

# Residential Knob and Tube Wiring

Knob and tube (K&T) wiring can be presumed to be the original electrical wiring in the home and is generally considered outdated by modern safety standards.

The age of the system generally creates problems because many service professionals don't understand how a K&T system is designed to work, and they improperly splice or otherwise damage the system.



Knob and tube wiring gets its name from its design, using porcelain or ceramic tubes to protect electric wires that run through lumber framing and knobs to hold the wires when they run along or next to lumber framing.

The connections for knob and tube wiring are open and visible, and the wires typically are spliced and connected with fibrous electrical tape. Knob and tube wiring was used up until shortly after World War II.

Any home with active knob and tube wiring should be examined in its entirety by a licensed electrician familiar and experienced with working with older electrical systems.

Provided ALL OF THESE CONDITIONS EXIST, knob and tube can provide many more years of reliable service:

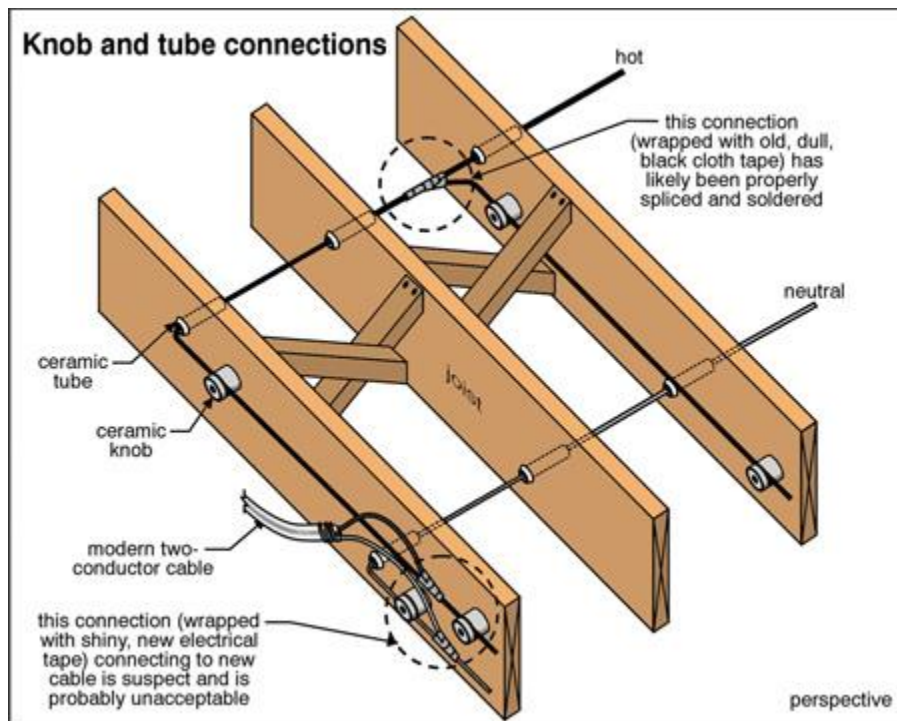
- it was installed properly,
- the insulation is in good condition,
- building insulation does not envelop the wire or make other improper contact,
- K&T wiring should not be used in kitchens, bathrooms, laundry rooms or outdoors. Wiring must be grounded in order to be used safely in these locations, and
- it has not been abused by excessive splicing and connections. It is the damaged wiring that can be a hazard.

Most old houses do not have as many electrical circuits as new houses. Often, when a circuit became overtaxed, resulting in blown 15 amp fuses, some ill-informed home owners would put in 25 or 30 amp fuses to "solve" the problem. Allowing 25 or 30 amps to flow through a wire which was not intended to handle that much electricity causes the wire to overheat. This can cause the wire and the insulation to become brittle. Some home owners also decided to add additional outlets in the house and tie the new outlets into the old wiring. These connections are often not soldered and appropriately protected, creating potentially hazardous conditions.



