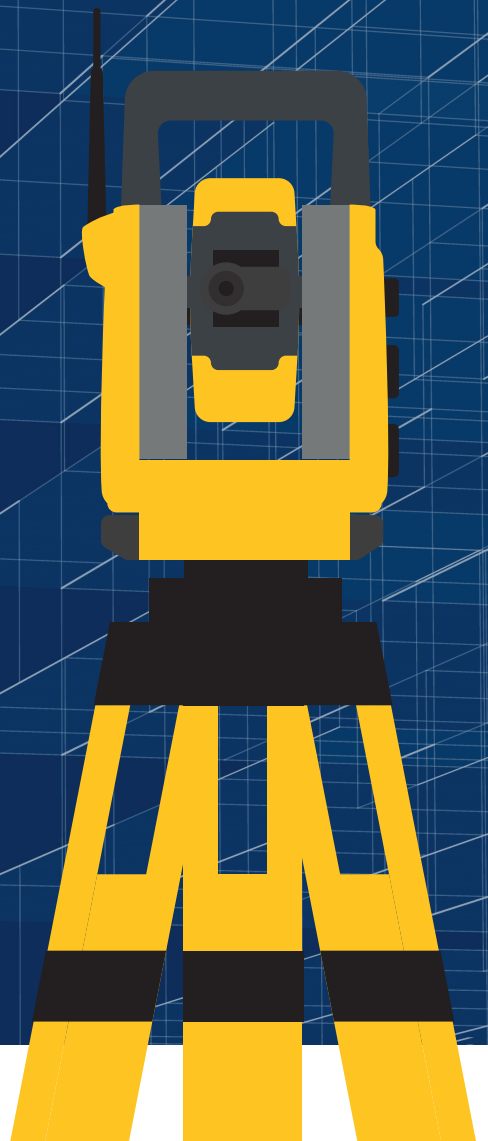
The Small & Specialty Contractor's Essential Guide to Layout Technology

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Introduction

The construction industry is evolving away from manual tools and processes toward modern technologies. While adopting technology can undoubtedly be a hurdle for some construction companies, many others have made the leap and are already experiencing the competitive advantages of technology firsthand.

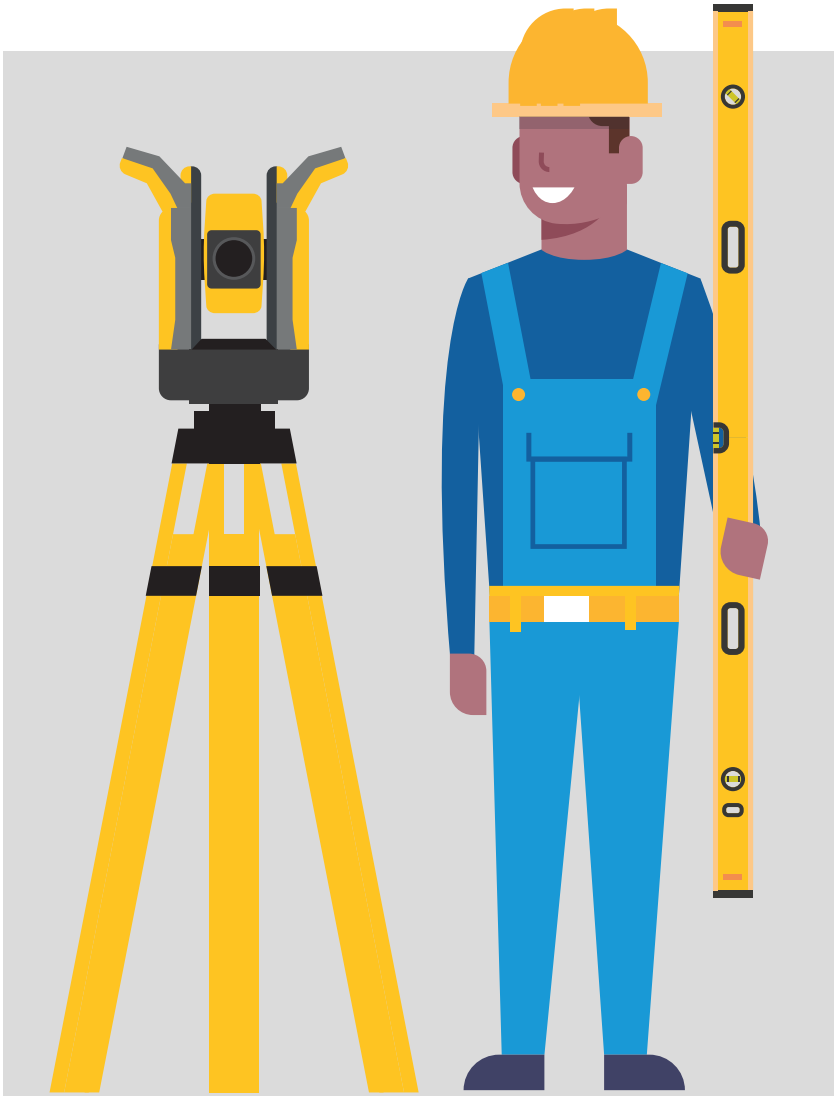
When it comes to layout, the benefits of technology are clear. Advancements in layout tools and processes have made an ordinarily tedious phase of construction much more efficient and accurate, easing some of the pressure from the labor shortage and fueling greater productivity.

