HOW TO SAVE 87.5% ON EVERY LAYOUT POINT

As a layout technician in the modern construction industry, you're in one of three different boats:

1 You're handling layout using the manual process that's "always worked in the past."

2 You're handling layout digitally using a laser level and/or total station, but still working with manual (paper) plans and output.

3 You're handling layout using a robotic total station (RTS), working from a 3D model, and feeding your data back into the BIM workflow.

Of course, you may be attempting some sort of hybrid of those options, but — just like trying to stand on two different boats at the same time — it's not easy, it's not practical, and you're bound to regret it eventually.

Everything else being equal, you'd likely agree that evolving with the industry and fully adopting automated layout technology makes good sense. But, everything really isn't equal. In fact, from where you stand, there are a lot of issues up in the air:

▶ As a layout technician, you may not have the decision-making power to lead the way into this level of tech adoption.

▶ You may have little or no exposure to a RTS or related solutions, and have probably heard a number of myths and misconceptions about them that make you second guess taking that step.

▶ You may simply not realize the potentially vast improvement to layout operations working with a quality RTS solution offers.

The purpose of this brief guide is threefold:

1 To address those issues and concerns

2 To educate qualified layout technicians about the newest layout technology available, and

3 To empower you to add even greater value in your role, not just improving your firm's bottom line, but your own job satisfaction and career prospects as well!

THE 3 BOATS

First, let's establish where the industry was — and, quite possibly, **where you are right now** — by discussing the traditional, manual layout workflow.

The traditional, manual layout workflow

Traditionally, every layout assignment required a minimum of two trained technicians, a set of paper blueprints, a tape measure, string, plumb bob, wooden stakes, and a fat Sharpie.

The pair is assigned a section of the proposed site and a corresponding section of the plans, usually in the form of a 2D drawing. Then, plotting from one point to the next, measuring manually and marking the surfaces accordingly, the eventual placement of everything from electrical conduit to HVAC ductwork is mapped out.

The best, most experienced layout technicians, could use these simple tools and methods to translate a designer's plans into real-world functionality that could then guide installation pros through every step of their own interpretation of the building plans. The larger the project,

or the faster you needed layout to take place, the more pairs of techs you put in the field. With coordination and good recordkeeping, each experienced team could plow through, on average, about 75 points in an 8-hour workday.

Tolerances were generally accepted to be fairly wide — you couldn't expect layout techs working manually to guarantee measurements down to the millimeter or 1/16 inch, so practically speaking, everything had to be re-measured during installation, and sometimes prefabricated components would need to be reworked as a result, but that was just an accepted, necessary part of the workflow.

For decades, this is just how the work was done. And, frankly, it worked! We might compare the manual layout process to a heavy duty rowboat: it's not much to look at, and it certainly has its limitations, but if you're looking to get yourself and some gear from one side of a lake to another, it does the job consistently.

But, looking back, there's no way to argue that better tools have provided a better way.

Going Digital: The original Total Stations

With the introduction of digital Total Stations and, later, multistations, manual layout became faster and more precise.

No longer did layout technicians need to rely on manual tools like tape measures, strings, and plumb bobs to accurately measure distances, angles, or grade. Tolerances shrunk dramatically as the laser-based instruments could pinpoint exactly where to place a mark within tiny fractions of an inch. This upgrade not only reduced the time it took at the point of installation (since installers no longer needed to remeasure every point as a matter of course) but it reduced the cost and delays involved with prefab rework as well, saving time and money.

Additionally, the layout process effectively doubled in speed, with the same two-person layout team being able to mark about 150 points in an 8-hour day using a digital total station. If manual layout was like that old row boat, then going digital and using a total station was like upgrading to a nice fiberglass fishing boat with a heavy duty outboard engine. It looks nicer, feels nicer, offers plenty of form to go with its function, and gets you across the lake much faster.

This was a huge step in the right direction, but it's still not the nicest boat on the water.

BIM, 3D modeling, and the Robotic Total Station

The latest sea change in layout technology — and one that continues to be enhanced and improved — is the invention of the Robotic Total Station (RTS).

Combined with a mobile phone or tablet-based controller, the RTS reduces a professional layout team to just one qualified technician. Uploaded with precise layout data from a detailed 3D model produced as part of a BIM workflow, the RTS and one operator can easily layout twice as many points as its non-robotic predecessor. Again, enhancing speed and reducing cost without sacrificing any of the total station's emphasis on impeccable accuracy.

