

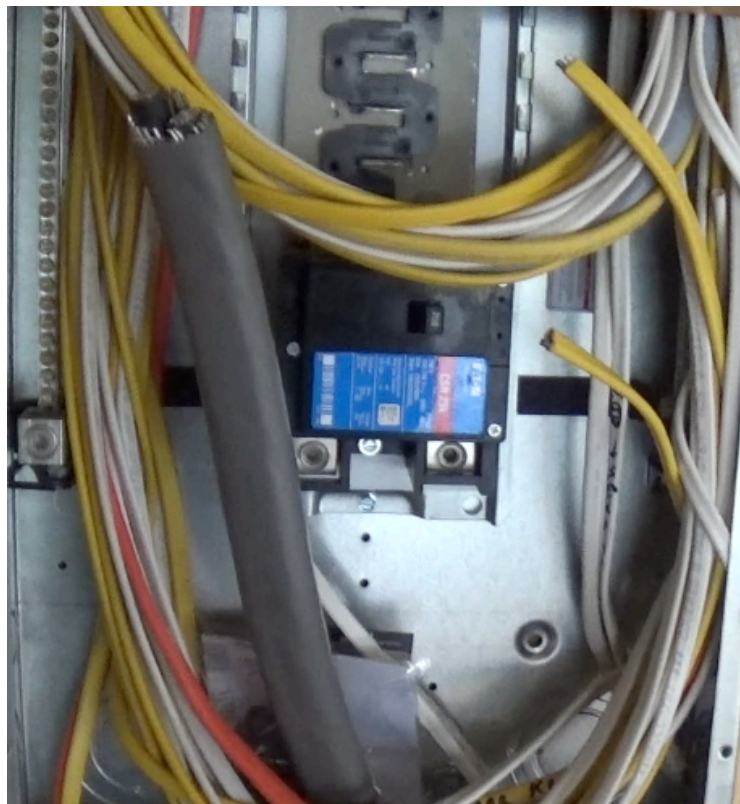
# Electrical Report

## *Suggestions for Electricians to Reduce Electromagnetic Fields*

Tracing Date: Wednesday, October 24, 2018

Home Owner: Steve Austin (123) 456-7890

Location: 123 Yourhome Drive, Raleigh, NC 27615



Andrew McAfee, EMF Consultant

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**See Video Notes here:**

<https://www.brighteon.com/5854307966001>

**Short List:**

- 1) Add Meter/Disconnect combo outside
- 2) Run 4 wire service conductors to main panel
- 3) Separate neutrals and grounds
- 4) Confirm no parallel neutrals (especially 3 ways don't merge 2 circuits)
- 5) Confirm no neutral/ground connections
- 6) Confirm no current on any grounding conductor (add intersystem bus bar)
- 7) Add two dedicated outlets off main panel
- 8) Add double pole outlet switch on right side of bed
- 9) Add MC cable outlet for CPAP on left side of bed
- 10) Replace crawlspace light and furnace Romex with MC
- 11) Generator subpanel with separate neutrals and grounds
- 12) Locate doorbell transformer away from living areas
- 13) Remove Romex staples from floorboard
- 14) Confirm the communications panel near the furnace is NOT wireless
- 15) Ensure plenty of Ethernet/Internet and phone jacks available throughout

**Expanded List:**

1) Add outside disconnect before inside main panel. This establishes an essential foundation for the entire electrical system where the neutral/ground connection, at the first means of disconnect, is separate from the inside branch circuit conductors. Adding a Meter/Disconnect Combo is the most convenient and cost effective way to accomplish this. This will be the only place the ground and neutral touch on the entire premises. Have the Ground Rod connected at this point.

