



AUTODESK
CONSTRUCTION
CLOUD™

How Mechanical Contractors Can Leverage Software for Better Business Outcomes

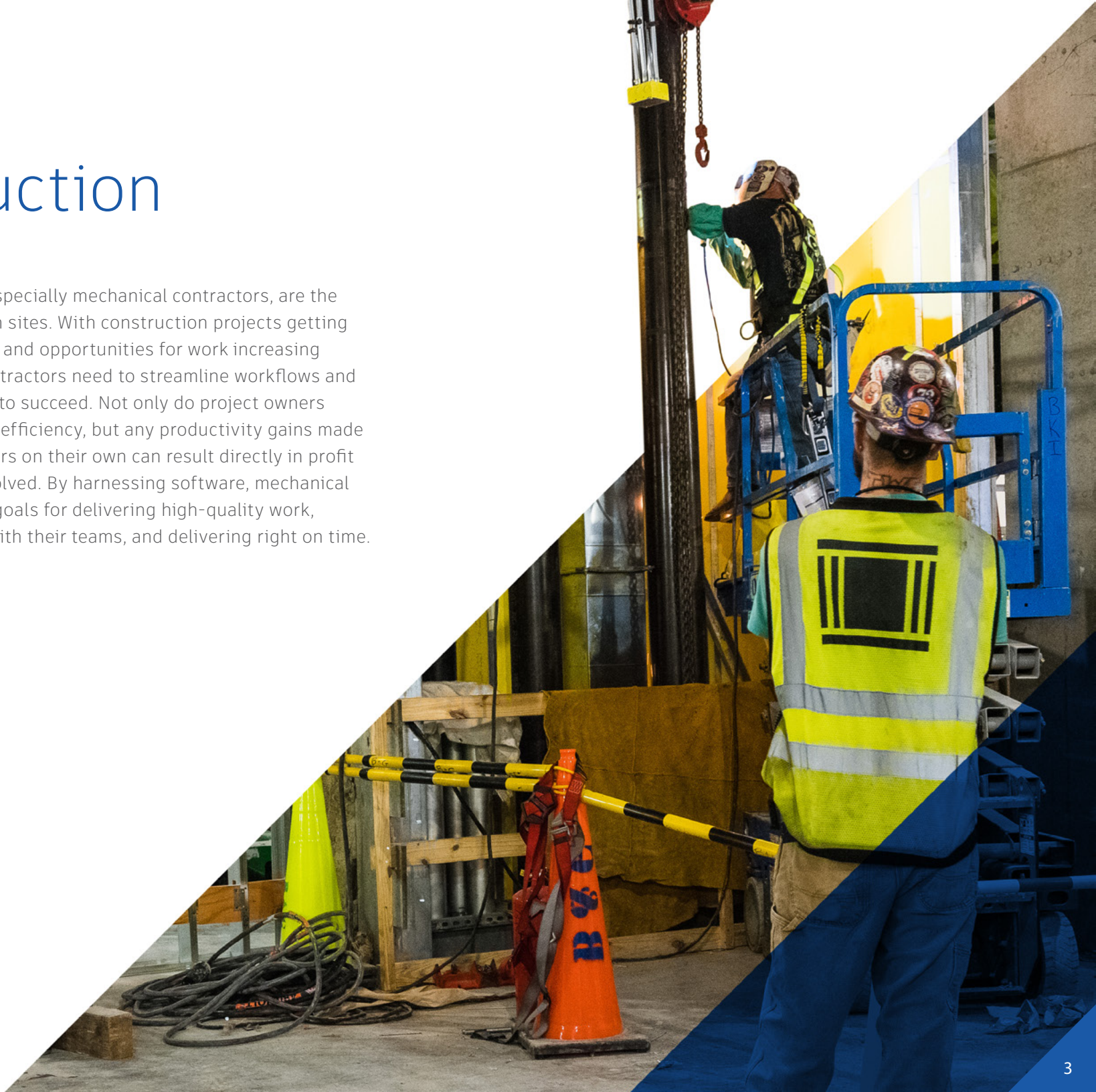


Table of Contents

- 3 Introduction**
- 4 The Current Mechanical Contractor Landscape**
- 5 Common Challenges Mechanical Contractors Face**
 - Challenges During the Preconstruction Phase
 - Challenges During the Construction Phase
- 8 The Benefits of a Technology Strategy for Mechanical Contractors**
 - Standardize Workflows
 - Capture the Work
 - Mitigate Risk
 - Win More Work
- 11 Case Study: McKinstry Experiences 50% Time Savings with Assemble for Earned Value Tracking**
 - Dealing with Inefficiencies on a Major Project
 - Getting Accurate Data and Smooth Communication with the Right Software
 - Saving Time and Improving Quality of Mechanical Contracting Work
- 13 The Modern Mechanical Contractor's Software Solution**
- 14 Add Software to the Mechanical Contractor's List of Skills**