Seeing the gains others are making using layout technology may create curiosity about how it can help your business, too. But you may also be concerned about the upheaval it can bring to your teams and workflows. It's hard to introduce a new tool or process when everyone is comfortable using the current one. And there could be worries that investing in a new tool won't reap the expected rewards.

Despite the hesitation you may feel, technology doesn't need to be an obstacle. There are layout tools designed specifically for small and specialty contractors that are more intuitive and easy to use than you may realize, while also delivering a rapid return on investment.

Read on to learn more about how layout technology can help you:

- Increase your accuracy and avoid costly rework
- Complete layout work with more speed and efficiency
- Document your work and any changes
- Improve overall productivity and project performance



54% of contractors use at least one advanced technology on their jobsites, while 74% expect to adopt one or more in the next three years.[1]



Rework costs average nearly 6% of the total contract amount, plus indirect costs of 5.5%.[3]

Why Improving Your Layout Process Is Worth Prioritizing

The layout phase of a construction project is critical to bringing the plans to life as a physical structure. It's an important step to get right as it can have a significant impact on the success of the entire project. But because so much hinges upon layout, it's also one of the most time-consuming and complex tasks on a construction project.

Layout can account for as much as 25% of a contractor's costs.[2]

If you've long been accustomed to using manual methods for layout, making the switch to a new system may seem unnecessary at best and downright disruptive at worst. Often it's a case of the devil you know vs. the devil you don't. You and your team may not immediately see the value in adopting a new tool, so sticking with the manual processes you're familiar with is more comfortable.

But what feels familiar now isn't doing you any favors in the long run. The negative effects of using manual methods are hard to ignore, including adverse impacts on the schedule, budget, and even your professional reputation.

Increased Potential for Rework

When you're relying on manual layout methods, you introduce the probability of human error. Your field crews have a higher likelihood of making measurement mistakes or missing measurements altogether. Given the complexity and sheer volume of work involved in manual layout, it can also be harder for them to identify potential layout problems or discrepancies between the site conditions and the plans. If layout errors aren't caught quickly—or at all—they can cause much bigger issues down the road, leading to costly rework.

Rework is a nagging problem in the construction industry that kills profit margins. And one of the leading causes of rework is inaccurate and incomplete project details. If mistakes are made during measurement or there's limited ability to uncover potential problems on the construction site, let alone share those concerns with other key stakeholders, your firm could be at risk for having to redo work later. You could incur a serious financial burden and damage your reputation as a result.

No Proof of Work Performed

Few construction projects are entirely free of scope changes, sudden new variables, or shifting circumstances. When changes inevitably happen on construction sites, original layout points often have to be moved. But if you don't have a record of the changes that were made and why, the quality of your work could be called into question, along with your overall progress on the project.

