the field. These fields are produced whether current is flowing or not; for example, a hair dryer that is plugged in produces an electric field even if it is not turned on. Electric fields are blocked by objects like trees or buildings. They can also be shielded or insulated. Electric fields are measured in units of volts per metre or kilovolts per metre (kV/m).

- Magnetic fields are generated by current and are only present when current is flowing. Using the same example, a hair dryer only produces magnetic fields while switched on; when switched off, even if it remains plugged in, magnetic fields are not present. Unlike electric fields, magnetic fields will pass through most objects. Magnetic fields are measured in units of gauss or milligauss (mG), and in Europe, measured in units of Tesla or microtesla. For the most part, magnetic fields, rather than electric fields, have been the focus of research studies of potential health effects.

Exposure to magnetic fields is determined by how strong the field is at its source (e.g., a blender, a computer, a power line); how far away you are from the source; and how long you stay near the source. The strength of the magnetic field drops quickly as you move away from the source, whether it is an electrical appliance or a power line. For this reason, magnetic fields can be higher near commonly used electrical appliances that are used close to the body, including power saws and microwave ovens than near transmission lines.

Different forms of electromagnetic energy are distinguished by their frequency, measured in hertz (Hz). Electrical power EMF has a frequency of 60 Hz. The power we use in North America uses alternating current (mostly) and the power alternates back and forth 60 times each second. EMF from electricity is classified as "extremely low frequency." It produces much less energy than other waveforms in the spectrum such as X-Rays, as shown on the graphic below.

Frequencies of the Electromagnetic Spectrum and Common Sources



Source: Institute of Electrical and Electronics Engineers.

TYPICAL MAGNETIC FIELD LEVELS IN THE HOME

Typical Canadian Household 1 mG (milligauss). At 15 cm away*

1. Portable Heater **100 mG**
2. Hairdryer **300 mG**
3. Washing Machine **20 mG**
4. Power Saw **200 mG**
5. Dishwasher **20 mG**
6. Vacuum **300 mG**

**Source is 2002 NIEHS EMF Q&A booklet*

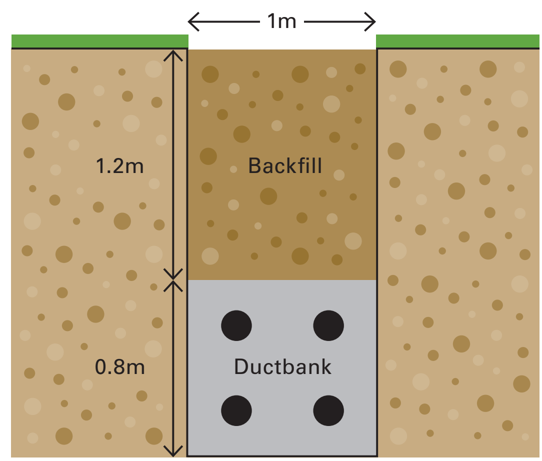
TYPICAL UNDERGROUND MAGNETIC FIELD LEVELS FOR THE SOUTH CENTRAL EDMONTON TRANSMISSION REINFORCEMENT PROJECT

This project involves reinforcing the transmission system in south central Edmonton to meet increasing demand for power. It involves the installation of a new underground transmission line approximately 2.7 km in length, between Rossdale and Garneau substations, under city streets and beneath the North Saskatchewan River and additional infrastructure at the existing Garneau and Rossdale substations.

UNDERGROUND EMF INFORMATION

The electric fields from underground cables are shielded by the wire's insulation and the surrounding ground, but the magnetic fields are not, as shown on the diagram to the right. Magnetic field levels are typically higher immediately above buried transmission lines, than below overhead lines. However, magnetic fields drop off quicker when the buried cables are placed closer together which results in the magnetic fields diminishing faster (as indicated in the chart to the right) with distance, compared to an overhead line where cables are farther apart.

TYPICAL UNDERGROUND TRANSMISSION LINE



CALCULATED MAGNETIC FIELD LEVELS - UNDERGROUND TRANSMISSION LINE

Distance (m) from centerline of underground cable	Milligauss (mG)
0	9.8
2	7.6
5	3.5
10	1.5
15	0.9
20	0.6
32.5	0.4
50	0.2
100	0.1

**Note: Based on average line loading, measured 1m from above the ground*

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