For most of us, taking a measurement of an object is simple. We read the length or width directly from our measuring tape. When we want to determine the volume or area, it gets a little more complicated. We must take the measurements, get the calculator, enter the numbers (hopefully correctly), and calculate the value.

I have been working with a variety of hand-held distance measuring equipment for more than 10 years. This equipment is really a computer that allows you to take measurements with either a sonic wave or a laser light beam and subsequently does the calculations. For those who routinely measure distances and determine areas and/or volumes, this can be a major time saver. The cost of this equipment is as low as $60.

**Principles:** The distance measuring devices calculate the distance by sending out a sound wave or a laser light beam that hits a target and bounces back. A timer measures how long it takes for the sound wave or laser light beam to travel to the target and return.

The equipment then calculates the distance by the formula: \( D = \frac{VT}{2} \), where: \( D = \) Distance in whatever units the user chooses, \( V = \) Velocity of the sound wave or the laser light beam, and \( T = \) Time for the sound wave or laser light beam to hit the target and return.

Sound waves vary by temperature and have a conical shape. If part of the sound wave hits any interference, the reading will be incorrect. The timer in this equipment is simpler and the cost is lower. I don’t recommend sonic wave equipment as, in my research, it has been unreliable.

The laser equipment has a small narrow light beam that has a consistent velocity. The user can see the laser light and detect any interference. This equipment has an accuracy of less than +/- 1/8 inch, which is probably more accurate than a tape measure. I strongly recommend using the laser equipment. Be careful when purchasing equipment as it may be unclear whether it uses a sound wave or laser light.

**Range:** The biggest question the user must consider is the distance they will be measuring. Hand-held laser distance measuring equipment that will measure up to 100 feet costs less than $100. If you need to measure longer distances, the cost will increase from $200-$500. Surveying equipment that measures still longer distances has a much higher cost.

**Procedures:** Hand-held laser distance measuring devices are simple to use and self-explanatory. One of the most important procedures is to determine area or volume in the unit of choice. The menu on the equipment will show a square (for area) or a cube (for volume). If you select area, the equipment allows two distance measurements (length and width) and then multiplies them to provide the area. If you select volume, the equipment allows three distance measurements (length, width, and height) and then multiplies them to provide the volume.

**Experiments:** Using college students, I conducted experiments using this equipment to calculate the volume of a room to determine its ease of use and accuracy. The students also conducted distance measurements outside to determine how the laser performed in sunlight. The research showed that the students, after the first uncertain attempt, quickly achieved more than 95 percent accuracy and were able to complete the work in less than 15 seconds.

Adults recruited from a local coffee shop were also tested in calculating the area of a wall. They were only provided the manufacturer’s written instructions. Some read the instructions, most just turned on the instrument. After 15 minutes, both groups could take the reading in five seconds and were more than 99 percent accurate. These adults showed how easy the equipment is to use.

**Problems:** The students found that the biggest source of error came from not holding the equipment level and learned to double check the equipment.

Students also had to ascertain whether the laser beam had a clear path to the object. Most were able to adjust the equipment when they saw interference with the laser beam. This was more challenging in sunlight, since it’s more difficult to insure the laser beam is hitting the intended target. Using laser glasses or simply shading the target areas solved this issue.

**Conclusions:** The tape measure will always be a useful tool on construction projects for short measurements. With longer distances, however, hand-held laser distance measuring equipment can quickly take measurements and calculate areas or volumes. This equipment’s inexpensive prices will quickly pay for itself.

**Top right:** Hand-held measuring equipment we experimented with; the low cost instrument is on the left.

**Left:** Luke (on the right) reviewing the answer of an area measurement.