84% of small construction companies have problems with cash flow.[5]

Questions about your work do more than just shine an uncomfortable spotlight on your firm's professionalism. They can also lead to payment delays, which hurts your cash flow and your ability to pay your bills and laborers. Slow payments are more common than you may realize. In a recent survey of construction companies, many with fewer than 50 employees, 84% reported they had problems with cash flow.[4] Delayed payment is a frustrating situation that ties your hands and creates undue financial strain.

Lowered Productivity

Relying on manual processes requires more time and human resources than are necessary. Construction companies that are still managing their workflows the old-fashioned way, including layout, are adding to their own productivity issues. And they're also contributing—however unknowingly—to stagnant productivity across the industry as a whole.[6]

Manual layout methods also create bottlenecks. Two-person crews and multiple trips to a jobsite are generally the norm with manual layout. This requires even more resources, time, and budget, further harming your productivity and job performance. As the industry continues to grapple with the labor shortage and already-slim profit margins, your construction company has to prioritize greater productivity just to remain competitive.

Staying dependent upon manual layout methods only perpetuates and multiplies the challenges you face. But layout technology can provide a host of benefits, and the transition to using technology tools is easier than you think.

Technology could ease labor challenges, streamline processes, boost efficiency, and create a safer work environment.[7]



How a Robotic Layout Station Benefits You

Whether you're a general contractor or a specialty trade such as MEP, steel, or concrete, it's imperative for you to get layout right. The building's overall structural integrity is dependent upon accurate steel and concrete layout. And MEP provides the vital systems that are the lifeblood of the facility, much like the respiratory, circulatory, and nervous systems of the human body.

When you use a robotic layout station instead of manual tools and processes, you can:

Ensure greater accuracy

A robotic layout station uses positioning technology and advanced computations to translate coordinates from the drawing and place them with pinpoint precision in their physical locations on the site. It removes the element of human error in measurement and simultaneously enables operators to come out from behind the instrument and move freely around the site to visually verify locations and conditions.

With the robotic layout station, you gain greater confidence that you've translated the design accurately to the physical site. And as the project progresses, you can digitally document the work you performed so you can catch any mistakes or discrepancies upfront and quickly—before they turn into costly rework.

"In order to reduce measurement mishaps, layout teams need technology that is capable of carrying out the extreme precision required by a design plan."

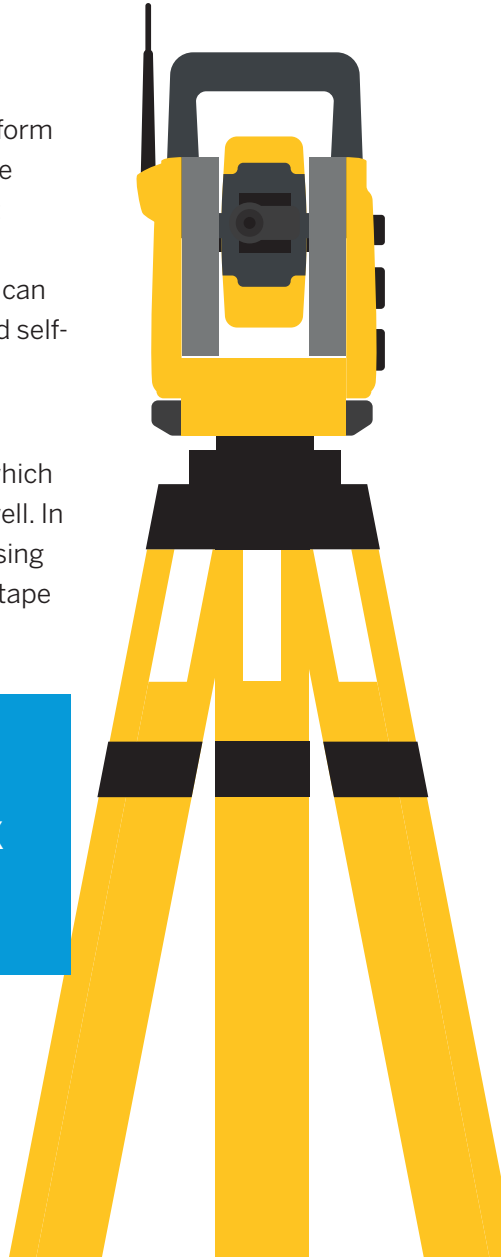
In order to reduce measurement mishaps, layout teams need technology that is capable of carrying out the extreme precision required by a design plan.[8]

