Electric

History

While many scientists have observed and theorized about electricity for the past several centuries, it is only in the past 200 years that considerable progress has been made in the field of electricity and electrical engineering.

Scientists

The following individuals conducted countless electrical experiments that shape our modern world:

Benjamin Franklin, Thomas Edison, Nicola Tesla, Alexander Graham Bell

George Westinghouse, Lord Kelvin,

Ernest Werner von Siemens

Electricity is…

The flow of electrons from a source of generation.

The electrical power grid of the United States is Alternating Current or AC.

Alternating Current can travel further distances (less loss) than Direct Current or DC.

Electrical Generation

Sources include nuclear, fossil fuels (coal, natural gas, oil), hydro (water), geothermal, wind, solar and thermoelectric.

Transmission

Power from the generation facility travels via high tension transmission lines that can have voltages as high as 765,000 volts.

The high voltage helps reduce voltage drop over long distances.

From there the voltage may drop several times via transformers. Common light commercial and residential voltage is 120/240 volts.

The Future

The power requirements of a typical residential household have increased over the past several decades as our homes become more inundated with electrical devices.

Electricity will continue to be a major factor in industrialized society for the foreseeable future.

Code

The National Electric Code published by the National Fire Protection Association dictates the electrical requirements in many areas of the United States.

Many codes focus on proper grounding to help ensure safety of the end user.

Conductor

A wire that carries electricity.

The most common are copper and aluminum.

The diameter limits the amount of current that can flow.

- 12 gauge wire can accommodate 20 amps
- 14 gauge wire can accommodate 15 amps

Ampere (Amp)

The unit of measurement of current.

A larger amperage requires a larger conductor (wire size).

Most residential wall outlets (receptacles) are either 15 or 20 amp.

Volts

Electromotive force that causes current to flow.

Most residential outlets and appliances are 110 volts.

Some appliances such as dryers/furnaces/hot water heaters use 220 volts.

Watts

Watts = Amps x volts

Wattage is used when determining number of conductors needed.

A typical circuit is designed to carry only about 80% of its full capability.

Common Wattages

Incandescent Light: 60-100w

Compact Florescent Light: 14w

Computer: 300w

Iron: 1200w

Microwave: 1000-2500w

Hair Dryer: 1800w

Game Console: 150w

Some devices such as motors have a higher wattage when starting up.

Circuit

Two or more conductors carrying electricity to a device and returning.

Most wiring has three conductors, a neutral, hot and ground.

A three way switch requires a circuit with 4 wires. The fourth wire is a jumper (hot).

Circuit Breaker

A switching devices that automatically opens a circuit when overloaded. When open, no current can flow.

Circuit breakers have replaced fuses in most applications.

Conduit

A pipe or channel in which conductors are run.

EMT or plastic is most common.

The conduit protects the wires and creates safety for people.

Required in commercial applications.

Service Entrance

Conductors from the utility pole to the distribution panel.

A meter is located in line between the pole and panel.

Distribution Panel

A breaker panel that houses the main disconnect switch and individual circuit breakers or fuses.

Most residential panels are 200 amp service. It was common practice several decades ago to only have a 100 amp service.

Ground

A wire that connects a circuit to the earth.

The ground helps prevent electrocution to individuals by channeling “stray” electricity to the ground.

All metal boxes require a ground connection.

Schedule

A table that contains information regarding a certain device. It may include color, shape, power requirements, brand, size, model number and general description.

Safety

Tools and machinery should be properly maintained and serviced to prevent serious injury or death.

A tagout/lockout should be placed on a piece of machinery or electrical panel before servicing
to prevent someone from reenergizing circuitry.