Have no other appliance circuits/breakers in that outside service panel. If large 240V appliances are needed outside, add it as a subpanel off the inside panel, after the meter/disconnect combo. If for some reason the electricians put 240V circuits in an outside panel at the meter (not recommended), ensure the grounds do NOT have continuity with the inside panels or branch circuits through their equipment grounding conductors or through metal pipe. The outside panel and inside panel must NOT connect (creating a ground loop) through appliances, pipes or grounds other than the main Service Conductors. Never put 120V circuits in the outside Service Entrance Panel where the neutrals and grounds connect.

2) Run a new 4 wire (hot, hot, neutral, ground) feed from outside disconnect to inside main panel. Right now there is a 3 wire service conductor. Replace the 3 with a 4.

3) In the inside main panel, separate the neutrals and grounds onto different bus bars with no continuity between neutral and case/cabinet or with any grounds. Ground bar has the bonding jumper to case. Ensure the neutral bus is insulated from panel and has

no bonding jumper to case.<sup>1</sup> Right now the panel will have the neutrals and grounds connected together and throughout the house. Equipment grounding conductors will have neutral return voltages on them. Faults will not clear as designed. Body voltage will increase because neutrals will be pushing on equipment grounding conductors for a path back to source. No neutrals touching grounds on load side of first disconnect.<sup>2</sup>

4) No parallel neutrals in home.<sup>3</sup> Double check every circuit that it has one hot and only one return neutral, not two. Likely problems exist in 3 way light switches, 3 and 4 or gang light switch plates and any subpanel or box with two or more hots from different circuits. Never bundle together neutrals in a wire nut from separate circuits. Separate out the neutrals to dedicate only one return path so the magnetic fields cancel.

Every hot conductor must have its neutral running along side it with the same amount of current running in the opposite direction to cancel the magnetic field. 3 way switches are likely problems and should be removed if every hot can't have the same return current running along side it (traveler) to cancel the field. Make sure the 3 ways do NOT interconnect two different circuits.

5) No neutral/ground connections inside home.<sup>4</sup> Frequent problems areas are the dryer, cooktop range and any subpanel with a 120V and a 240V circuit (AC, Furnace, Water heater, etc.). 120/240V appliances must have a 4 wire run and I see that the range and dryer do have 4 wires run. Excellent! Make sure when the appliances are installed, the wiring inside the back panel of the appliance AND in the outlet, have neutrals and grounds separated. No neutral strap to case connection.

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<sup>1</sup> **2017 NEC Article 408.40 Grounding of Panelboards.**

“Equipment grounding conductors shall not be connected to a terminal bar provided for grounded conductors or neutral conductors...”

<sup>2</sup> **Article 250.24 Grounding Service-Supplied Alternating-Current Systems.**  
**(A)(5) Load Side Grounding Connections.**

"A grounded conductor shall not be connected to normally non-current-carrying metal parts of equipment, to equipment grounding conductor(s), or are be reconnected to ground on the load side of the service disconnecting means except as otherwise permitted in this article.

<sup>3</sup> **2017 NEC Article 310.10 (H) Conductors in Parallel**

“...neutral, or grounded circuit shall be permitted to be connected to parallel (electrically joined at both ends) only in sizes 1/0 AWG and larger...”

<sup>4</sup> **2017 NEC Article 250.142 (B) Load Side Equipment**

“The grounded circuit conductor shall not be used for grounding non-current carrying metal parts of equipment on the load side of the service disconnecting means ....”

6) There can be no current on the grounding conductors, the equipment grounding conductors or the grounding electrode conductor (GEC).<sup>5</sup> Likely sources not mentioned so far are from cable internet bonds, water pipes bonds and gas bonds. Ensure these bonds connect to the GEC, NOT to the service neutral bus.

Add an intersystem bonding termination bus on the GEC/ground rod for these bonds. This is the lightning path. The individual circuits will clear any faults on the metal pipe line for example from the water heater and gas furnace.<sup>6</sup> For insurance, install PEX or other food grade non-conductive pipe onto the water pipe where it enters the premises. This ensures the neighbor's current does not enter the home on the water pipe. Place the water pipe bond within 5 feet of entering the crawl space and connect to intersystem bonding termination.<sup>7</sup>

7) Add two outlets nearby off the inside main panel, one dedicated to the A phase and one to the B phase, two different 15A circuits in two different single boxes. These will be for the dirty electricity filters, added later.

