# *Electrical*

MODULE

# STUDY SESSION 2

1. You should have finished Study Session 1 and Quick Quiz 1 before starting this Study Session.
2. This Study Session deals with the basics of electricity.
3. At the end of this Session, you should understand –
   - the various tasks that electricity can perform
   - how electricity moves
   - terms such as volts, ohms, amperes and watts, and the relationship among these
   - the difference between 120 and 240 volts
   - what a circuit is
   - the functions of fuses and breakers
   - parallel circuits
   - the implications of damaged wire and loose connections
4. This Study Session may take roughly an hour to complete.
5. Please read Section 1.0 of the Electrical chapter of **The Home Reference Book** before starting this Session.
6. Quick Quiz 2 is included at the end. Answers can be written in your book.

# ► 6.0 SERVICE SIZE

## 6.1 WHY DOES IT MATTER?

*Bigger Is Better*

The size of the electrical service is important. It's one of the things you have to report according to the Standards. Anyone buying a house will want to know the service size. People focus on this because it's easy to understand that 100-amps is bigger than 60-amps, and 200-amps is bigger than 100-amps. Bigger is always better. It's like saying your car has 16 valves or double overhead cams. Most people are not sure why that matters, but they do sense that more is better.

*Voltage Is Always 240*

The size of the electrical service is a function of both the voltage and amperage. For 999 out of 1,000 houses, the voltage is 240 volts. Although we've talked about how to identify a 120-volt service (only two service entrance wires), this is becoming very rare. A three-phase service (four service entrance wires) would be typical of commercial occupancies and is beyond the scope of our discussion. So the first part is easy: the service size is almost always going to be 240 volts (three service entrance wires).

*Ampacity Is The Key*

The challenge is to know how much current the system is capable of carrying. People talk about this as the **ampacity** of the service or the **service size**. The common service sizes are 60-amps, 100-amps, and 200-amps, with some others thrown in between. While it's a little too simple to say that small houses are okay with 60- amp services, average houses are okay with 100-amps and big houses need 200-amps, it's not a bad yardstick.

*We Don't Do Load Calculations*

At the other end of the scale are load calculations, performed to determine exactly what a house needs. Even these calculations, however, make assumptions about how many things will be used simultaneously. Home inspectors don't do these detailed calculations. They use general rules, and good inspectors explain to their clients how lifestyle is a big factor in determining whether the electrical service is adequately sized.

Let's clarify a couple of things:

*Not A Safety Hazard*

1. An undersized service is not a safety hazard. If you have a 60-amp service in a huge house with many electrical demands, what is likely to happen? If you use enough appliances at the same time, the total current draw through the red and/or black wires will exceed 60-amps and the main fuses or breakers will shut off the power. This is an inconvenience, but it isn't a safety hazard.

 

| TYPICAL SERVICE SIZES | | | | |
|---|---|---|---|---|
| MINIMUM WIRE SIZE U.S.A. | | SERVICE SIZE (AMPS) | MINIMUM WIRE SIZE CANADA | |
| **Copper** | **Aluminum** | | **Copper** | **Aluminum** |
| 10* | 8* | 30 | 10* | 8* |
| 6* | 6* | 60 | 6 | 6 |
| 6* | 4* | 70 | 4 | N/A |
| 4 | 2 | 100 | 3 | 2 |
| 2 | 1/0 | 125 | 2 | 2/0 (1/0) |
| 1 | 2/0 | 150 | 1/0 | 3/0 |
| 2/0 | 4/0 | 200 | 3/0 | 250 MCM |

Note: 1. *–not found on new work.
2. All wire gauges are AWG except 250 MCM.
3. Several variations are possible depending on the type of wire, the temperature rating, etc.

## 6.2 DETERMINING SERVICE SIZE

Now that we know how much current each wire can carry, let's see how we identify it in the field.

*Unreliable Indicators*

Let's dispel some myths first. Here are some **unreliable** ways to determine the electrical service size. Do **not** determine the electrical size by any of the following

**1.The size of the service drop wires**. Because they are in free air, they can be much smaller than you would expect.

2. **The size of the service entrance conduit**. The only thing this tells you is the size of the conduit the electrician had in his truck that day.

   While the minimum size conduits are laid out below, electricians may use larger conduit.

   60 amp service – 1 inch diameter conduit minimum

   100 amp service – 1 ¼ inch diameter conduit minimum

   200 amp service – 2 inch diameter conduit minimum

   (That being said, there are times when you can use the size of the service entrance conduit to help you. A house built in the 1950s or 1960s, with an original-looking (rusty), one-inch diameter service conduit very likely has a 60 amp service. Another example is the conduit sizes for an underground service. Usually the service laterals will be sized by the utility for 200A, so the conduit entering the meter will be in the 2-inch range. If the conduit leaving the meter is the same size, there is a good chance that the house service is 200 amps.)

 

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# QUICK QUIZ 5

Please watch the Service Drop and Service Entrance section on the Electrical CD-ROM before taking the quiz.

## ☑ INSTRUCTIONS

- You should finish Study Session 5 before doing this Quiz.
- Write your answers in the spaces provided.
- Check your answers against ours at the end of this Section after the Final Test.
- If you have trouble with the Quiz, re-read the Study Session and try the Quiz again.
- If you did well, it's time for Field Exercise 1.

**1.** The size of the electrical service has to be reported according to the Standards.
True ☐ False ☐

**2.** Roughly 999 out of 1,000 houses have _____ volts available (insert a number).

**3.** Roughly 999 out of 1,000 houses have _____ service entrance wires (insert a number).

**4.** Load calculations are part of a home inspection.
True ☐ False ☐

**5.** Implications of an undersized service include –

a. shock hazard
b. fire hazard
c. shock and fire hazard
d. melting insulation
e. nuisance tripping of the main fuses or breakers