The best RTS solutions can then feed all that layout data back into the BIM workflow along with a laser scan and live camera capture of as-built conditions of every space that's been laid out, informing changes in the model before any previously unforeseen errors are made at the fabrication shop or during the installation and erection phases.

Without a doubt, one trained and qualified layout technician with a fully-integrated and optimized RTS is riding a sleek and powerful speedboat that's likely to leave that fishing boat in its wake, (and may even capsize the old rowboat) as it races effortlessly across the lake.

Is there really a contest on the lake?

The following chart was first published in 2014 by **Construction Executive** based on studies compiled two years earlier:

	Traditional Layout	Conventional Total Station	Robotic Total Station
# of Workers on a Layout Crew	2	2	1
# of Layout Crews/Project	1	1	1
Hours Worked/Week	40	40	40
Hours Cost/Person	$75	$75	$75
# of Layout Points/Day	75	150	300
Total Cost Per Point	$16	$8	$2

In our opinion, the results are probably over-simplified, but it makes a few very powerful points:

▶ Compared to traditional manual layout, you can expect a **300 percent increase** in points laid out per day and a **87.5 percent decrease** in cost per point.

▶ Even compared to the far more common traditional total station, running a RTS results in **twice the points** laid out per day at **one quarter the cost**.

With layout accounting for approximately 25 percent of every construction budget, what do those numbers mean to your firm's bottom line? How much time and money could be saved each day? What about over the course of an entire project? Or, an entire year?

The same Construction Executive article used this hypothetical breakdown of one conventional project:

> **"Figure one crew with two workers logging 40 hours per week can achieve 75 points per day using traditional layout methods. Assuming an hourly cost per person of $75 (including benefits), the total cost per point is $16.**
>
> **"Estimating the total number of points on the project is jobsite specific; for example, assume there are 2,000 points per floor for a standard six-story building. This includes anchor points, through penetrations, location of drywall track, and door and window openings for a total of 12,000 points for the project."**

In the scenario described, laying out all 12,000 points manually would take about 160 workdays (or, most of eight months assuming no overtime), and cost roughly $192,000. Using their simplified but, nonetheless, realistic figures, note the shocking conclusion in dollars and cents:

"For the same project size, the labor-related layout costs are $96,000 and $24,000, respectively, for using a conventional versus robotic total station."

Plus, using a total station, the layout would take two techs just 80 workdays (less than five months), and using a RTS, it would take one technician just 40 workdays (about two months) to complete the project.

Meaning, without bringing on any more layout technicians, your firm could theoretically handle more than twice the number of layout projects every year, while earning far more profit from each one.

However, as compelling as these facts are, we realize there are other things still holding you back from taking that step and committing fully to the most advanced layout solution available.

"Using (a) robotic total station, we set approximately 500 individual field points in one day with one person. Comparable conventional methods using a tape measure would have taken several days. When it comes to concrete deck insert layouts, we have increased our productivity by a factor of 10.

"It would have been cumbersome to have our two-person crews working in this area using a traditional tape measure and paper drawings. The (layout solution, including RTS) allows one person to work more efficiently around the clutter."

— Jason Smith, Chief Engineer, F.E. Moran (Smith oversaw a complex HVAC project at Palos Community Hospital in Chicago, Illinois. These comments referenced the team's work laying out a 17,500 square foot concrete deck while working around other MEP trades and rebar steel installation crews. **Download the full Case Study here**.)

REASONS WHY YOU MAY NOT CHOOSE TO UPGRADE YOUR LAYOUT TECH

Let's be honest: there's more involved in this decision than just hard facts:

1 You've heard a lot of bad things about this kind of technology, and you're worried.

2 You're concerned about the learning curve and what impact new tech may have on your long-term career outlook.

3 You're probably not the final decision maker, so you're wondering why you should care in the first place.

Let's touch on these valid concerns one at a time.

Myths and misconceptions regarding the newest layout technology

It's very common for new technologies, workflows, or processes to be preceded by a lot of fear and even anger. Sometimes, this is born from legitimate concerns, and sometimes it's even a good thing.

Skilled professionals are always right to be cautious when it comes to evaluating new tools or solutions that are likely to directly impact their day-to-day job, career, and even way of life. If you didn't care about things like that, you wouldn't be as good at your job as you are.

However, it's also important for pros to be open-minded and willing to pragmatically consider new technology and ways of doing things. What would otherwise be wise caution can become thoughtless stubbornness.