8) Run a metal clad (MC)14 gauge (15A) line to the master bed room, metal box connectors grounded back to the panel. This is for the CPAP at night, on the left side bed outlet.

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<sup>5</sup> **Article 250.6 (A) Objectionable Current.**

**(A) Arrangement to Prevent Objectionable Current.** "The grounding of electrical systems, circuit conductors, ... and conductive normally non-current carrying metal parts of equipment, shall be installed and arranged in a matter that will prevent objectionable current."

<sup>6</sup> **2017 NEC Article 250.104 Bonding of Piping Systems and Exposed Structural Metal.**

**(B) Other Metal Piping.** If installed in or attached to a building or structure, a metal piping system(s), including gas piping, that is likely to become energized shall be bonded to any of the following:

- 1) Equipment grounding conductor for the circuit that is likely to energize the piping system
- 4) Grounding electrode conductor, if of sufficient size
- 5) One or more grounding electrodes used, if the grounding conductor or bonding jumper to the grounding electrode is of sufficient size

<sup>7</sup> **2017 NEC Article 250.104 Bonding of Piping Systems and Exposed Structural Metal.**

**(A) 1. General.** Metal water piping system(s) installed in or attached to a building or structure shall be bonded to any of the following:

- 3) Grounding electrode conductor if of sufficient size
- 4) One or more grounding electrodes used, if the grounding electrode conductor or bonding jumper to the grounding electrode is of sufficient size

9) Add a single outlet box above the first outlet to the right of the bed for a double pole outlet switch, to kill the hot and neutral Romex wire running along the headboard.

10) The Romex wire feeding the furnace and crawlspace light beneath the master bed must be replaced with MC cable, grounded back to panel. No stapled Romex lines under the sleeping areas. You may use one MC line feeding the 120V furnace and the CPAP in master. Upgrade amperage as needed (12 or 10 gauge MC).

11) Future Generator Panel needs to be configured so there is no neutral/ground connection or ground loop between the two panels. Best to have a breaker in the main panel for the subpanel, NOT a separate service feeding the generator. Make everything one system, not two, feeding the main panel. Subpanel for generator is correct terminology as the neutrals and grounds will NOT touch in the subpanel or that will become a load side neutral/ground violation.<sup>8</sup> In my opinion, it is best to feed power to the main panel rather than have two separate branch circuit systems.

12) Manual door bell, battery powered doorbell chime or locate transformer away from living area. Magnetic field from transformer extends out 3 to 6 feet.

13) Remove Romex staples from floorboard under kitchen, dining area, living room and replace with plastic hanging clips. The metal staples put the energy of the Romex into the floors and raises body voltage in those areas. Best to have MC cable run under heavy use areas, grounded back to panel.

14) Confirm the communications panel near the furnace is NOT wireless. Needs to use wires to relay information.

15) Err on the side of too many Ethernet/internet wall jacks available in the kitchen, guest room, office, upstairs bonus room, etc. Phone lines as well.

Respectfully submitted by Andrew McAfee. on October 28, 2018

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<sup>8</sup> **Article 250.24 Grounding Service-Supplied Alternating-Current Systems.**

**(A)(5) Load Side Grounding Connections.** "A grounded conductor shall not be connected to normally non-current-carrying metal parts of equipment, to equipment grounding conductor(s), or are be reconnected to ground on the load side of the service disconnecting means except as otherwise permitted in this article."

Informational Note: See 250.30 for separately derived systems, 250.32 for connections at separate buildings or structures, and 250.142 for use of the grounded circuit conductor for grounding equipment.