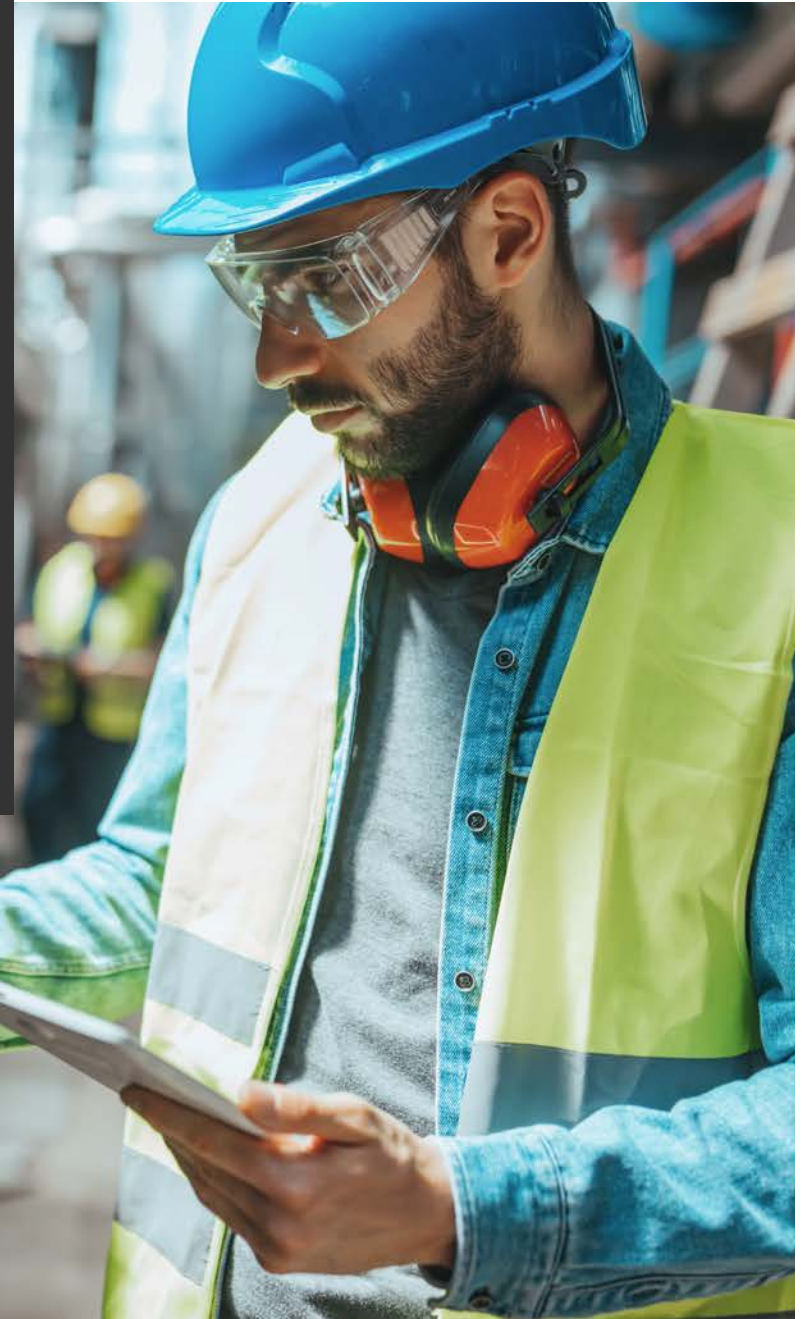


MEP GUIDE

# 5 tips for digitizing your design and layout workflow

How to harness technology to grow your business and accelerate your digital transformation



**Mechanical, electrical and plumbing (MEP) contractors are critical to meeting the world's increasing demand for high-quality, high-performance commercial buildings. But there's a problem.**

With construction schedules tightening and MEP infrastructure growing more complex, there's a shortage of skilled workers entering the field. Additional worries revolve around escalating labor and insurance costs, heightened project competition, and the growing demand for digital deliverables from general contractors and owners.

Can you continue to grow your company and revenue amid these headwinds?

