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Electrical dangers in homes with knob and tube wiring
by Brian Cook, May 2007

Based on about 100 home electrical safety surveys that I have conducted done over the past 6 months, I have found only one home with dangerous knob and tube cabling. In this house the hazardous knob-and-tube wiring was a direct result of over fusing which resulted in over-loading of the conductors followed by insulation breakdown. With this home I rated the home high risk and presented that the home be rewired. The homeowner has done so.

A common danger relating to knob and tube wiring is the use of electrical devices requiring grounding that are connected to “ungrounded, 3-prong receptacles” (found in virtually all homes examined). This situation, the "lack of ground" can easily be remedied with the replacement of the ungrounded 3-prong receptacles with GFCI receptacles (or GFCI protection at the panel). This is an excellent solution that in my opinion provides equal if not better ground protection than standard 3-prong grounded receptacles.

A second danger relating to knob and tube wiring is the implementation of "Handyman add-ons". These add-ons are often found, though not exclusively, tapped into existing knob and tube circuits. Handyman add-ons can be very dangerous, consisting of, for example undersized wire, open splices, poor connections and/or dangerous placement or type of device to which it is powering. My findings show that dangerous "Handyman add-ons" are not limited to homes with knob and tube wiring, but related to the age of the house. Regarding homes with serious electrical hazards, I have found a particularly high incidence in homes with secondary suites, a result of the homeowners doing the wiring themselves or by unlicensed electricians.

Interestingly, in all homes examined, I have conducted “voltage drop test under loading”, an excellent test to determine the conductivity of the conductors, thus a presentation of electrical heat dissipated in the conductors and connections enroute. Any poor connections clearly show up whether the cabling be knob-and-tube, aluminum, or modern wiring. Poor electrical connections can lead to arcing followed by fire. My findings show that if there has not been “handyman tampering” the conductivity of knob-and tube circuits has been by-in-large superior to that modern cabling.[1] This is likely due to the soldered connections and the shorter wire runs of knob and tube wiring.

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[1] Voltage drop test under loading: Canadian Electrical Code states that at full load values within 5% are acceptable. Modern home wiring circuits typically show values in range of 4 – 4 1/2 %; Knob & tube circuits most often measure values in the range of 1 to 2%; On aluminum wiring circuits I have measured values exceeding 10%. This additional voltage drop is likely due one or more poor connections enroute to the receptacle, and must be repaired. A 1500 watt load (e.g. an electric kettle) connected to a circuit with a 5% voltage drop at a poor connection yields 60 watts heat generated at that connection. This would be comparable to the heat generated from a 60 W light bulb; most dangerous and must be repaired.

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A final mention: Of significant concern is dangers of service supply conductors (home powerline). The two very dangerous concerns that have found have been (a) broken "Emily knob" (in 3% of homes) and (b) trees applying pressure to service-supply conductors (in 26% of homes), causing tension on the conductors which could lead to a broken Emily knob. Once the Emily knob has detached from the house, the service supply conductors are at high risk of becoming detached at a point close to the side of the house. This can, and has led to fire outbreak.

In summary, electrical hazards have been found both in homes with and without knob and tube wiring, but the hazards have by-in large not been related to the knob and tube wiring itself. Homes with significant hazards have by-in-large been related to (a) the age of the house (the number of years where Handyman tampering could have occurred), (b) the application of the house (secondary suite or not), and proximity of trees to the service supply conductors. A comprehensive electrical inspection by qualified personnel is the only sure way to identify if and where there are electrical hazards.

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