Electrical Risks, Safety and Solutions for Older Homes

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www.powercheck.ca

Learning objectives

- 1. To understand the different types of wiring used in older houses
- 2. To recognize the leading electrical fire concerns in older houses
- 3. To understand the PowerCheck program

Electrical fires

 In BC, 2004-2007

 €633 reported electrical fires
 ¥4 fatalities
 ¥\$55.7 MM property loss
 ¥Fepresents ~10% of
 reported fires



As houses ages: Probability of fire increases



In 25% date of house construction unknown. Data source: BC OFC

What is causing electrical fires?

 Old services, panels & wiring

Important to check, and sometimes faulty, though not the leading cause of electrical fire

Handyman tinkering

Accounts for the vast majority of electrical fires.

Hazardous add-ons build up over the years.

Sometimes old houses are rampant with hazardous handyman add-ons



ALL TOO COMMON.

In older homes hazards such as this add-on basement receptacle are commonly found. These hazardous additions put the house at high risk of electrical fire.

Electrical System Components



Service: 60-amp

- Until the1970s nearly all homes had 60-amp service.
- Original 60-amp services can be acceptable today, if there has been no additional circuits or tampering.
- Homeowners today are often not aware their home has 60-amp service.



Old service boxes often have the wording "*Rated for 100 amps*". This refers to the box rating, not service size.

Sometimes panelboards have been hazardously upgraded





100 amp main breaker on 60 amp service!

200 amp main breaker on 60 amp service!

Common hazard in panelboard: An over-rated circuit breaker...







...can create over-heated conductors



Wiring before 1950: Knob and tube

- Installed in nearly all homes built before 1950.
- Still present in *most* pre-1950 homes today.
- Often concealed thus hard to identify, particularly if outlets have been changed.



Original two-prong, ungrounded receptacle

Knob and tube: Qualities

• Characteristics:

- Two single conductors
- Supported by porcelain knobs and tubes
- A well designed system:
 - Heavy gauge conductors
 - Spaced well apart
 - All connections soldered
- Work seldom done by nonprofessionals



If basement has been finished, and new panel installed, knob and tube is likely concealed, behind the walls and in the ceilings

Knob and tube: Hazards

- Original 2-prong outlets: Now 3prong:
 Result: No ground protection
- Original lighting: Now recessed lighting

Result: Insulation breakdown

The limited number of outlets in older homes spurred add-on circuits, so often installed by unqualified people.
 Result: Hazardous add-on circuits



In 99% of older homes, the original 2prong outlets have been found swapped for modern 3-prong, falsely presenting receptacles are grounded.

Knob and tube: Solutions

- 1. **Rewire: \$20,000 +** or
- 2. If wiring checks out fine: GFCIs can provide excellent ground protection: \$20 each

Note: Vast majority of homes: Old wiring = Excellent condition!

AN EXCELLENT SOLUTION!



GFCI receptacle provides excellent ground protection. It disconnects the power if leakage to ground exceeds 5 mA.

Knob and tube: Findings

In 99% of homes:

- Knob and tube wiring is still live today
 Usually not visible due to new panel and finished basement.
- Knob-and-tube wiring is in excellent condition
 No need for expensive replacement, but:

Original 2-prong outlets now modern 3-prong

- Falsely presenting outlets are grounded, thus rated "High Risk".
- Cost to eliminate fire risk: Less than **\$500**

RESULT: SAFE AND HAPPY HOMEOWNERS!

1950s: Ungrounded cable "NMD1"

- New cable introduced 1950.
- Installed in most homes throughout the '50s
- Similar to knob and tube, presenting same fire concerns:
 - ☑ Original 2-prong outlets now 3prong
 - ☑ Not suitable for recessed lighting
 - Due to limited number of outlets installed at time of construction: Probability of hazardous add-ons in home is high.



Due to speed of installation NMD1 quickly replaced knoband-tube wiring. Shown here, feeding a 3-prong receptacle

Wiring of the 1960s

- NEW cable introduced in the 1960s: "With ground"
- Fire hazards:
 - Though providing ground protection, the insulation is still not suitable for recessed lighting.
 - Due to limited number of outlets installed at time of construction, probability of hazardous add-ons being present in home is high.



Introduced in the late 1950s: "NMD3". Same conductors as NMD1, but "With ground". Early versions had these words written on the cable jacket.

Wiring of the 1970s

- A new cable with higher insulation temperature becomes the standard.
- Suitable for recessed lighting.
- Fire hazards:
 - ☑ Due to the rapid rise in basement suites, kitchen renos and powering of garages: Unauthorized electrical work thrives.
 - This is encouraged with the proliferation of self-help guide books and easy access of electrical supplies.



Modern wiring, NMD7 & NMD90 become the standard, but along with it comes "do-it-yourselfers".