The answer is yes — if you're one of the many MEP contractors that have adopted digital layout and measurement technologies. According to a recent survey by Leica Geosystems and Construction Dive's studioID:\*

**1 out of 2 MEP professionals uses a total station (manual or robotic) on a monthly basis.**

**Nearly 1 out of 4 uses a laser scanner or 3D-reality capture technology every week.**

These tools can enable your team to work faster and safer while producing results at a level of detail and accuracy that's ideal for building information modeling (BIM) and component prefabrication—and laborious to achieve through manual methods.

*\*Surveying the MEP Field: Digital Technology Essentials for Profitability.  
Get the full report*

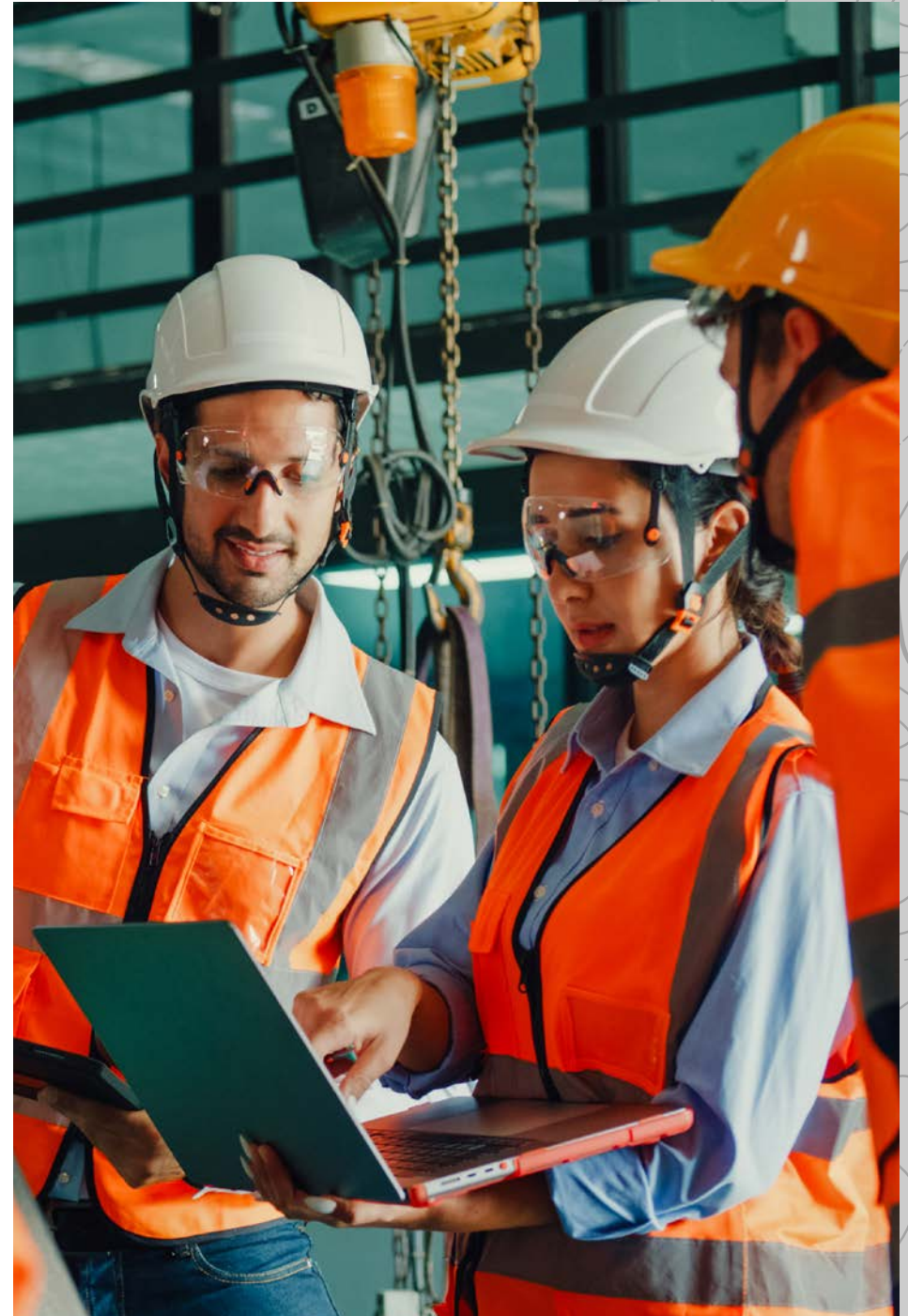






Image courtesy of August Winter & Sons

With more than nine decades under its belt, Appleton, Wisconsin-based mechanical contractor and fabricator August Winter & Sons knows BIM and other digital design and construction technologies are the way of the future.