Introduction

Specialty contractors, especially mechanical contractors, are the lifeblood of construction sites. With construction projects getting more complex each year and opportunities for work increasing globally, mechanical contractors need to streamline workflows and scale with ease in order to succeed. Not only do project owners expect a certain level of efficiency, but any productivity gains made by mechanical contractors on their own can result directly in profit gain for all partners involved. By harnessing software, mechanical specialists can achieve goals for delivering high-quality work, communicating better with their teams, and delivering right on time.



The Current Mechanical Contractor Landscape

Specialty contractors are the primary labor force that completes work on a construction site, providing trades that make large construction projects possible. Mechanical contracting typically includes HVAC, but can also include other types of cooling systems, chillers, refrigeration, working with sheet metal, piping, and sometimes plumbing. Mechanical subcontractors spend a lot of time working closely with other specialty contractors on-site, as well as general contractors and project owners, due to the interconnected need for wiring and piping to connect mechanical systems.

The mechanical contractors that are part of the ENR Top 600 Specialty Contractors group generated over 18% of the \$135 billion in revenue brought

in during 2018. With over \$25 billion generated by these contractors alone, these companies are definitely handling large enough projects to require better management techniques.

With the total global mechanical services market valued at over \$7 billion as of 2019, there's already a healthy demand for HVAC and related installations.¹ However, demand for mechanical contractors on new construction in particular is forecasted to rise because of higher temperatures in many parts of the world. Research supports the forecast of a rise to \$14 billion in value for the entire HVAC market by 2025.¹

As the spend on construction projects continues to increase, the demand for mechanical contractors will rise simultaneously. Anything these contractors can do to improve efficiencies, scale with ease, and better communicate will help to expedite these projects—allowing even smaller contractors to take on more work, capitalizing on the predicted market growth.



Common Challenges Mechanical Contractors Face

In today's market, specialty contractors like mechanical installers face many challenges during both the preconstruction and construction phases. Challenges across the project lifecycle make it difficult for mechanical contractors of all sizes to take full advantage of the opportunities in the market.

Challenges During Preconstruction

Mechanical contractors spend a lot of time and effort in the bidding process before a project has even begun. Since mechanical systems are required through most commercial buildings, the process of planning and estimating costs for a project can take weeks. In any mechanical contractor's project, this stage is crucial because it ensures there is both work in the company's pipeline and a steady cash flow.

Tracking Bid Information:

There's often a lack of standardization when a general contractor sends an invitation to bid (ITB). There's typically no centralized

database or easy way to see all the bids in the office at one time, often resulting in missed opportunities. Since mechanical contractors spend a lot of hours on responding to bids, it's important to identify which are still active or live and worth working on. Mechanical subcontractors are also more likely than others to function as a prime subcontractor. Since they're handling subcontractors under them, they have to track bid information across all the general contractors in addition to the bids coming from their subcontractors.

Lack of Communication and Collaboration:

Currently, mechanical contractors who have multiple offices and departments often find it difficult to communicate effectively as a team during preconstruction. Collaboration with other trades is essential for the mechanical subcontractor because constructability issues are best solved before they arrive on site. You don't want to discover the wiring for an A/C unit was run a foot too short only after beginning the

installation. Clash detection and tracking is essential because the involved trades can quickly work together to find a solution before a delay occurs. Without shared clash detection, it's a much slower process to discover the problem and communicate it to the other involved subcontractors.

Estimate Accuracy:

For mechanical contractors, the takeoff of materials can be extremely complex, time consuming, and can make or break a job. If the quantity takeoff is wrong, the subcontractor risks either not winning the job because their estimate is too high or exposing themselves to risk during construction because they missed critical components in their bid. Many mechanical subcontractors are still doing this in 2D, where 3D-based model takeoffs have been shown to be more accurate. Taking advantage of today's estimation and bidding software can simplify the takeoff process.



Common Challenges Mechanical Contractors Face (cont.)