Increase speed and efficiency

Instead of needing a team of two or more workers to perform manual layout, only one person is required to operate the robotic layout station. Physical barriers on the site don't impede the layout process since the tool uses a laser to pinpoint the location of construction elements. The tool can also be placed in any number of locations on the site and self-calibrate its position.

The number of days spent required for manual layout is reduced to mere hours with the robotic layout station, which means labor and budget requirements are reduced as well. In fact, one person can lay out five times as many points using a robotic positioning tool as a team of two people using tape measures, string, and 2D plans.[9]

Even compared to the far more common mechanical total station, [a robotic layout tool] results in 2X the points laid out per day at one quarter the cost.[10]



Document work performed

A robotic layout station doesn't just place layout points, it can also collect measurement data on the work performed. When you have the ability to document your work, you reduce the need for change orders or rework later because the model stays aligned with the as-built conditions. The robotic total station also facilitates better communication with the design team to resolve issues quickly and speed up decision making.

With a record of the work performed and why, including any changes to the original design made in the field, you can provide a quick and thorough response to any concerns that call your work into question. You can effectively provide proof of work, demonstrating your professionalism and safeguarding your reputation—and you'll get paid faster to boot.

Mismanaged paper trails routinely spur disagreements between owners and contractors on such matters as construction progress, change orders, and claims management.[11]

Improve productivity and job performance

A robotic layout station allows you to lay out positions on the jobsite with just one person instead of a traditional team of two. And because anyone on your team can learn to use the tool in just a few days, they can quickly realize the benefits of an automated, intuitive tool that improves their accuracy and efficiency.

Not only do you cut your layout labor requirement in half when you use a robotic layout station, you can be exponentially more productive as well. Compared to traditional manual layout, you can expect a 300% increase in points laid out per day and an 87.5% decrease in cost per point. [12]

When your productivity improves, it has a positive impact on the project and your entire business. Better management of your resources creates significant time and cost savings, helping you complete projects faster and more profitably.



New technologies...will not only improve productivity and reduce project delays, but can also enhance the quality of buildings and improve safety, working conditions, and environmental compatibility.[13]

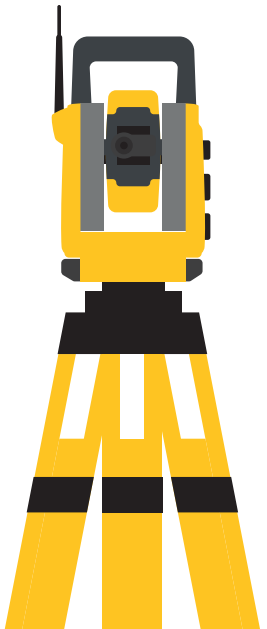
How a Robotic Layout Station Works

A robotic layout solution typically includes a rapid positioning tool, a pole and prisms, and a tablet device loaded with field layout software. Here's a closer look at each of the components.

Rapid positioning tool (RPT)

The tool is positioned on a tripod and features a rugged housing built for use on the jobsite. Upon startup, it self-levels and self-calibrates its orientation to the site, making setup fast and easy.

An RPT eliminates the need for two-person operation, requiring just one person to remotely operate the tool and lay out points. The tool is able to automatically search for and identify targets around the jobsite. It can be used to perform layout using a prism pole, or its laser pointer can be used to mark points. Through construction-specific software, you're able to mark the exact position of layout points from 3D models, as well as 2D plans and digital PDFs.



