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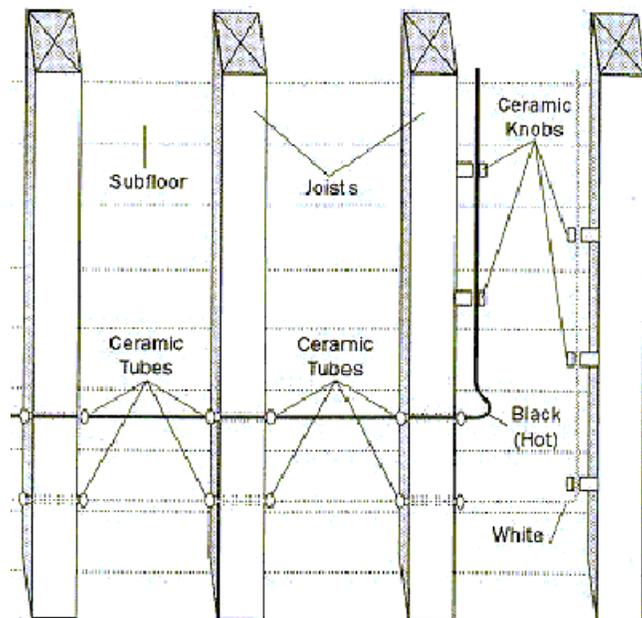
## Knob and tube wiring in residential installations

### Issues with knob and tube wiring

Since January 2003, the Electrical Safety Authority (ESA) has received an increasing number of questions about the safety of knob and tube wiring. In particular, purchasers or owners of older homes are finding that many insurers will not provide or renew coverage on such properties. In some cases, the insurance companies are requiring a total replacement of this wiring prior to providing insurance coverage.

Knob and tube wiring, more recently referred to as open wiring, was a wiring method used in the early 1900s to 1940s in the residential sector. Over the years wiring installation practices have changed in the residential sector and knob and tube wiring is no longer installed, however, parts continue to be available for maintenance purposes.

**Diagram F1- Typical knob and tube installation**



Existing knob and tube conductors concealed in walls, floor spaces, etc; supplying general lighting and receptacle circuits are permitted to remain in place if:

- They are protected by a 15 A fuse or circuit breaker; and
- No additional outlets have been added to the original installation, so as to overload the circuit; and
- The conductors, where visible, appear to be in good condition.

If your home has knob and tube wiring, we recommend that you follow these guidelines:

- Have a licensed electrical contractor check the “knob and tube” conductors in your existing installations for signs of deterioration and damage.
- “Knob & tube” conductors should be replaced where exposed conductors show evidence of mechanical abuse and/ or deterioration, poor connections, overheating, or alterations that result in overloading, or if changes to the wiring contravene any section of the Ontario Electrical Safety Code (OESC).

Homes with knob and tube wiring may not have the electrical capacity to meet today's needs. As a result, homeowners have modified their electrical system with what ESA classifies as unsafe practices:

- Improper use of extension cords – using improperly rated extension cords, or using extension cords as permanent wiring;
- Improper fuse replacement – using 20 or 30 A fuses to replace 15 A;
- Improper connections - adding receptacles and outlets on existing circuits or improperly connecting to the knob and tube wiring (this work should be done by a licensed electrician);
- Removing ground pins – ground pins on power bars or electrical equipment should not be removed to accommodate the two pin receptacles used in knob and tube wiring (2 pin to 3 pin are not permitted)
- Improper replacement of two pin receptacles. If you require a three prong receptacle, only use a ground fault circuit interrupter (GFCI) receptacle.

Homeowners who are planning to modify their knob and tube wiring, or any other electrical wiring, should have the work performed by a licensed electrical contractor. A notification is required to be filed as per Rule 2-004.

### Receptacles in existing knob and tube installations

Where grounding type receptacles (three pin) are installed in existing knob and tube installations to replace the ungrounded type (two pin) receptacles, special caution must be exercised.

**Diagram F2-Two and three pin receptacle configuration**



Two Pin (ungrounded) Three Pin (Grounded)

Rule 26-702 1) requires the installation of a bond conductor, to bond the receptacle to ground. This is permitted to be an external bonding conductor that is connected to either the system ground conductor or a metallic cold water pipe that is bonded to ground. This method may be difficult to accomplish.

As an alternative to bonding, Rule 26-702 2) of the Code also states that "grounding type receptacles without a bonding conductor shall be permitted to be installed, provided each receptacle is protected by a GFCI of the Class A type, that is an integral part of this receptacle; or supplied from a receptacle containing a GFCI of the Class A type; or supplied from a circuit protected by a GFCI of the Class A type (a GFCI breaker in the panel, or either a GFCI receptacle or a GFCI dead front mounted in an outlet box next to the panel). Where this option is used, no bonding conductor is permitted between outlets, unless that conductor is in turn connected to ground.

GFCI protection of the receptacles does not provide a ground reference to the U-ground slot of the receptacles. Some appliances require a bond be connected to the U-ground slot in order to function properly. For example, surge protective devices for computer or entertainment equipment will not function without a ground reference.

As new electrical equipment is introduced into the dwelling unit there might be a need for additional outlets to be installed. Extension cords are not to be used as a substitute for permanent wiring. The following shall be followed when installing new receptacles:

- Outdoor receptacles shall be GFCI protected,
- Bathroom and washroom receptacles shall be GFCI protected.
- Kitchen receptacles within 1 m of a sink shall be GFCI protected
- New outlets shall follow the current OESC requirements for wiring, meaning a new branch circuit shall be grounded and receptacles that utilize the three pin grounded configuration, listed in Diagram F2.

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### **Benefits of new wiring**

While knob and tube conductors in good condition that have not been inappropriately altered will not present undue hazards, it is worth noting that modern electrical installations contain safety benefits not found in older electrical systems. These include:

- Generally larger electrical capacity and more electrical circuits reducing the need to use extension cords
- Splices and joints made in approved electrical boxes
- Dedicated electrical circuits for certain types of electrical equipment or appliances
- Grounded and bonded receptacles, switches and light fixtures
- Tamper resistant receptacles in homes
- Ground fault circuit interrupters in bathrooms and outdoor locations as per the latest edition of the OESC
- Arc Fault Circuit Interrupters in bedroom receptacle circuits
- GFCIs near sinks.

Homeowners who are planning to modify their knob and tube wiring, or any other electrical wiring, should have the work performed by a licensed electrical contractor or electrician and arrange for an electrical inspection by ESA.

### **Myths**

- Knob & Tube wiring is unsafe.
- All knob and tube wiring must be disconnected and replaced.
- The OESC no longer recognizes knob and tube wiring as an acceptable wiring method.

### **Facts**

- Knob & Tube wiring is safe, provided it is properly maintained by competent licensed people as outlined above.
- The ESA as well as the OESC recognize and accept knob and tube wiring methods.
- The OESC contains rules that govern the installation of open type wiring methods (knob & tube). Rules 12-202 to 12-224 set out the minimum safety standards for the installation of open wiring, which may still be installed to this day.