

Electrical Systems

We're Gonna Walk Down to Electric Avenue

It's hard not to take electricity for granted, isn't it?

The only time we *really* pay attention to electricity is when the lights don't come on when we flip the switch, a situation many of us suffered during the recent numerous polar vortices (yes, we had to refer to our old and musty Merriam-Webster for the plural of vortex).

We also pay attention to electricity when our utility bills arrive and we suffer heart palpitations. We curse the electricity gods (otherwise known as the local utility) when we look at our thermostats and notice "Aux Heat On." And then we start to cry because we know our next utility bill will be even higher.

There's no doubt about it – electricity is pretty darned important. From Ben Franklin's famous kite and key experiment to Thomas Edison's first light bulb (which supposedly lasted 100+ years) to Dr. Frankenstein's unholy creation to the more recent exciting innovations in LED technologies, electricity has rapidly morphed from innovation to novelty to luxury to absolute necessity.

But despite its critical contribution to all of our daily lives, most of us don't really spend a lot of time thinking about electricity, how it gets into our homes and, once it's there, how it gets distributed around the house.

Three Parts of an Electrical System Inside a Home

Electrical systems inside residential homes generally can be characterized into three subsystems:

- **Service Wiring** – Utility service wire to the meter and from meter to main panel
- **Main Panel** – Main electrical panel and all subpanels
- **Branch Wiring** – Wiring from electrical panels to outlets, lights and appliances

We will spare you the excruciating details but you probably already realize that there are *thousands* of pages of electrical codes over the years that detail exactly how all of the wiring has to be installed and how and where electrical panels can be placed, in addition to many rules regarding what types of wiring can be installed for specific applications.

Thankfully (for both of our sakes), we're interested in providing you with a general overview and a basic understanding of electrical systems in residential applications.

Plugged in to the Matrix: Service Wiring

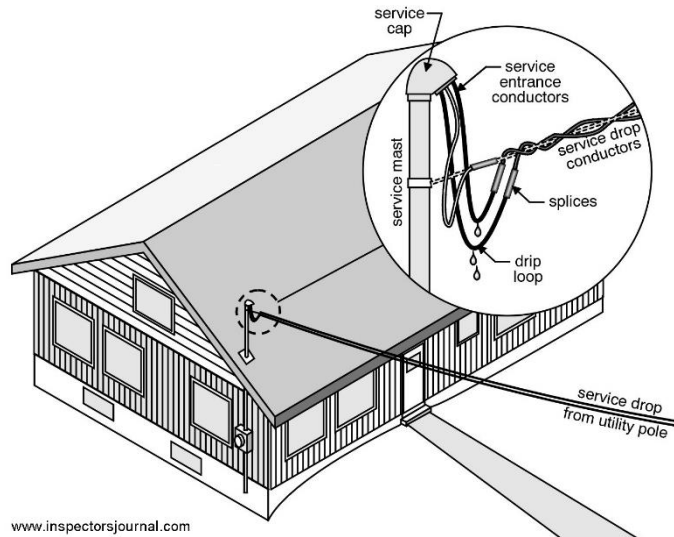
Forget for a moment about the larger energy picture, which includes energy generation, transmission and distribution. Instead, let's focus intently on the local electrical transformer – exactly how does electricity get from the local source to your residential single family homes or townhouse?



The answer is *service wires*, generally via one of two methods: i) underground conduits and wires or ii) above ground with electrical poles and overhead wires.

Underground service wires emanate from the local transformer to your meter and are typically protected by a plastic pipe coming out of the ground to the bottom of the electrical meter.

Service wire via overhead cable is similar but instead of being buried, cables are strung on electrical poles and tapped off the poles to individual homes; an electrician runs a service wire from the electric meter to a service mast where the service wire from the power company is installed. The electrician typically installs a “drip loop” to prevent water from running down the electrical wire to the service meter.



Regardless of service wire method, the incoming wires are connected to one side of the service meter; wires from the main panel are attached to the other side of the meter to ensure that all power flowing from the utility company into the home is counted.

From an inspection perspective, wires entering the meter need to be sealed to keep water from damaging the electrical system. The meter needs to be painted and vegetation must be controlled to allow access and to prevent damage to the wires and components.