“

Construction schedules seem to be getting more compressed. It's critical that we're able to prefab more components. During construction, we use our robotic total stations as layout tools to make sure, for example, we can have anchors drilled ahead of time in the deck—that's huge from a safety standpoint. And laser scanning has helped us save hours of fieldwork measuring and verifying locations of pipes, equipment and structure. ”

JEFF LUCZAK  
Engineering manager, August Winter & Sons

For many others in the MEP trades, the decision to go all-in on advanced hardware and software solutions is clear: **Their contract requires it.**



## What's in it for MEP Contractors?

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Against this rising digital-first backdrop, you might still be weighing the cost-benefit options against familiar, albeit fading, manual measurement methods, such as the tape measure and theodolite. But the reasons to embrace digital as the new normal are increasingly compelling.

Take layout. The requirements for layout teams to capture distances and angles for hangers, anchors, sleeves, boxes, pipework, cable trays and other building-service components aren't getting simpler, particularly with today's increasingly rigorous efficiency and performance standards in addition to more complex architectural design.

Just like architects, engineers and contractors who have adopted BIM for their design and construction workflows, you want to evolve your company's capabilities to keep pace with ever tighter project schedules, tolerances and margins for error.

Digital surveying tools and 3D reality capture solutions are key for meeting the demands of your clients in the field and in the office.

## What You'll Learn in This Playbook

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Digital technology is not a cure-all. Rework must always be anticipated at various points in the project life cycle: It's the nature of construction. A growing body of evidence shows the digitalization of project information associated with BIM offers project stakeholders a new order of construction precision and understanding, starting with unprecedented data and visual collaboration across all trades.

This playbook focuses on MEP delivery and its central place in the construction ecosystem. We'll explore how MEP contractors like yourself are embracing a digital transformation. How technology can improve your workflow and increase your productivity. And what factors you should consider when evaluating digital solutions.



## 3 Digital Measurement Tools that Enable BIM for MEP Pros

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To deliver the precision of BIM design, you need digital measurement tools. For that, contractors turn to a trio of technologies:

- Robotic total stations
- 3D laser scanners
- Digital layout tools

Every technology presents a particular set of advantages. Here's a brief look at each:

### Robotic Total Stations

Let's begin the examination with the chief BIM-enabling tool for MEP professionals, the robotic total station (RTS). This tripod-mounted electronic/optical instrument can be found at many work sites. For AEC professionals on both large and small projects, the instrument's precision and speed in layout applications are essential.

The RTS combines an electronic theodolite with electronic distance measurement. This enables measurement of vertical and horizontal angles along with the distance from the device to an intended point, such as a hanger or anchor location. The word robotic describes the unit's remote-control feature, which allows a single operator to manage the digital layout tool at distances ranging from 1.5 meters to 3500 meters (5 ft to approximately 11,500 ft).

Modern robotic total stations also have other automation built in, such as the ability to find and lock onto the prism even while it's moving and the ability to complete setup routines automatically. Recent innovations, such as a smart prism pole system, advance productivity even further by automating functions, such as target identification and pole height readings, and they allow you to measure or lay out points without leveling the pole for increased speed and safety.



*Robotic total stations combined with innovations such as the Leica AP20 AutoPole smart prism pole system provide significant time savings for layout. [Learn more.](#)*



Laser scanners like the Leica RTC360 are invaluable in optimizing prefabrication and documenting installation. [Learn more.](#)

### 3D Laser Scanners

Where total stations measure discrete points, 3D laser scanners capture millions of accurate measurement points simultaneously (a point cloud) at the touch of a button. Available in a range of configurations for anything from long-distance survey-grade measurement to small-space capture with spherical images, laser scanners provide an efficient, accurate way to capture and use detailed spatial data. They reduce human error and allow for improved coordination, saving time and resources.

You can use point cloud data to create detailed 3D models of HVAC systems before installation to identify optimal placement and layout and ensure proper fit. You can plan wiring paths, circuit breaker locations and lighting installations while avoiding clashes with other elements of the building. And you can optimize pipe routing and connections for water, waste and gas lines while performing clash detection with electrical and mechanical systems. MEP contractors who use laser scanning find it invaluable for preventing installation issues, optimizing prefabrication and documenting the installation progress.