It might be like being handed the keys to that gorgeous speedboat only to refuse them because you're emotionally attached to your rowboat. It makes no sense.

So, what myths and misconceptions have prevented some firms from adopting clearly superior layout technology?

"THIS TECHNOLOGY IS STEALING OUR JOBS!"

Considering that one of its key selling points — as outlined above — is the fact that using a RTS reduces a two-person layout team to just one, this concern is understandable.

No one wants to be phased out or made irrelevant by a machine. And, no one wants to support the adoption of technology that's bound to result in the loss of their own job in the near future. As a result, many layout technicians — especially those who have been perfecting their craft for decades now — resist the adoption of robotic total stations. Regrettably, they chafe at the inclusion of other BIM-related changes as well, figuring all roads lead to the same negative outcome.

However, the facts tell a very different story.

Rather than laying off experienced layout techs in favor of automation, most firms actually expand their layout teams, using the opportunity to scale exponentially with the help of the time- and labor-saving benefits of a RTS system.

While it's true that layout technicians who staunchly refuse to give up their tape measure and plumb bob will find it increasingly difficult to justify their wage in coming years, the skills and experience long-time techs bring to this construction speciality will always trump purely automated options.

"AUTOMATION COULD KILL 73 MILLION U.S. JOBS BY 2030"

After, no doubt, collecting millions of frightened readers with that frightening headline, **USA Today's article** (published November 28, 2017) went on to reveal:

"Automation could destroy as many as 73 million U.S. jobs by 2030, but economic growth, rising productivity and other forces could more than offset the losses, according to a new report by McKinsey Global Institute.

"The dire predictions that robots are going to take our jobs are overstated," says Susan Lund, the group's director of research and co-author of the study. **"There will be enough jobs for everyone in most sectors."**

They went on to compare the coming economic changes brought on by automation and robotic technology to the changes that were required in the early 19th century as the United States moved from a largely agricultural to an industrial economy.

"THERE'S NO WAY I CAN LEARN TO USE SOMETHING LIKE A RTS."

In reality, operating a RTS via the connected mobile device is very easy. There's a lot of complex technology "under the hood", but we all know you don't have to understand the intricacies of internal combustion to drive a car.

"ANYONE CAN RUN THIS THING. I'M BECOMING OBSOLETE."

On the contrary: your unique skills in layout add incomparable value to the automation the RTS affords.

While the RTS can do the job it's programmed to handle very well, it can't know where the best place is for it to be stationed, or how each location's unique surroundings and activity are going to impact its ability to carry out its assignment. Likewise, the RTS and accompanying software isn't necessarily going to be able to recognize even glaring errors that may have made it through the initial planning phases unnoticed. But, a trained and experienced layout technician can.

The key to understanding the fallacy of these common concerns is in recognizing a few inescapable facts:

▶ A growth-oriented construction firm that's suddenly able to cut its layout teams in half (thanks to the addition of a RTS) would be foolish to respond to that opportunity by eliminating half their skilled layout workforce. Instead, a smart company would use their existing team to complete every project that much faster and allow the firm to take on more projects overall.

▶ Translating traditional layout skills to the use of a RTS is a natural progression of experience for a construction professional living and working during a period of rapid technological advancement. There's every reason to believe a faster, better version of current RTS solutions could be just around the corner!

REASONS WHY YOU SHOULD SUPPORT THE MOVE TO A ROBOTIC TOTAL STATION

As mentioned earlier, you're probably not the key decision maker involved with pulling the trigger on purchasing a RTS layout solution. However, you can bet your boss is going to heavily rely on your input when it's time to make that decision.

When you get down to it, making the move to invest in a RTS solution is the only logical choice for all but the very smallest of construction firms. Here's why:

▶ **Easier** — One operator, one machine, one 3D model that travels from initial planning through to completion of the project.

▶ **Faster** — 300% more points laid out in the same amount of time.

▶ **More accurate** — More accurate measurements, with greater flexibility during layout.

▶ **Less expensive** — Half the labor cost, more accomplished in less time, plus elimination of duplicated measurements and rework due to manual errors.

Your old, reliable rowboat is sitting there on the beach, but there's a shiny speedboat tied up at the dock with your name all over it.

Which one are you going to choose?

➡ **LEARN MORE ABOUT THE LATEST AND GREATEST IN CONSTRUCTION LAYOUT SOLUTIONS**