Aluminum wiring: 1966 – 1974

- In vast majority of homes built 1966 – 1974.
- Still present today in *most* homes built 1966 – 1974.
- Designed as a costeffective solution due to the high price of copper during these years.



An aluminum-rated receptacle was required with the installation of aluminum wire.

Aluminum wiring: Hazards

Aluminum wiring can be fine, but:

 Original aluminum-rated outlets are commonly found swapped for modern, non-aluminum-rated outlets HAZARD: LOOSE & POSSIBLY CORRODED CONNECTIONS

FIRE HAZARD!



Original aluminum-rated outlets are commonly found swapped for modern, non-aluminum-rated outlets.

Aluminum wiring: Solutions

- 1. **Rewire: \$20,000** or
- 2. Approved copper pigtailing/ aluminum rated devices Typical cost: ~\$1000

Plus: Regular maintenance

Checking that electrical connections have remained sound, recommended every 15 years.



"If home [with aluminum wiring] has not been checked since new, it is high time overdue" (NFPA).

Hazardous add-ons

- So prevalent in older houses, putting house at risk of fire
- Multitude of ways, including:
 Incorrect cables
 Circuits poorly grounded
 Oversized circuit breakers
 Oversized circuit breakers
 Poor electrical connections
 Knock outs ("mouse holes") in JBs and panels
 BX cables without antishorts





Some hazards are inadvertent actions from other trades

- Original copper water pipe replaced with "PEX" plumbing pipe, disconnecting the service ground
- Old hot-water-tank electrical cable left live and dangling.
- Both these concerns commonly found



Houses with illegal suites show particularly increased risk

To accommodate additional power demands of multiple suites, original 60-amp fuses are sometimes found replaced with copper pipe, eliminating circuit protection, putting house in extreme peril.



This exact scene was found by PowerCheck in an older home in Vancouver. Homeowner believed he had 100-amp service due to rating on box. **Home was sent to us because of knob-and-tube wiring**.

Old circuit breakers may not trip

- Old breakers, such as Pushmatic, XO Sq. D & Federal Pacific do not have the fast trip characteristics of modern breakers
- Old circuit breakers, pre-1970s have well exceeded their rated service life.



Type XO breakers, by Square D should be replaced whenever identified.

Exposed electrical connections

If connections become at all loose they will arc, easily igniting surrounding wall material.

Commonly found.



This scene was found in a older home in New Westminster by PowerCheck. **Home was sent to us because of knob-and-tube wiring**.

No junction box behind electrical device

If connections become at all loose they will arc, easily igniting surrounding ceiling material.

Commonly found.



Home was sent to us because of knob-and-tube wiring.

Extension cords stapled to walls

Staples put pressure on cord. Over time the cord insulation breaks down. The staple then creates a direct short across the wires, which can easily result in fire.

Commonly found.



Home was sent to us because of knob-and-tube wiring.

Baseboard heaters prone to fires

Electrical equipment needs to be installed with thorough knowledge of the electrical code.

Incorrect installation can easily result in electrical fires.



"Seven firefighters said the fire began about 1 a.m. near an electric baseboard heater. Three children died, ages 6, 2 and 14 months" (Cleveland News, Dec 5, 2007).

Statistics Pre-1950 homes in general



Data source: First 100 homes examined by PowerCheck

Statistics Pre-1950 homes with secondary suite



Data source: First 100 homes examined by PowerCheck

Risk and age



Summary

- Electrical fire hazards are to be found in nearly all homes built before 1975.
- Though deterioration of older electrical systems is occasionally found, the vast majority of fire hazards have been due to handyman tinkering.
- Expected cost to bring home to "Medium Risk", in vast majority of homes: < \$1000
- Expected cost to bring home from "Medium Risk" to "Low Risk": \$1000 - \$1500

PowerCheck Electrical Safety Assessment

- Standardized electrical safety examinations
- Key points:
 Conducted only by master electrician
 Comprehensive 80-point examination
 Third party examination only



PowerCheck Electrical Safety Report

- Standardized risk rating
 Extreme
 High
 Medium
 Low
- One price: \$349 for all single family homes*

* 2012, up to 300m², within major city limits

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PowerCheck Risk Rating explained

- Extreme Risk
 Serious fire hazards identified requiring immediate attention
- High Risk

Fire hazards identified. Repairs recommended ASAP • Medium Risk

Acceptable condition. Complies with code at time of installation.

• Low Risk

Not only meets Medium Risk, but additional upgrades have been done to substantially bring home up to current standards.

The PowerCheck promise

- Standardized examinations
- Accurate and consistent reports
- Examiners across Canada
- Simplifying the electrical risk evaluation process

Over 2000 clients have had their electrical system examined by PowerCheck. Nearly all have said, "*It was the best thing that we have ever done*".