### Digital layout tools

An increase in project complexity with tight deadlines, a steady rise in digitalization, and a requirement for clear and consistent documentation is driving demand for a new class of measurement technology. New layout and 3D measurement tools equipped with visual measurement technology simplify measurement and layout while delivering high accuracy. Easy to learn and use, this technology lowers the skill level required to complete complex tasks and eliminates common mistakes. The ability to use visual-based target tracking, automatic tilt compensation and auto-height detection lets you accelerate the layout of hanger locations for HVAC and ductwork, inserts and slits for sheet metal work. Fully automatic layout routines of points on floor or ceiling and lines for pipe wall penetrations increases productivity.



**The client initially wanted us to hand draw the detailing because of a schedule issue. That would have taken hundreds of hours. Our operator went out and scanned the floor and brought the data back. We accomplished in less than a week what would have taken at least a month—all in 3D, too. Now the client wants the entire facility scanned.**



**RYAN HOGGATT**  
Director of Manufacturing for UMC

## Efficiency and Safety

The genius of digital measurement technology is its ability to accurately roundtrip layout coordinates between the BIM model and the jobsite, eliminating the need for notebooks in which to scrawl manual measurements. For example, advanced digital tools can transmit measurement data back to the office to verify precise placement of hangers or piping before installation begins, optimizing efficiency and minimizing or even eliminating rework.

Automation, laser precision and single-operator ease leads to speedier project completion. Ryan Hoggatt, director of manufacturing for UMC, a full-service MEP contracting company headquartered in Lynnwood, Wash., knows the before and after firsthand. “We were working on a clean room facility that was modeled for miles and miles of under-floor piping,” he explained. “The client initially wanted us to hand draw the detailing because of a schedule issue. That would have taken hundreds of hours. Our operator went out and scanned the floor and brought the data back. We accomplished in less than a week what would have taken at least a month—all in 3D, too. Now the client wants the entire facility scanned.”

Speed and efficiency gains are just part of the story. On-the-fly QA/QC and documentation are also significant considerations, along with the increased safety of being able to capture measurements while keeping workers out of harm’s way. The value of a BIM-enabled workflow, and more specifically, the integration of digital measuring tools, can vary across the trades.

**Here’s how several MEP professionals assess their experience.**



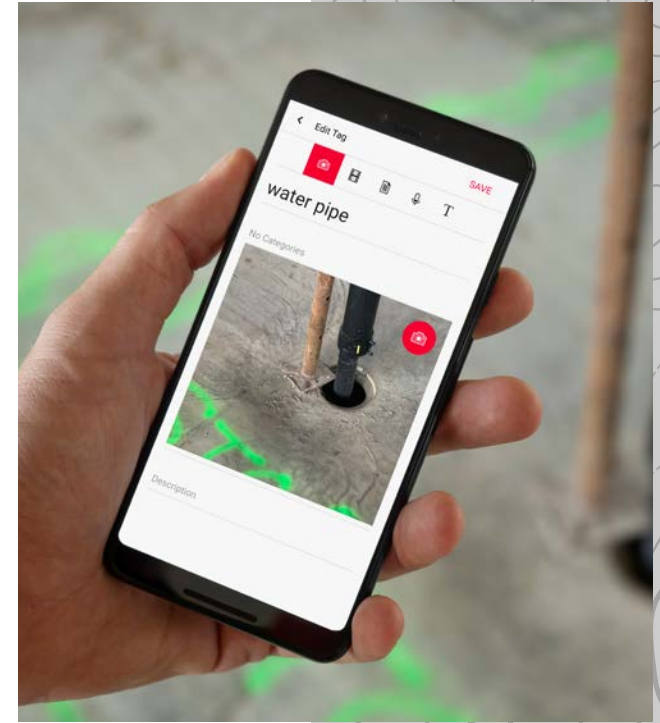
## Full-Service MEP

### UMC, Lynnwood, Washington

For more than a century, UMC has been recognized in the Pacific Northwest for its exacting care and quality in mechanical and plumbing services. Hoggatt leads the company's manufacturing unit, which focuses on prefabricated assemblies for mechanical and plumbing applications, such as spool components. Hoggatt also runs the reality capture group, on which the fabrication shop relies for 100% accurate parts specs.

