240v 120v single phase explained

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Someone told me that a 240V circuit does not require a neutral wire in the cable. Can anyone explain this phenomenon from the electricity perspective and generally explain why circuits do and do not need a neutral wire?

In a 120/240V single split phase system, the two ungrounded (hot) legs are actually connected to the secondary winding of the distribution transformer. The transformer actually steps down the voltage to 240 volts, so the two legs are a complete 240 volt circuit.

The grounded (neutral) conductor is connected to the center of the coil (center tap), which is why it provides half the voltage.

Therefore, if a device requires only 240V, only two ungrounded (hot) conductors are required to supply the device. If a device runs on 120V, one ungrounded (hot) conductor and one grounded (neutral) conductor are needed. If a device needs both 120V and 240V, then two ungrounded (hot) conductors and one grounded (neutral) conductor must be used.

If you connect a load between one of the ungrounded conductors, and the grounded (neutral) conductor. You can also get a complete circuit, though it"s only through half of the coil.

Since these circuits only include half the coil, the voltage is also half (Es = EpNs/Np).

For the second part: clothes dryers often have 240 V heaters and 120 V motors. Stoves use 240 V for the elements and 120 V for the light bulbs. These are both plug-in and need the neutral.

My new electric hot-water heater is 240 V, not plug-in, and uses the old 120 V wiring. The electrician doing the install marked the "old" neutral with black tape at each end to warn that it"s now hot, and that there"s no neutral.....

In some wiring codes, each individual plug in a duplex outlet in a kitchen needs a separate breaker. They run a 240 V line to the plug, wire two hot lines each to the hot on a different plug, wire the one neutral line to both neutrals, and break off the tab connecting the two hots.

AC current requires a return path, electricity goes out one way and back the other. With 120V wiring in the US, you have a center tapped transformer with two hots that total 240V. The neutral is that center tap, which combined with only one of the hots gives you 120V. Use both of the hots and you have 240V. The only need for the neutral is to get a 120V circuit. It"s smart to wire a 240V circuit with a neutral conductor even if you don"t need it for the current appliance since it"s easier to run the extra wire once in case you need it in the

future, but that"s not required and electricians often cut these sorts of corners since that third conductor adds a lot to the wire cost.

Separate from the neutral is the ground, and this does need to be run on every circuit (though that wasn"t always the case).

Ground or earth is same together. In electrical systems wiring system is a conductor that provides a low impedance path to the earth to prevent dangerous voltages from looking on equipment. The terms "ground" (North American practice) and "earth" (most other English-speaking countries) are used synonymously here). Under normal conditions, a grounding conductor does not carry current. But Neutral is a circuit conductor that carries current in normal operation, which is connected to ground (or earth). Ref. wikipedia

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