Challenges During the Construction Phase

Once a mechanical contractor has won the bid for a construction process, the planning, management, and communication required for the next phase can take center stage. Teams must be managed to maximize retention, hiring must be completed as required, and the volume of documentation and information that must be stored and quickly accessed rapidly increases.

Employee Satisfaction and Safety:

Mechanical contractors perform some of the most dangerous work on a job site. The weight of a single heating or cooling unit poses serious risks to both people and property. This means proper safety procedures, equipment, and training are top priorities. In addition to

the importance of keeping employees healthy and happy, general contractors will consider safety records when choosing a mechanical contractor.

Skilled Labor Challenges and Shortages:

Employee safety and satisfaction are key aspects of retention, as mechanical contractors rely heavily on skilled labor. It's challenging to quickly train employees to deal with refrigerants and gas lines with no experience or background in the field. When there are labor shortages, specialty contractors like mechanical installers are hit the hardest. To compound the challenge of employee retention, attracting and finding the right talent is difficult. With a lack of skilled workers comes expensive recruitment costs and high levels of competition between firms.

Managing Plans and Documentation:

With multiple projects across different job sites, mechanical contractors need to ensure all team members have the latest plans, changes, and updates in real time. Analog processes add the additional challenge of keeping all of the projects updated, often leading to teams working from outdated plans. Variations between pieces of equipment also complicates work from one project to the next. Proper document management techniques keep manufacturer's data close at hand any time there's a question. Ensuring everyone has access to all file types is also essential to the mechanical subcontractor in particular. Having the 3D view of the installation often helps crews more efficiently and answer any confusion they may have seen in the 2D drawings.



Common Challenges Mechanical Contractors Face (cont.)

Cash Flow Management:

Another common challenge of mechanical contractors is paying for materials upfront, and then later invoicing for reimbursement. Teams need to be able to bill immediately in order to manage cash flow. Thorough documentation is key to getting paid quickly. Mechanical contractors need a single system for documenting materials purchased, work done, dates of project changes, and when billing can occur. Tracking the materials used in mechanical subcontracting is particularly tricky, adding extra labor for the project manager to track and invoice hundreds or thousands of individual components. Yet without precise cost tracking, it's impossible to tell if a contracting company is turning a healthy profit or not.

Adoption of New Technology:

Many mechanical contractors know there is software in the marketplace that can help address these challenges, but they struggle to figure out how to implement such a large change. New technology can be a significant investment and it's often difficult to know which software will help achieve the desired improvements for their processes. Some mechanical contractors have adopted technology specifically for the closeout and QA portions of the work, yet lack the tools to assist in smoother preconstruction and planning phases.

The Benefits of a Technology Strategy for Mechanical Contractors

There is a solution to the common challenges faced by mechanical contractors today: a well-thought-out technology strategy. A key aspect of this strategy might start with choosing the right software. Powerful cloud-based software platforms can house project plans, drawings, workflows, communication, installation details, manufacturer data, progress tracking, and billing information. By finding the right software solution for the construction industry, mechanical contractors can see substantial gains in efficiency, profit, and customer satisfaction.

Standardize Workflows

Choose mobile technology that teams can use from project to project, regardless of what the general contractor might choose to use. Most of the time, mechanical contractors have no say in

the software requirements of either the general contractor or the project, so they need to adapt on a project-by-project basis. But when it comes to internal workflows, software standardization can help in the field.

Mechanical contractors know what resources, equipment, processes, and people are required for any given workflow. By standardizing workflows in one software platform that contractors can take into the field to reference, efficiencies are gained with every project that is completed on the platform. Since mechanical contractors must work so closely with electrical and plumbing contractors, a standardized workflow aids immensely on keeping the entire team communicating clearly with unfamiliar partners.

Capture the Work

When the entire team is able to markup, attach photos, and track every detail of work that gets done, there's no question about what was done or when. This is essential when dealing with HVAC equipment since documentation plays a large role in ongoing maintenance. In many cases, the same mechanical contractor is hired for both the initial construction installation and ongoing maintenance. If the installers can't easily document small changes made during the process, it's much harder for the service technicians to find access points later when repairs are needed.

Earned value is a performance metric that's been used for keeping mechanical contractor projects on time for decades. However, manual tracking of this value is a cumbersome process prone to errors



The Benefits of a Technology Strategy for Specialty Contractors (cont.)

and is one of the most challenging parts of capturing the work. Upgrading to a software system allows for automation of capturing earned value data. The cloud-based solution from Autodesk's Assemble works for tracking mechanical systems and its earned value metrics at all stages, reducing the amount of unnecessary labor.