UMC is no stranger to 3D modeling; it has been working with 3D applications for more than 25 years. Its decision to invest in a digital measurement tool was born out of necessity. The day of reckoning arrived after completing a grueling boiler room upgrade for Boeing, which required the fabrication of thousands of spools.

"I basically said, 'There's got to be a better way than tapes and lasers,'" Hoggatt said. "Being able to scan into a BIM model and then draw the piping knowing it will fit in the field with certainty is huge for our clients."



### 5 BENEFITS: Digital Measurement for Mechanical Contractors

- 1 Capture data in real time and bring it into the BIM model.
- 2 Identify clashes and inconsistencies early in planning.
- 3 Fabricate must-fit spooling parts with 100% accurate information.
- 4 Compress project measurement cycle times.
- 5 Differentiate your company as a BIM-friendly player.





## 5 BENEFITS: Digital Measurement for Electrical Contractors

- 1 Produce more accurate and precise electrical designs.
- 2 Complete larger installs faster.
- 3 Eliminate manual work using measuring tape and string lines.
- 4 Catch clashes sooner, and reduce rework from uncoordinated BIM.
- 5 Reduce training time needed for system installs.

## Electrical Contractor

Miller Electric, Jacksonville, Fla.

Miller Electric Company is the nation's largest and oldest electric contractor, with a presence in all 50 states. Similar to UMC, Miller depends on the fabrication of large off-site modules using the BIM model. Alan Creel, the company's vice president of pre-construction services, explained: "If we're certain we are designing and installing precisely, then we're able to quickly install much larger coordinated assemblies. We're getting larger with every project."

That growing confidence stems from an RTS. Miller is often the first to install its assemblies on the job site. That puts it at a measurement disadvantage. Many of the go-to reference points, such as HVAC ductwork, do not exist. That risk exposure prompted the RTS investment.

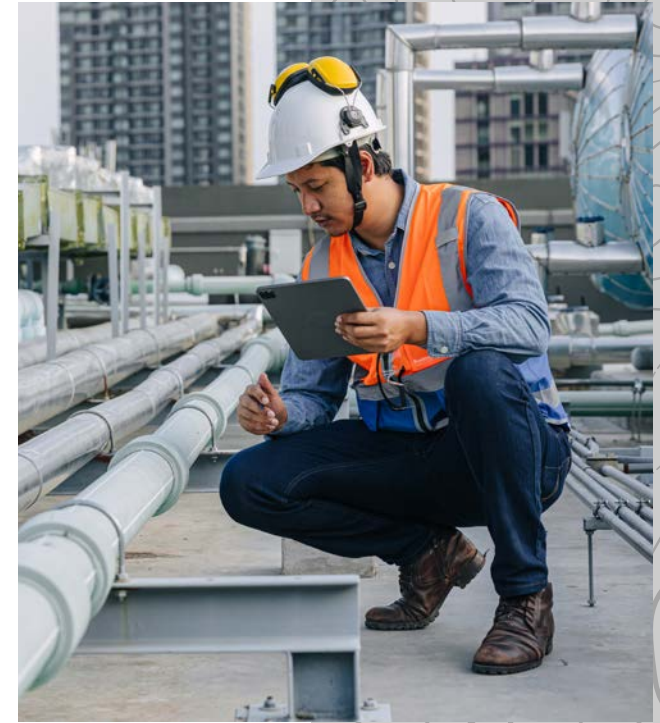
For Creel and his team, the results have been transformative. "We model conduits, hangers and overhead or underground racks and then extract precise XYZ coordinates at attachment and layout points," he said. "We can lay out in an empty field with no need for string lines, tapes or offsetting. It's made a big difference in the way we work. We now train all our union electricians to use the RTS. We think it's essential to our trade."

## Plumbing Contractor

The Sack Company, Statesboro, Georgia

The Sack Company is a full-service MEP contracting company that has served the Southeast since 1945. It used modeling and layout technology as needed, but hesitated to acquire in-house RTS capability until a recent school construction project. To test the new device, the company used it to double-check what the team had previously laid out using manual measurements. The RTS identified several errors that the company could fix before moving on to installation.

“Being able to see things in a 3D environment makes it easier to understand what you are looking at,” said Brandon Spainhour, the company’s BIM/CAD coordinator. “Rather than going through hundreds of pages of design documents, you turn on a tablet. Using the RTS ties our work together with BIM, which saves us time and money and reduces overall project risks. We have one person dedicated to the RTS. No one is taken off a crew to digitally measure.”



