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Specifications for the Reduction of Magnetic Fields from Electrical Panels

by
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Here are instructions to help reduce the low frequency (60 Hz) magnetic fields typically emitted from electrical panels such as main meter panels, distribution sub-panels, and junction boxes.

#1.) Note on Location of the Panel:

If possible, locate the panel at least 8 feet away from any areas where people will spend a lot of time. This will not reduce the magnetic fields from the panel itself, but it is one of the most effective ways to reduce actual long-term exposures to people. This is because the magnetic fields will usually drop off greatly with increased distance from the panel.

#2.) Arrangement of Wires Inside the Panel for Maximum Self-Cancellation:

The placement of the hot and neutral wires inside the panel will greatly influence the magnetic fields emitted from the panel or junction box.

A.) For the power feeder wires to the panel: Keep the black, red and white feeder wires as close together as possible when connecting to the hot and neutral bus bars in the panel. The more separation there is between these three wires, the greater will be the magnetic fields emitted.

B.) For circuits which consist of one hot (black) wire and one neutral (white) wire: Run the black and white for each circuit as close together as possible right up to the breaker and neutral bar. Any physical separation between these two paired wires will effectively increase the magnetic fields.

C.) For three wire circuits consisting of two hot wires (a red plus a black) and one neutral (white) wire: Install the black, red and white wires as close together as possible right up to the breakers and neutral bar. Again, any separation of these three wires will increase the magnetic fields.

D.) Note that the ground wires do not carry current: Thus, they can be run in any convenient manner inside the panel or junction box.

Note: Explanation of the “Cancellation Technique” Used Above...

A magnetic field is created whenever an electric current flows in a wire. The magnetic field created by the current in the hot wire will be equal in strength *but opposite in direction* to the magnetic field created by its paired neutral. When a hot and neutral pair are run together as closely as possible, the magnetic field from the neutral wire will actually “cancel out” most of the magnetic field of the hot wire. This is because their magnetic fields are equal but opposite.

However, if there is any physical separation between the hot and neutral, there will be less “cancellation” between the two wires. This will result in a higher magnetic field from the panel. For any circuit, the more distance there is between a hot and its neutral, the more they will simulate a loop of current like the winding in a motor or transformer, which of course generates a strong magnetic field.

Note: Since the two hot bus bars and the neutral bars are necessarily separated from each other in the panel, this separation itself will create a certain level of magnetic fields inherent to any panel, which cannot be further reduced by cancellation. To reduce levels even further, special shielding using materials with high magnetic permeability, such as MuMetal, can be installed around the panel.

For further assistance regarding these procedures, or for other EMF testing, shielding, troubleshooting and installation of EMF-free wiring, please contact my office at 707-578-1645.

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