Mitigate Risk

When teams use the same software, everyone has access to one source of truth. The software ensures the most up-to-date plans and documents are always available. Software solutions built to support mobile devices, like cell phones and tablets, also ensure that the latest drawings are available no matter where the mechanical contractors are located. No one needs to drive back to the office or make a call to determine what drawing to use. Use Assemble to improve

estimator accuracy and reduce risk of missed scope during construction with 3D-based model takeoffs. With automatic clash detection from BIM360 Coordinate, mechanical subcontractors can avoid constructability issues down the road.

Win More Work

Once mechanical contractors become comfortable using software, the data collected and the systems within the program can be used to streamline the preconstruction process as well. By capturing more data using the software on previous projects, mechanical contractors have the information to potentially quote on future jobs more accurately. The software can take some of the guesswork out of bidding and may offer solutions to up the process. Mechanical contractors can also use the software to increase the number of bids issued, meaning more opportunities for work.

As an example, specialty contractor Innovative Mechanical harnessed software to improve their bidding process. The company moved from a manual whiteboard process to an online bid board. The whiteboard of the past kept track of everything, from due dates and job walks to bid contacts and more. The problem was that people could simply walk past the board clumsily and erase valuable project data. It became a project management nightmare for the company.

Innovative Mechanical decided it was time to invest in software and put Autodesk's Bid Board Pro to work for them. The software centralized all information and ensured that every team member was looking at the most up-to-date data. Every task had a calendar invite associated with it, so nothing was left to chance.

The Benefits of a Technology Strategy for Mechanical Contractors (cont.)

Team members now don't have to waste time looking through emails or paperwork to find valuable bid information.

Innovative Mechanical estimates that they are saving about one day per week by streamlining their process with Bid Board Pro. With that time saved, the mechanical contractor company has been able to better keep up with the competition, eliminate missed deadlines, minimize double-booked job walks, and increase the number of bids won. valuable project data. It became a project management nightmare for the company.

Innovative Mechanical decided it was time to invest in software and put Autodesk's Bid Board Pro to work for them. The software centralized all information and ensured that every team member was looking at the most up-to-date data. Every task had a calendar invite associated with it, so nothing was left to chance.

Team members now don't have to waste time looking through emails or paperwork to find valuable bid information. Innovative Mechanical estimates that they are saving about one day per week by streamlining their process with Bid Board Pro. With that time saved, the company has been able to better keep up with the competition, eliminate missed deadlines, minimize double-booked job walks, and increase the number of bids won.



McKinstry Experiences 50% Time Savings with Assemble for Earned Value Tracking

McKinstry is a national leader in designing, constructing, operating, and maintaining high-performing buildings. On the Seattle Life Sciences Building—a 13-story project comprising over 345,000 sq. ft. of office and lab space—McKinstry was tracking earned value through a 2D-based drawing solution, which was time-consuming and inaccurate. One lab floor had 47 tons of ductwork and 5.5 miles of piping, so tracking the installed progress was a cumbersome task.

Dealing with Inefficiencies on a Major Project

On the Life Sciences Building, the project team at McKinstry wanted to track sheet metal using pounds and using linear feet to track plumbing and piping. The team would manually highlight and mark up a drawing in the field, and then manually takeoff the drawing in the office. The results were inaccurate for multiple reasons. Because of the complexity of the project, there were 12 drawings per floor. Trying to figure out and trace the installation of pieces was difficult because of the drawings' overlapping systems. Another major problem was the inability of the team to compare the numbers to budget, since the budget numbers from the estimating team came in pounds, and the 2D takeoff only provided linear feet. There was no way for the project team to determine if the budget was in line with the actual numbers.

“Assemble is a multi-faceted tool that can be used in so many different ways. If you are familiar with pivot tables in Excel, try to visualize Assemble as a pivot table in the 3D environment, it allows you to slice and dice the information however you want, and there is so much flexibility, and countless use cases.”

—CJ Best, Director of Manufacturing

McKinstry Experiences 50% Time Savings with Assemble for Earned Value Tracking (cont.)