### 5 BENEFITS: Digital Measurement for Plumbing Contractors

- 1 More accurate and precise layout models.
- 2 Real-time BIM model access in an IFC format.
- 3 See model issues and inconsistencies in real time.
- 4 Generate point data that has been checked and validated.
- 5 One person operation for greater productivity.





*The innovative Leica iCS50 digital layout and 3D measurement tool incorporates visual measurement technology for fast, easy MEP layout. [Learn more.](#)*

## 5 Strategies for Digitizing MEP Workflows

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### 1 Invest in your future

The decision to digitize your workflows is an important one in the life of any MEP company. BIM isn't going away. The pressure to upgrade MEP services to clients, especially BIM-savvy GCs, will only become stronger in the coming months and years. As projects and building systems become increasingly complex, particularly with the growing attention on energy efficiency, MEP contractors who rely on manual measurements and 2D design might not make the cut in the digital-first world. What is certain is that thriving MEP companies like August Winter & Sons, UMC, Miller Electric and The Sack Company aren't standing still. They understand that strategic reinvestment in technology has helped each survive and flourish across decades.

“One of our biggest priorities is to look for time savings in the field,” said August Winter Engineering Manager Jeff Luczak. “We're always considering how we can make the job easier for our field staff so they stay healthy and fit for a longer duration of their career.”

In fact, what Luczak most looks forward to in the industry is “more automation in the field.” His company knows firsthand how advanced digital tools have changed its productivity. How many times faster can his team document a boiler room with a laser scanner versus manual measurement tools? According to him, “tenfold.”

### 2 Look for ease of use

Whether you're working with a robotic total station, laser scanner, digital layout tool, or a combination of these technologies, they should be simple to operate. The transfer of data between the field and the office should be intuitive and streamlined, and file formats should be compatible with common BIM software.

**3 Ask for accuracy and dexterity**

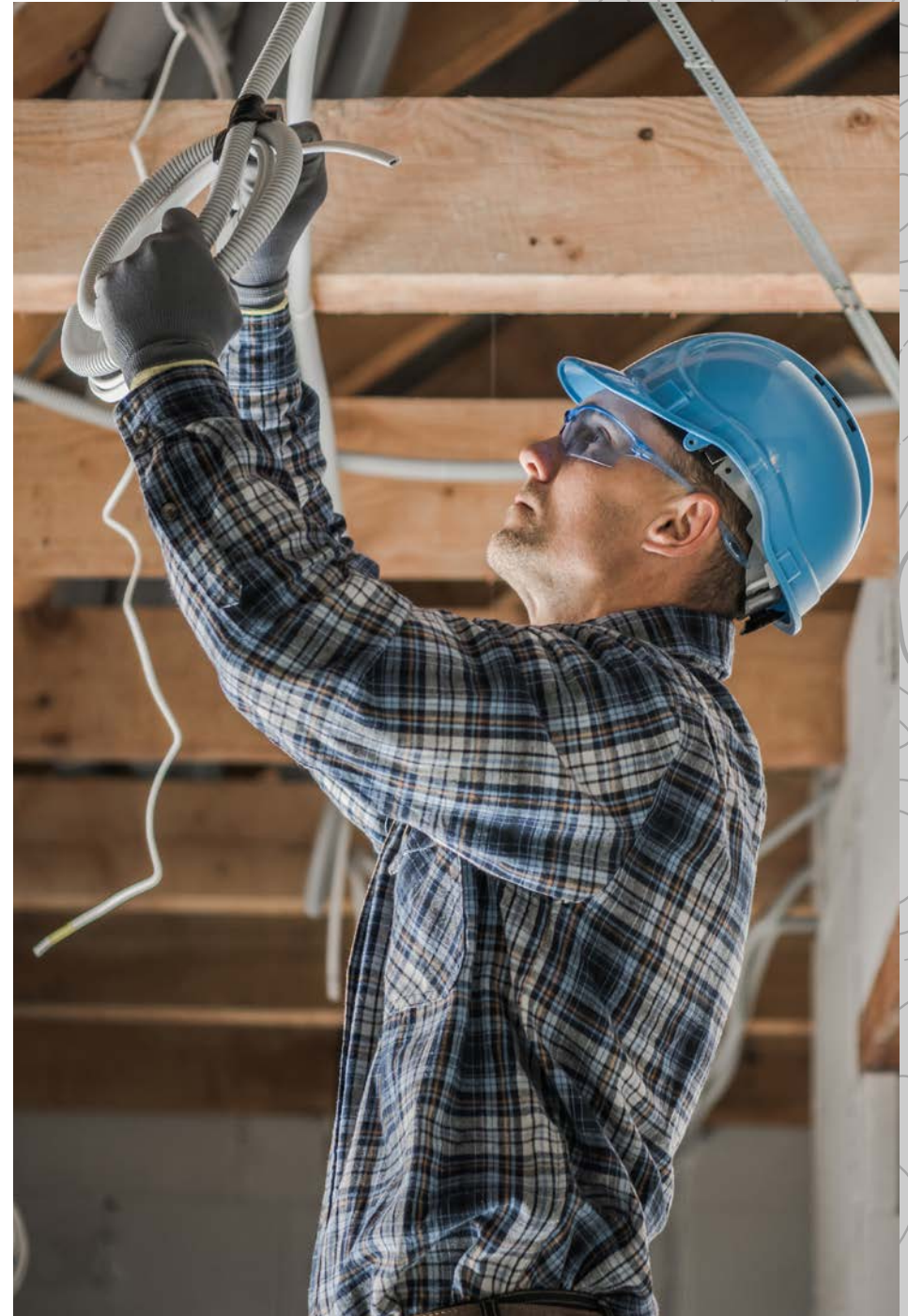
The hallmark of an RTS, 3D laser scanner and digital layout tool is their ability to bring order and confidence to once-difficult measuring, such as curved walls and parametric geometries. Today's geospatial technology should include built-in routines and automated workflows for a variety of surface layouts and slope lines.

