Building Biology Wiring Error Evaluation and Mitigation Protocol — Summary

Objective: Wiring errors = incorrect connections in neutral or grounding system. Current flows on wrong neutral or grounds. Determine problem circuit, trace and repair. Test: power on or off.


Neutrals of two circuits, combined

Power off: Test neutrals at panel with low voltage continuity tester. See blue-box.jpg. Blue box has 120 V to 12 V transformer, 12 V auto light, and dimmer switch.
Turn off circuits in panel. TEST NEUTRAL CONDUCTORS ONLY.
12 V test leads clip to panel ground and lifted neutral.
Do not use digital multi-meter (DMM) as continuity tester (can cause false positives due to low voltage on neutrals).
Lift neutrals from bus, one by one. Clip to lifted neutral. Dark light = good. Test light on = wiring error. Find location in building. Buzz stick locates path of affected circuit. Find first J-box. Check current loads on each pair of hots and neutrals in box. Pair from panel will match unbalanced load measured at panel. Find branch with net current. Follow until connection is located.
Problem could be in lamp fixture or J-box at fixture.
If branch goes to outlets, problem will either be:
ground wire + neutral under same wire nut; nick in insulation; bare ground touching neutral screw of outlet
Wrap tape around outlet screws.


Neutrals of same two circuits, separated

No mixing of neutrals and grounds in sub panels. Neutral bus must be isolated with no bonding screw or strap to back of panel.

Power on: Turn on loads throughout house. Clamp on circuits.
Look for net current (unbalanced loads) by comparing hot vs. neutral, or hot vs. neutral and ground.
Goals: 1) Load on neutral = load on hot.
2) Zero Amps on ground. No net current.
If Amps on neutral < hot, shut off other breakers. Find second neutral with net current. Caused by neutral-to-neutral error. Find neutrals from different circuits under one wire nut in J-box. Separate the neutrals from different circuits; resolves net current.


1 Amp on circuit ground, measured at panel

Wiring Errors violate NEC Section 301-3(b), which states, "All conductors of the same circuit -- including the neutral and all equipment grounding conductors -- must be run in the same raceway, cable tray, trench, cable, or cord." Also, NEC Section 310-4, which states, ”Conductors may not be paralleled, that is joined at both ends, so you can’t join two neutrals at a junction box because they are also joined at the circuit breaker panel where they terminate at the neutral bus.”

Neutral-to-ground errors violate NEC Sections 250.6 and 250.142. Section 250.6 says “objectionable” current is not to flow on grounding or bonding paths. 250-24 A5 states: “Neutral shall not be connected to ground at any point after the main service panel (containing the main disconnect switch).”


0.72 Amp net current on all conductors of same circuit