Getting Accurate Data and Smooth Communication with the Right Software

Assemble was implemented halfway through the project, allowing the team to compare the original method to the new and more efficient way of tracking progress with Assemble. To apply the improved method of tracking Earned Value, the McKinstry team started by publishing the CAD model to Assemble Systems' cloud-based solution. Assemble allowed McKinstry to create unique views based on each stakeholder's specific needs, and then further enrich the model by adding information in highly customizable Assemble properties tying it model objects. Everyone from the office to the field was working off the same data set, which helped eliminate confusion and human error. The field team also found the Assemble mobile app very easy to use and highly customizable.

"I can sort and filter the data from Assemble by installation status and activity IDs in seconds to see quantities installed. With the manual takeoff methods, it would take hours, and when we would go back and double-check, the numbers would come out different every time. With Assemble, we have extreme confidence in the number we are reporting," says Spencer Hobson, Senior Project Engineer at McKinstry.

Saving Time and Improving Quality of Mechanical Contracting Work

For the first time, the McKinstry project team was able to track the installation in pounds and get an instant comparison to the estimate. Assemble allowed the team to pull directly from CAD, giving every single piece of ductwork an associated weight. Finally, the team had insight into whether the budget was spot on, heavy, or had some breathing room.

"Instead of spending eight hours a week on Earned Value Tracking, we've lowered that to four hours," says Hobson. In addition to 50% time-savings, it has increased data quality by eliminating redundancies in tracking. "We used to say the Earned Value was within 10%, but now it is within 3%." With the improved reporting with Assemble for Earned Value Tracking, McKinstry has increased visibility into project tracking and has deployed it on at least 50% of large-scale projects.



The Modern Mechanical Contractor's Software Solution

Autodesk's solution for mechanical contractors is one option that demonstrates the benefits of using software to get the job done more efficiently. When evaluating software solutions for business, be sure that the chosen platform also has the following benefits:

- **Easy to use from start to finish, maximizing adoption**
- **Secure data solution for cloud collaboration**
- **Trusted by leaders of specialty contractors**

A cloud-based platform is a must because it allows mechanical contractor teams to access plans on the job site using a mobile phone or tablet. The ability to quickly access the latest drawings in the field not only keeps teams working to the right specifications, but it also reduces rework, which delivers exceptional work quality and better business outcomes.

Additionally, cloud-based platforms eliminate the constant back-and-forth of various specialty contractors to different

job sites. Because all communication is centralized and plans can be uploaded right to Autodesk Construction Cloud™, there's no need for constant updates on plan changes or new directions. Instead, all project information is contained in one program. If an update to the wiring diagram for the building requires changes in the mechanical systems, you'll get an alert right away so you can get started.

Add Software to the Mechanical Contractor's List of Skills

While a software platform adds to the list of things mechanical contractors must manage, the return on investment far outweighs the time and money put into acquiring, implementing, and adopting the software. Technology is just another tool, like a wrench or a vacuum pump, that mechanical contractors must add to their repertoire.

Gaining the skills necessary to wield the job-specific tools is an understood and accepted upfront cost. But after the technology or tools are implemented, the job can be better done to higher quality standards with much less rework. Software solutions such as Autodesk Construction Cloud™ are no different. Because the

platform was designed for ease of use and implementation, teams can reap the benefits quickly, including winning more work by better tracking of bid invites, deadlines, and workloads; increased work quality and less costly rework through instant access to the latest drawings and plans on mobile or desktop devices; and faster payment by standardizing and centralizing communication and documentation throughout the project.

References

- [1] [HVAC Services Market—Growth, Trends, and Forecast \(2020–2025\)](#)
Research and Markets: Market Research Reports Welcome, The Business Research Company, July. 2020