Tablet and software

A simple handheld tablet with user-friendly field layout software allows you to effectively take the design to the jobsite. You can import plans and access them from the field using the tablet. You're able to interact with the plans or design and move from point to point with a real-time visual reference, helping you envision even the most complex layouts in the physical space.

When performing layout functions, the robotic layout station communicates with the software to translate the digital plan and run automated layout routines, identifying exact positions for layout that are then marked by the user. Field layout software guides you through each measurement step from start to finish, creating a consistent workflow that even less experienced field crews can follow. Software that's able to conform to your business will also give you the flexibility to work from a 2D drawing, as well as create points and produce a plan on the fly.



The robotic layout station can also be used to take measurements of work performed and as-built conditions. It can overlay these as-built points onto the plans to ensure accuracy, as well as to document changes made in the field. You're able to see what the instrument sees from your tablet, as well as point, visualize, and position the instrument from wherever you happen to be standing. You can also use the tablet's camera to take photographs to be shared with design teams and other project stakeholders.

With the right software solution, you can import points from other software like Microsoft Excel, AutoCAD, Tekla, and SketchUp, as well as share data with other systems and software. The ability to integrate the robotic layout solution with other systems and software facilitates collaboration and data sharing so you can surface concerns quickly and make better and faster decisions.

To see a robotic layout station in action, watch this short video.



[1] Q4 2018 USG + U.S. Chamber of Commerce Commercial Construction Index. Dodge Data & Analytics.

[2] Williams, Bryan. "The Real Cost of Inefficient Construction Layout." Constructible Blog. Trimble. Aug. 13, 2019.

[3] Stewart, Larry. "5 Tips to Eliminate Construction Rework." ForConstructionPros. April 23, 2019.

[4] 2019 National Construction Payments Report. Levelset & TSheets. August 2019.

[5] Ibid.

[6] Agarwal, Rajat; Chandrasekaran, Shankar; Sridhar, Mukund. "Imagining Construction's Digital Future." McKinsey & Company. June 2016.

[7] Q4 2018 USG + U.S. Chamber of Commerce Commercial Construction Index. Dodge Data & Analytics.

[8] The Tech Behind an Optimal Layout Process. Constructible Guide. Trimble.

[9] Construction Layout with the Trimble Robotic Total Station. YouTube. Nov. 6, 2015.

[10] Williams, Bryan. "The Real Cost of Inefficient Construction Layout." Constructible Blog. Trimble. Aug. 13, 2019.

[11] Agarwal, Rajat; Chandrasekaran, Shankar; Sridhar, Mukund. "Imagining Construction's Digital Future." McKinsey & Company. June 2016.

[12] Williams, Bryan. "The Real Cost of Inefficient Construction Layout." Constructible Blog. Trimble. Aug. 13, 2019.

[13] Shaping the Future of Construction: A Breakthrough in Mindset and Technology. World Economic Forum & The Boston Consulting Group. May 2016.

[14] Jones, Kendall. "How Technology is Reshaping the Construction Industry." ConstructionConnect. Dec. 5, 2018.



It's Time to Take a Closer Look at Layout Technology

As a small contractor, you increase your risks when you continue to use manual tools and processes despite better technology being available. The potential for rework, payment delays, and lost productivity that come from relying on manual and outdated methods for layout can hurt your company's reputation, financial health, and future success.

A robotic layout station can be an efficient solution for many contractors. Unlike a total station, it's specifically designed for layout and ease of use. A robotic layout station is designed to be easy to use and doesn't include features or extras you don't need or want to pay for. Helping you perform layout in a fraction of the time, a robotic layout station can significantly improve your accuracy, productivity, and cost savings, and in turn build your competitive advantage.

Robotic layout stations enable you to:

- Ensure greater accuracy and avoid costly rework
- Increase layout speed and efficiency
- Document work performed and alleviate cash-flow concerns
- Improve productivity and enjoy better project performance

To learn more, visit

www.buildingpointohiovalley.com

Ready to see how a robotic layout station could work for you?

REQUEST A DEMO

