Tools for Field Surveying

by Evan H. Shu, FAIA

When architects begin a renovation or addition to a building for which no plans are available, they are often faced with the tedious chore of measuring existing conditions and creating plans from scratch. Not too long ago, the most efficient process involved a three-person team — one with a clipboard and two with a measuring tape, calling out distances. But in recent years, several aids have been developed that make it easier, even for one person alone, to make measurements fast and accurately.

One low-cost, relatively low-tech aid is a sonic measuring device. About the size of a big hand-held calculator, these units can be purchased at any good building supply store. They vary in quality and features, but they are usually accurate to an 1 inch (25 millimeters) or so at a range of about 50 feet (15 meters). One limitation is that they need a flat surface to bounce their sound off of.

You hold sonic measuring device with its back against one wall, aim it toward another wall, press the button, and listen for a quick series of clicks. You can then read the distance on the display screen. It is advisable to measure each distance several times and check it against your common sense in case the sound is bouncing off some intermediary object. Some of these units incorporate basic calculators that allow you to add distances together or multiply them to get room area and volume.

A better but more expensive measuring device is a laser meter. You aim the meter's small red laser dot at the surface you want to measure to. This improves on the sonic device because you get visual confirmation that you're measuring to the correct surface. >>>

Traditional field too manual tape measu are giving way to technical aids such sonic devices (lowe and laser meters (l right).
Photo: Zircon, Kesc and Leica

Another level of tec aids for field survey are PDAs with CAD programs such as ZiPCAD.
Image: ZiPCAD

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Two companies that make such devices are Hilti and Leica. These devices will measure up to 650 feet (200 meters) and are accurate to within an inch per 100 feet (0.8 millimeters per meter) of distance. They fit in your pocket and operate on two AA batteries. These are especially helpful for measuring vertical distances such as to ceilings or exterior soffits.

From Measurement to Plan

It is common to complete an exhaustive field survey only to realize, after you're back in the office, that you are missing a dimension or two. Or maybe you can't remember what a dimension refers to. This is why a video camera can be a great aid. If you do overall panning of each room and shoot video while walking around the exterior, you can often make educated guesses later on about the distances in question.

It is also helpful to place a yardstick leaning against a wall to provide a graphic scale for your video. Digital still cameras can be used to create elevations if your CAD software allows raster image input.

Better yet, use a video camera that also takes still photos, so you can have both formats from a single device. It's also helpful to take a tape recorder so you can dictate notes about the images you are photographing.

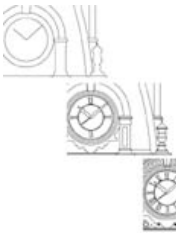
Higher-Tech Options

Some architects try to eliminate the "back-to-office, missing-measurements" problem by taking their laptops into the field and constructing drawings there. This can work if you have a clean, empty, conditioned space and can set up a desk for yourself without pressure to leave by a certain time.

Unfortunately, conditions rarely offer that convenience. More likely, the space you plan to remodel is a dusty, unheated, makeshift storage area, where you're allowed to stay only a limited time.

So, rather than your laptop, consider taking a less cumbersome personal digital assistant (PDA). PDAs are much easier to carry around and work with in the field. They're also useful for job site inspections and punch lists. Back in the office, you can download the data to a workstation without intermediary paperwork.

High-tech assistanc architects doing fiel measurements is available with 3D la scanning.
Image: Eos System Quantapoint



Laser scanning sys can give varying de of accuracy, depen on the purpose of t documentation.
Image: Quantapoin

ZipCAD is a new Pi based CAD system architects in the fiel
Image: ZiPCAD

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POPQUIZ

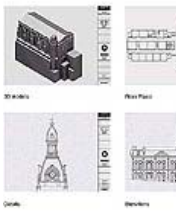
PDAs are also powerful enough to run CAD programs. PocketCAD works on handheld Pocket PCs, which can connect to laser measuring devices to import the distances you just measured.

A newer PDA CAD program, ZiPCAD, is specifically designed for architectural field surveying. It works on any Palm-compatible handheld device, and CAD data can be both imported and exported as DXF files. It is a simplified yet elegant CAD program, and this equivalent of a digital sketchpad gives you just about everything you need to layout a quick floor plan to work in tandem with your main CAD program back in the office.

PhotoModeler uses photogrammetry to convert a series of photos into a detail digital representatic building.
Image: Eos System

Never Mind the Plans

There are yet higher-tech systems that bypass plan drawing altogether. Photogrammetry is the science of measuring distances from a photograph that was taken from a known station point with a known focal lens. It takes some effort to learn, but if you can master a program like PhotoModeler, you can make quick work of field surveying.



Quantapoint offers range of services th can provide both traditional orthograp CAD drawings and modeling data.
Image: Quantapoin

In the field, you take a few measurements and a series of photos; then in the office, you calibrate the images in PhotoModeler. The software creates a scaled 3D model of the building or space.

Unfortunately, you may spend twice as much time working with the software as you normally would for old-fashioned measuring. The process will undoubtedly get easier over time as the software improves. In a few years, this photo modeling technique may be the way we all do field surveying.

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One last "super-tech" solution can give very detailed CAD information. You might use this, for instance, on a Gothic Revival church restoration project for which you need not only room dimensions but also scaled drawings of ornate column capitals.

The Cyrax 3D Laser Scanning System from Cyra Technologies, Inc. creates a 3D "cloud" of data points from a given station point. By merging all the cloud data from various station points, both inside and outside a building, you can create an XYZ database of the building or space. You then extract from that 3D cloud any level of detail, from schematic plans to full 3D details of column capitals.

Quantapoint is an service available in the northeast United States that does this data collection for you. The company uses a 360-degree rotating laser camera that shoots a beam 125,000 times per second to the surrounding surfaces. The Quantapoint service can be quite affordable, particularly if you compare the cost to the hours required to do the equivalent job yourself.

Regardless of which tools and techniques you choose, it's important to remember that the quality of results of field surveying is only partly dependent on the technology you use. Even if you have the best tools available, you still need to apply common sense to achieve maximum benefit.

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