Brains of the Operation: Main Electrical Panel(s)

Electric panels take the main service wire and allocate it to smaller individual circuits which can be wired for specific loads for each electrical component, and which can be protected from overload by safety breakers. The main “hot” service cables come into the panel and are attached to a center busbar, which has tabs or other attachment points for the breaker connections.

For most residential electrical panels, there are two 120V hot wires and the attachment points for the breakers are staggered down each side of the hot busbar; if the circuit only needs 120V, it goes into one slot but if the circuit needs 240V (e.g., for certain appliances), it uses both of the 120V wires. There are also separate busbars for the grounds and neutrals to attach to and provisions are made to ground the electrical panel so if any wires become loose the electrical panel will shut off the circuit.



There are many different types of electrical panels and most work well. However, older fuse panels are known to have

problems and some insurance companies will not cover properties with fuse panels, or will exclude any claims due to faulty electrical issues if fuse panels are in use. Stab-Loc panels have also been known to have problems with breakers not shutting off when they overheat or not allowing breakers to attach securely, which causes dangerous arcing. Whenever these types of panels are present, we recommend retaining an electrician to identify and resolve safety concerns.

[Spreading the Electrical Joy: Branch Circuits](#)

Branch circuits are pretty simple conceptually – grab little currents of electricity from the main panel and spread the joy throughout the house to outlets, lights and appliances. There have been lots of different types of branch circuits since the introduction of residential electrical systems...

Knob and Tube – 1890s to 1930s

Happy New Years, it's almost 1880 and Thomas Edison is going to exhibit his electric lighting system in a few homes in Menlo Park, NJ. Cool demo, right? Yes, but it took Edison until 1892 to devise a branch wiring system, referred to as Knob and Tube, which was used almost exclusively for 30 years.

There are *many* older homes today that still have functional knob and tube wiring but it is considered unsafe because of deterioration of the cloth sheathing around the wires. And in many cases, homeowners have installed insulation over the wiring, which prevents wires from dissipating heat and which can cause failures in the system or, worse, fire hazards.

BX Wiring – early 1900s to current

The next hot (get it, hot? 😊) popular electrical branch system was BX wiring (don't even ask why it was called BX), which used armored metallic cable. This wiring methodology was better than knob and tube but had limitations and is today normally replaced with newer wiring when possible. Current versions of BX include AC or Greenfield, both of which are used in residential applications.

NM – 1930s to 1960s

Next on the list was a more flexible cloth wire, known as NM for non-metallic (apparently, the only creativity required in naming was the ability to construct two-letter acronyms). NM systems were used for lots of reasons, primarily because the wiring was lighter and easier to work with. Unfortunately, the paper and cloth cladding became brittle over time, creating safety concerns.

Plastic Jacket – 1960s to current

The popular branch wiring system which has been used since the 1960s is plastic jacketed, multi-wire with separate PVC plastic clad wires for hot and neutral and either an unclad wire or clad wire for the ground. The cladding for the individual wires is color-coded for simple identification of the wire size and rating. These wires are commonly called Romex (for its production genesis in Rome, NY and you guessed, the naming brains in action).

Don't Get Your Fingers Burned: Increased Safety

The progression of rules for the distribution of the electricity throughout the home has evolved along with the different types of wiring but the basics are still present, with the primary goal of safety, including prevention of fire and/or electrocution.

It probably goes without saying that electrical installations and any problems associated with electrical systems should always be referred to licensed electricians. US Inspect encourages all of its clients to contact qualified, licensed electrical contractors to address all defective items discovered in a home.

If you or your clients have any questions about electrical systems or any inspection type, US Inspect is pleased and available to guide and assist you.

* * * * *

About Us Inspect

www.usinspect.com

US Inspect is the nation's leading inspection services firm, delivering residential and corporate relocation inspections since 1987. Our reputation is built on decades of honesty, integrity and excellent service to our customers at one of the most important decisions in their lives – buying or selling a home. We are committed to ensuring that each of our customers enjoys an exceptional inspection experience.

Please contact marketing@usinspect.com if you have any questions or require assistance.