*Note the improperly spliced wires buried in insulation.  
This photo shows a dangerous situation*

In a modern system, there are three wires: a hot, a neutral, and a ground. The term “neutral” is a misnomer since there is nothing neutral about it. Electricity comes into the house on the hot wire and leaves on the neutral wire. A properly designed and properly operating electrical system must return electricity to where it came from. If the electricity can't get back to where it came from, then it will try to go to the ground, hence the name for the ground wire. If there is no ground wire, then people and appliances provide a pathway to the ground if there is a short in an appliance or a problem with the electrical system. Electricity traveling to the ground through people is never a good idea. Since a knob and tube system has only two wires, meaning that there is no ground wire, it is difficult to splice into properly with modern wires that do include a ground. In modern electrical wires, there are actually three smaller wires inside of the large wire you see, whereas in a knob and tube system, the smaller wires are exposed. Consequently, it is easier to damage the knob and tube system, possibly resulting in electrical hot spots, arcing, and fires.



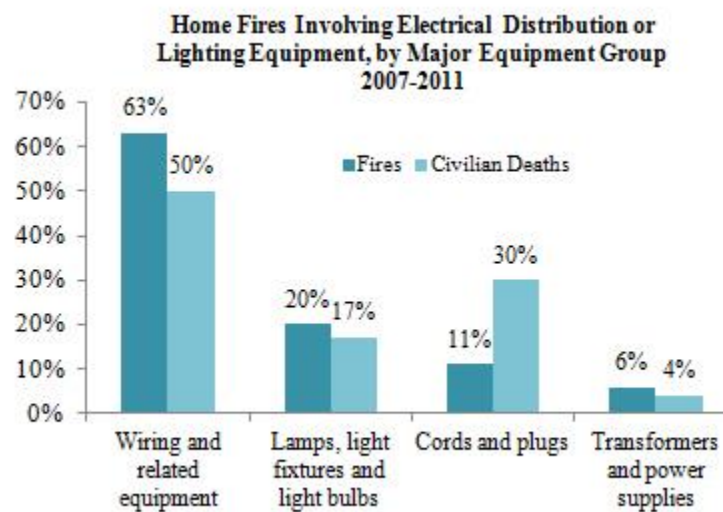
Since electrical wires get hot due to the resistance of the electrons flowing through the wire, a knob and tube system requires adequate clearance around it—good ventilation—in order to dissipate the heat that is inherent in electrical wiring, so it is not designed to be covered with any material such as the modern insulation that we put in our attics. Older wiring was specifically installed in open spaces so that it would stay cool. Modern insulation installers typically are not familiar with the design of older electrical systems, and do not know to carve out safe spaces for K&T wiring. The insulation on the wires is rubber or cloth that melts or burns at a relatively low temperature, so if the wires are covered by insulation other than the wire insulation itself, the wires could heat up enough to burn. Unfortunately, since K&T wiring indicates an older system, the insulation on the wires is probably brittle and might even be missing or damaged in some areas, especially if wildlife have intruded into the attic or foundation crawl spaces where most knob and tube wiring is located.

Many modern appliances have a three-prong plug, and modern electric outlets have three slots: a short vertical one that indicates the hot wire, a tall vertical one that indicates the neutral wire, and a round one that indicates the ground wire. A ground wire is necessary if you are plugging in appliances that have three prongs in the cord's plug. The three-to-two prong adaptors that are sold at home improvement stores bypass the ground safety circuit and should not be used for computers and other expensive or critical electronics. Without a ground, you're putting yourself and your equipment at risk. A three-wire system with a ground wire is currently the safest.



## Facts

- Properly installed and maintained knob and tube wiring is not necessarily unsafe
- Modern electrical installations contain safety benefits not found in older electrical systems, including:
  - Greater electrical capacity
  - Splices and joints made in approved electrical boxes
  - Dedicated electrical circuits for certain types of electrical equipment
  - Grounded switches and light fixtures
  - Tamper-resistant receptacles
  - Available ground fault circuit interrupters
  - A significant number of insurance companies now consider knob and tube wiring unsafe or a significantly higher risk. Consider contacting your preferred insurance company before close of escrow to ensure that appropriate homeowner's insurance can be obtained on the structure while active knob and tube wiring is present.
  - Modifications to knob and tube wiring should be done by a licensed electrical contractor knowledgeable about knob and tube systems.



If you have questions about K&T wiring, consult an reliable electrician for a full-home assessment.