Insurance Institute

Insurance Institute of BC Presents: Old Home Electrical Fire Risks Q&A

1. **The different types of wiring and the years they were most prevalent?**
   Pre-1950: Knob-and-tube. Note: Though knob and tube was phased out by 1950, the cable that replaced it, "NMD1" also had no ground. Grounded, modern 3-prong receptacles did not become code until1962.
   1965 – 1975: Aluminum wiring of branch circuits.
2. **How do you recognize the different types of wiring in a home?**
   A combination of visual inspection combined with electrical testing. Ungrounded wiring can usually be identified with a tester. However a visual inspection in the outlet is often also required as some outlets appear grounded when in fact they are not grounded correctly (example, outlets wired with old armoured cable). Aluminum wire is usually identified in the panelboard and at the receptacles and switches. It is important to note that identification of copper in basements tells us little about aluminum presence, as aluminum was typically used main and top floors only. Basements were left bare (except for washing machine and dryer outlets). Yet today, most basements have been fully wired, over subsequent years, with copper.
3. **Based on today's electrical needs what is a reasonable service size?**
   The correct service size depends on size of house and electric equipment in the house. Electric heating, including baseboards, hot tubs, ranges and dryers greatly increase electrical demand. A calculation called the "Demand Calculation" presented in the Canadian Electrical Code outlines the steps to determine minimum service size in a home.
4. **Why is 100-amp minimum requirement today? Is 60 amp not safe?**
   Beginning in the 1970s, if area of house is 80 square metres (861 square feet) or more the Canadian Electrical Code requires a minimum service of 100 amp regardless of the calculated demand. This rule does not imply 60 amp service is dangerous per se, only that in homes with larger area, regardless of calculated minimum service size, 100 amp should be installed, for potential future electrical demands that may arise (e.g., basement suite, second range, additional electric heating). This addition to the code makes sense, as at the time of new construction the extra cost to install a 100-amp instead of a 60-amp service is minimal.
5. **How do I determine service size in a house?**
   It is often thought to determine service size simply read the main breaker. While this method may work correctly in most cases, in many cases it does not give correct results, and may in fact overlook serious electrical fire hazards in the panelboard. In the main disconnect is not uncommon to find original 60-amp service conductors feeding a 100-amp circuit breaker. This scenario is a 60 amp service with an oversized main circuit breaker. It is illegal and puts house at increased risk of fire. In addition sometimes these illegal upgrades have splices in the main service conductors, greatly increasing risk of fire. The correct method to determine size is to open the main disconnect and take a look. This section of the panel can only be opened by a qualified electrician.

6. **What happens when there is a mix of different wiring in one building?**
   Most older houses do have a mix of wiring in the house. In houses built pre 1950, it is common to find original wiring of knob and tube, additions done in the 1960s with paper-wrapped cables and additions done in the 80s with modern plastic cables. All systems can work well together providing that they are all in compliance with Canadian Electrical Code. It is important to note that modern panelboards and modern cable can feed knob and tube circuits, but modern cable cannot be added on downstream to knob and tube. This is an easy check for an electrical examiner familiar with both systems of wiring.
7. **Homes in the interior being built with 400 amps, but not in the lower mainland. WHY?**
   Whereas houses in the Lower Mainland are usually heated by natural gas, in the Interior electric heating is commonplace. Electric heating greatly increases electrical demand. As such it is not uncommon for houses in the interior to have large electrical services.
8. **What tips are there to determine how a home is wired without having an inspection?**
   Best indicator: ***Age of home.*** If house was built pre-1950 it likely has knob and tube, if wired 1965 to 1975 it likely has aluminum. Without question houses pre-1975 have a higher probability that hazardous add-ons are present; putting house at increased risk of fire. Older houses had fewer outlets installed at time of construction, hence are more prone to more add-ons having taken place over the years. Older houses with an illegal suite are almost certain to have hazardous add-ons present.
9. **What can we expect to see in the next 10 years? Any concerns?**
   Due to increasing house prices the building of illegal suites continues to flourish. If electrical renovations and upgrades are done by unqualified people, without electrical permit, fire hazards are sure to be present.
10. **What is the most common cause of electrical house fires?**
    Hazardous add-on circuits are in abundance in older houses, hence likely the most common cause of electrical fire. It is not uncommon in an older house with an illegal suite or renovation to find circuits not grounded, extension cords installed hazardously as permanent wiring, exposed wire connections, over-sized circuit breakers, circuits not grounded. These hazards and so many more significantly increase the risk of electrical fire.
11. **If cell phone charger is plugged in but phone not into charger, is there any danger?**
    No undue concerns. However chargers do draw small operating current, thus it makes sense to unplug devices when not needed.
12. **Can you mix knob and tube with the new electrical system?**
    It is common in an older house to find a new service and panelboard feeding knob and tube circuits. Typically, new modern cables will run from the new panelboard to a junction box elsewhere in the house, where the cables connect to the knob and tube. Thus at the new panelboard there is no sign of knob-and-tube. Yet in nearly all houses built before 1950 some degree of knob and tube is still present and working, though usually not visible at the panel.
13. **How does the load of new devices such as projector TV's and sound systems that people install in the basement affect fire risk?**

If the circuits for these appliances are installed by a licensed electrical contractor under permit there should be no concern. If however the receptacles were added on, tied on to an existing circuit by handyman without electrical permit, then there is certainly potential for concern.