**4 Expect smart integration**

Fast, accurate and precise placement of hangers, anchors, conduits, spools and other building services is important. Regardless of the tools you select, the workflows should complement your existing processes and make your work safer and easier—not harder. Look for intuitive operation and compatibility with common BIM file formats and standards.

**5 Elevate your company's capabilities**

With a lineup of digital tools for site measurement, layout and as-built documentation, you can achieve a level of productivity many times greater than before. Furthermore, you can reduce your risk of costly, time-consuming and potentially dangerous construction errors by leveraging software that automatically analyzes your model data for clash detection, design considerations, and discrepancies between as-built and design conditions.





## Embrace Speed and Complexity With BIM

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As an MEP contractor, your need for the accurate and efficient fabrication and installation of MEP components and infrastructure makes you a logical advocate of BIM design.

As an MEP contractor, your need for the accurate and efficient fabrication and installation of MEP components and infrastructure makes you a logical advocate of BIM design. You play a central role in every building project. Your work must coordinate with the federated trades' 3D model, making BIM-enabled features such as clash detection and complex construction sequencing invaluable for a successful and profitable project.

Digitizing your workflow can enable you to meet industry demands and maximize on-site safety and efficiency; coordinate design changes to your office team in real time from the field; eliminate construction errors before they occur; and deliver information clearly and visually to stakeholders. The result: You can take on complex, fast-paced projects with confidence and provide outstanding value to your clients.

## MEP contractors expect a lot from their digital technology.

RTS, laser scanners and digital layout tools require substantial upfront investment. According to Leica Geosystems and Construction Dive's 2023 survey of 150 MEP professionals, the top five must-haves for their digital technology are:

- 1 Minimizes human error
- 2 Offers reliable and fast technical support
- 3 Enables more accurate and precise designs
- 4 Is easy to use and learn
- 5 Supports one-person operation

Your ROI will be determined by a number of factors, including your adoption rate and project load. Rest assured that many MEP professionals who have made the transition regularly use digital tools across all project phases, from surveying existing conditions (91% report frequent use) to prefabrication and installation (61%) and fault detection and repairs (73%).



Leica Geosystems has been revolutionizing the world of measurement and survey for nearly 200 years. We provide powerful software, efficient workflows and experienced support for a complete construction technology solution. Our products give you the tools needed to increase safety, facilitate quick scene documentation, save money, and substantially reduce the probability of errors. Together we provide maximum productivity and exceptional results, no matter how complex the task at hand.

With precise and accurate instruments, sophisticated software, and trusted services, Leica Geosystems delivers value every day to those shaping the future of our world.

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