Presentation Handout for Workshop on Advanced Topics in Stray Voltage Investigation, a Pre-Conference Workshop of the 55th Annual Rural Energy Conference, Midwest Rural Energy Council, 2/8/2017 in Bloomington, MN. www.mrec.org
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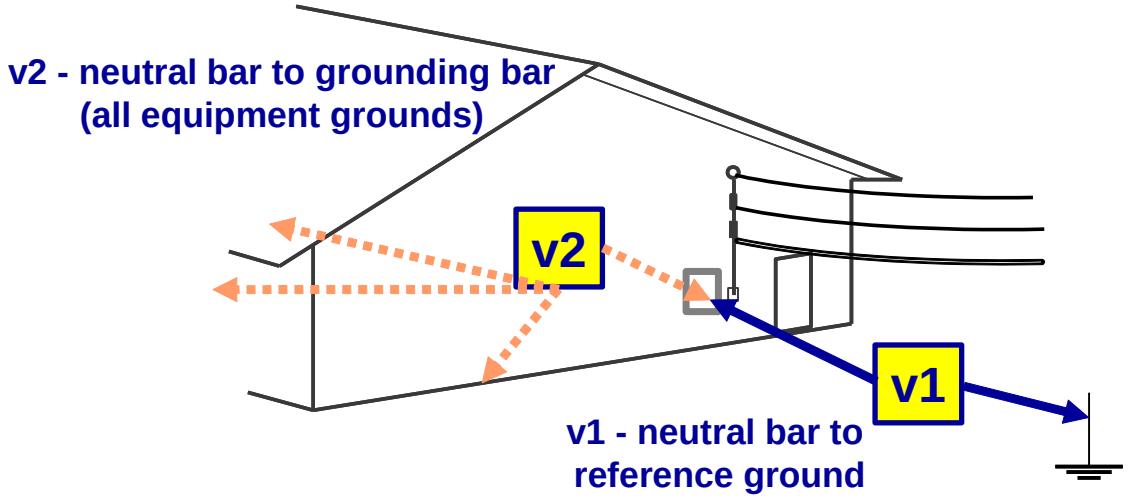
TESTING FOUR WIRE SYSTEMS rjf

I. USING VOLTAGE

1. Remove all loads from the service equipment.
2. Connect two meters, each one to the neutral bar (v1 and v2).
3. On one meter connect the reference rod (v1).
4. On the second meter connect the second lead to the grounding bar (v2).
5. Lift the bond between the neutral bar and the grounding bar.
6. Evaluate the separation of the grounded (neutral) and grounding conductors (fourth-wire) by the following analysis:
    - If v1 is much greater than v2 there is probably an unwanted interconnection between the neutral and grounding wires. v2 will be near zero if grounded and grounding conductors are connected.
    - Remove one outgoing grounding wire at a time until v1 and v2 read essentially the same **(see note below).
    - Find and separate the identified grounding wire/neutral interconnection.
    - Continue to remove other grounding wires one at a time from the grounding buss to verify test results.

The equipment grounding bar connects the second meter to all equipment grounds.



**Removing the neutral conductors versus the equipment grounding conductors may be more practical because the neutral conductors are insulated therefore easier to keep from touching each other while doing this test.

II. USING CURRENT TESTING 4 - WIRE SYSTEM

Turn off all circuit breakers in panel that has been 4-wired except one, 120 volt circuit (be sure all loads are unplugged on this circuit)

1. Put a milliamp meter around the 4th wire going back to the main service and take a reading
2. Turn on one 120 volt load (hair dryer) on the circuit that was left on
3. If the milliamp meter reading increases over ~ 0.250 amps there may be an intertie between the neutral and grounds
4. Verify that the N-G bond screw was removed from panel
5. Start measuring the equipment ground wires one at a time until the current close to the initial reading on the 4th wire feeder is found. Trace back on this circuit to find/repair the intertie. Repeat process to insure all interties are found

If the equipment grounds are bare current may access another circuit by touching each other or the panel enclosure.

When installing a 4-wire system in a panel keep in mind that this test needs to be done so allow room to get a milliamp meter around the two phase conductors, neutral and equipment ground conductors.

Also check the metallic waterline and/or LP line or other metallic lines to insure that they are not causing an intertie between two buildings.