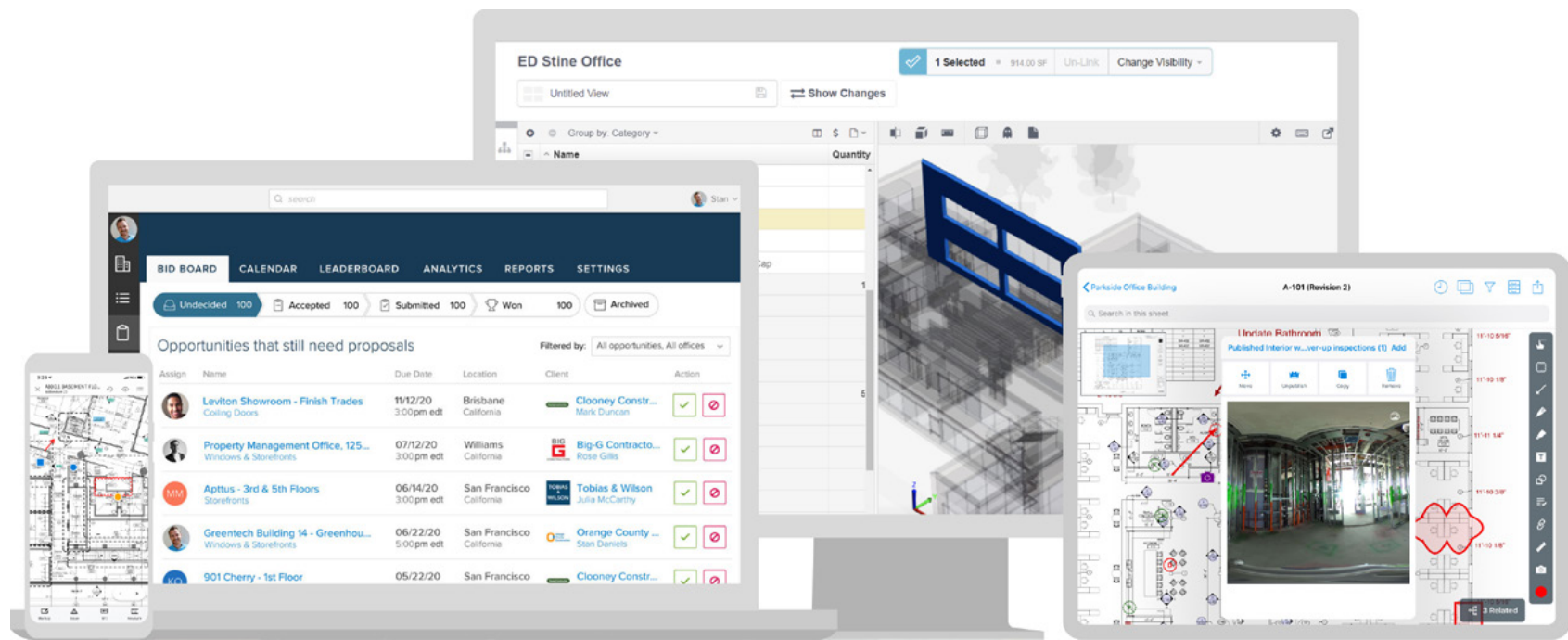


See the Future of Connected Construction

[construction.autodesk.com](https://www.construction.autodesk.com)

In 2018, Autodesk announced that construction would be a key focus area to help our customers on their design and make journey. To capitalize on the opportunity, Construction became its own CEO-staff level organization, Autodesk Construction Solutions. This unique structure is comprised of product development, customer success, marketing, and field operations. The organization is designed to move at the speed of the market and serve customers on a level playing field with other solution providers. Autodesk Construction Solutions offers products that cover the entire construction lifecycle, from design through plan to build and operate, including the Autodesk Construction Cloud which brings together our cloud-based solutions Assemble, BIM 360, BuildingConnected and PlanGrid.

Our vision is to create a vibrant construction industry where predictability and productivity are exponentially increased, while jobsite waste is proportionately reduced. The time has come for platform that will empower an industry transformation. Our mission is to help construction teams meet the world's rapidly expanding building and infrastructure needs, while making construction more predictable, safe and sustainable.





With Autodesk software, you have the power to Make Anything. The future of making is here, bringing with it radical changes in the way things are designed, made, and used. It's disrupting every industry: architecture, engineering, and construction; manufacturing; and media and entertainment. With the right knowledge and tools, this disruption is your opportunity. Our software is used by everyone - from design professionals, engineers and architects to digital artists, students and hobbyists. We constantly explore new ways to integrate all dimensions of diversity across our employees, customers, partners, and communities. Our ultimate goal is to expand opportunities for anyone to imagine, design, and make a better world.

Connect with ACS



© 2020 Autodesk. All Rights Reserved.

United States
+1 (866) 475-3802
[construction.autodesk.com](https://www.construction.autodesk.com)

Australia & APAC
AUS +61 1800 314 435
acs.apac@autodesk.com
[construction.autodesk.com/au](https://www.construction.autodesk.com/au)

UK & EMEA
+44 808 1892 253
acs.emea@autodesk.com
[construction.autodesk.com/gb](https://www.construction.autodesk.com/gb)