14. **I am interested in learning the difference between 110V and 220V. Something about "110V and 220V power are really the same thing. It's called split phase. The two phases are shifted 180deg, so they represent 110V to neutral, or 220V to each other." How does 220V then affect the fire risk?**
    Most single family houses in Canada are supplied with single phase power. The single phase power system provides the opportunity for both 120 volt and 240 volt circuits. Standard receptacles and lighting use 120 volts. Heating equipment typically use 240 volts. Major appliances typically employ both 120 and 240 circuits. If the wiring and equipment are installed by a licensed electrical contractor under permit then neither system poses undue concerns. Should however either system be installed by unqualified people then fire hazards can certainly be present.
15. **"Paper-wrapped cables" used from 1950 to 1980? How popular is this and is it safe?**
    Electrical paper-wrapped cables became popular late 1940s, phasing out knob-and-tube wiring as its installation was less labour intensive. The cable that replaced knob and tube ("NMD1") was similar to knob and tube in that it had no conductor for grounding. Throughout the 1950s NMD1 was installed throughout houses to lighting and to two-prong ungrounded receptacles. In the late 1950s a new cable was introduced ("NMD3") providing ground. However its use was not universal as "modern, grounded, 3-prong receptacles" were not required until 1962. The fire hazard we commonly see in houses built pre-1962 is that the original 2-prong, ungrounded receptacles have been swapped for modern 3-prong without providing the necessary ground protection to the receptacle, creating a fire hazard.
    In the 1970s a new cable "NMD7" was introduced designed for modern ceiling lighting, with a higher insulation temperature rating (90 ^{o}C) than its predecessors. It also had a paper-wrapped jacket. By the mid-1970s the paper-wrapped jacket of NMD7 was replaced with PVC, later to be called NMD90.
16. **Had a situation where a broker had advised a new home construction has aluminum wiring. Is aluminum wiring being installed in new construction? If so, how does this compare to older homes with aluminum wiring regarding fire safety?**
    Aluminum feeder cables are still often installed today, providing power for modern panelboards and for high current equipment. It is not uncommon to find an electric range wired with an aluminum cable. So long as these cables were installed as per code, these cables pose no undue concern, as modern panelboards and ranges are designed for both copper and aluminum conductors.
    The concern of aluminum wiring surrounds its use in "*branch circuit wiring*" (receptacles and lights) predominant 1965 to 1975. The classic hazard is the original receptacles and switches have been swapped for modern receptacles and switches which are not rated for use with aluminum. The connections at the receptacles get loose, creating the potential for fire. Fortunately there is a simple solution: "*Approved copper-pigtailing*".
    Approved copper-pigtailing entails short pieces of copper wire added to the modern devices,

which connect to the aluminum wire with a special wire connector. To assure this work has been done correctly, it is required to be done by a licensed electrical contractor under permit.

17. **Wall installed space heaters are becoming more popular. Some are hard wired while others are not. Are the concerns same as baseboard heating?**
    Wall installed space heaters share the same concerns as baseboard heaters. As electric heating draws high current, the electrical connections must be correct and tight, and of course correct grounding is essential.
18. **Is there a requirement under current code for homes with 60 or 70 amp service over 1000 sq ft to upgrade their electrical?**
    If there have been no electrical additions to house since time of construction (in many older houses that is the case) then existing 60 or 70 amp service remains acceptable today. If however the electrical demand has increased, such as the addition of a basement suite, then service must be upgraded to meet the new, increased electrical demand. In older houses with 60 or 70 amp service PowerCheck examiners conduct a demand calculation, to determine if existing 60 or 70 amp service remains acceptable.
19. **About municipal rules regarding altering electrical – does every change require inspection/permit?**
    The details as to where and when a permit is required, and who may perform the work is presented in "*BC Safety Standards Act, Electrical Safety Regulation, Part 2, Division 1 (sections 11 – 19)*". In summary, as a general guide, *any* new electrical installation work or alteration to the existing electrical system can only be done by a licensed electrical contractor under permit. This is to assure that the new installation or alteration has been done correctly. There are a few minor things that can be done without a permit, restricted to replacing a device such as a switch or receptacle with an equivalent of similar rating, or replacing a light fixture for example. All other electrical work, including most repairs requires the work be done by a "*licensed electrical contractor"* and likely under permit. To view the Regulation, see link below *(sections 11 – 19)*.

    http://www.bclaws.ca/Recon/document/ID/freeside/12_100_2004