CONSTRUCTION SITE TECH:
THE STATE-OF-THE-ART TOOLS REVOLUTIONIZING HOW WE BUILD





DISCOVER FIVE TECHNOLOGIES THAT ARE MAKING BUILDING CONSTRUCTION

smarter & more efficient than ever

(AND WHAT THEY MEAN FOR YOUR NEXT FACILITY)

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Construction Site Tech: The State-of-the-art Tools Revolutionizing How We Build

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THE GROWING INFLUENCE OF TECHNOLOGY AND WHY IT'S IMPORTANT TO YOU

Consider how technology has changed your life in the past several years. From smartphones to smart homes, these tools are revolutionizing the way we work, shop, eat and interact.

Technological advancements are shaping every aspect of our lives and the construction industry is no exception. So why do so many people still view construction as just hard hats, hammers and blueprints?

BUILDING CONSTRUCTION IS EVOLVING ALONG WITH THE DIGITAL WORLD AROUND US, BUT THE TRUTH IS:

some construction firms are missing the boat.

WHY SHOULD *YOU* CARE?

If your company is planning to invest in a new facility or renovation, you could be sacrificing quality and leaving money on the table if your contractor isn't on board with the latest construction technology.



Before you hire a firm for your next capital project, find out if they're using the technology we're about to discuss.

IF THEY DON'T, you may not be getting the most accurate, efficient and cost-effective product for your investment.

IF THEY DO, you'll save time, money and energy by the time you cut that grand opening ribbon.

LIDAR SCANNING

Traditionally, software and tech tools have been predominantly used in the design phase of projects, but Stellar is pushing the envelope. Lidar scanning — commonly referred to as laser scanning — bridges the gap between design and construction.

When it comes to renovation and retrofit projects, lidar scanning can be used before and during construction to ensure accurate measurements and placements.



Lidar measures distance by hitting a target with pulsed laser light and measuring the reflected pulses with a sensor to create digital 3D representations of the target area. By combining the millions of dimensioned points into a "point cloud," Stellar can understand existing conditions — for either the interior or exterior of a building — to a high degree of accuracy before beginning construction.

high degree of accuracy



LIDAR SCANNING BEYOND THE JOB SITE

Lidar scanning isn't just limited to the design and construction of a building. Here are some additional applications and benefits of scanning:

1: **PROCESS ENGINEERS** scan existing process equipment to create 3D representations and design layouts for processing lines.

2. **REFRIGERATION TEAMS** also use the technology to scan existing pipes and equipment.

3. **SCANNING** provide accurate as-built data for quality control and record.

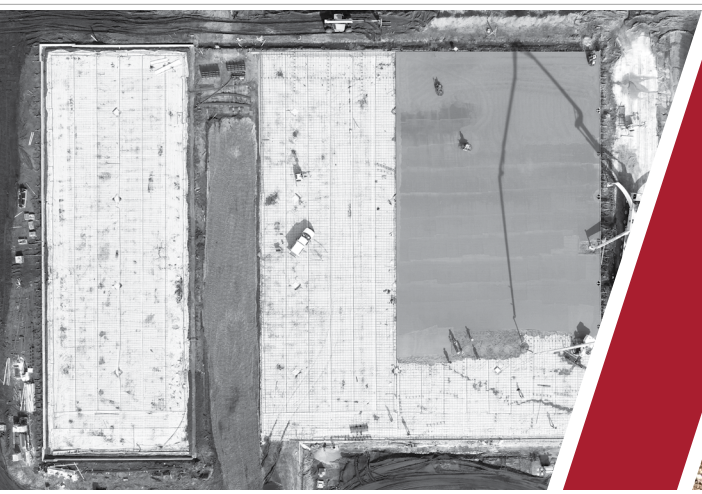
4. **TEAMS** monitor and document hidden objects such as underground utilities.

5. **DETAILS** be captured to assemble augmented reality models and virtual reality walkthroughs for better visualization.

AUTODESK POINT LAYOUT (APL)

The Autodesk Point Layout (APL) software translates coordinates in a building design model into the field. On the job site, APL helps construction crews place infrastructure more accurately, including components for:







The design team embeds the specific location for certain components within the 3D model. That model is then loaded onto a total robotic station that can be moved around the construction site to pinpoint where those components should be installed. For example, four anchor bolts for a column footing can be “placed” in the model and then crews can use the robotic station to locate where they are in real space on the job site.

APL also allows our crews to be more proactive with subcontractors and saves time by preventing errors. The robotic stations can confirm whether or not certain elements have been placed accurately before concrete is poured, meaning we can be more flexible and pivot in real time when new variables are introduced on the job site.



AUGMENTED REALITY

Translating building design to the construction site has come a long way. This fundamental phase of a project is when ideas become reality, so it's crucial to be as accurate and efficient as possible. Thanks to advancing technology, we can now perform this work better than ever before.

THE EVOLUTION OF DESIGN: FROM 2D TO 3D & VR TO AR

First, there was **2D design**: Builders analyzed two-dimensional drawings to determine conflicts or infrastructure issues. This intense effort required a scale to check the dimensions and determine elevations and locations.

Then came **3D design**: Crews could gather around large TV screens in job-site trailers to view three-dimensional models of the building, including using headsets to view models in **virtual reality (VR)**. Team members, from HVAC to electrical, could easily see different layouts and detect where **potential clashes** could occur before heading out into the construction area.

Today, **augmented reality (AR)** is redefining the way construction crews visualize their work. This technology is taking design conversations from the job-site trailer and into the actual construction space.



THE APPLICATIONS OF AUGMENTED REALITY IN BUILDING CONSTRUCTION

Augmented reality allows users to superimpose computer-generated images onto their view of the real world. Team members from various disciplines can now see the design in context instead of merely visualizing it on a computer and translating that to reality, which saves time and improves quality.

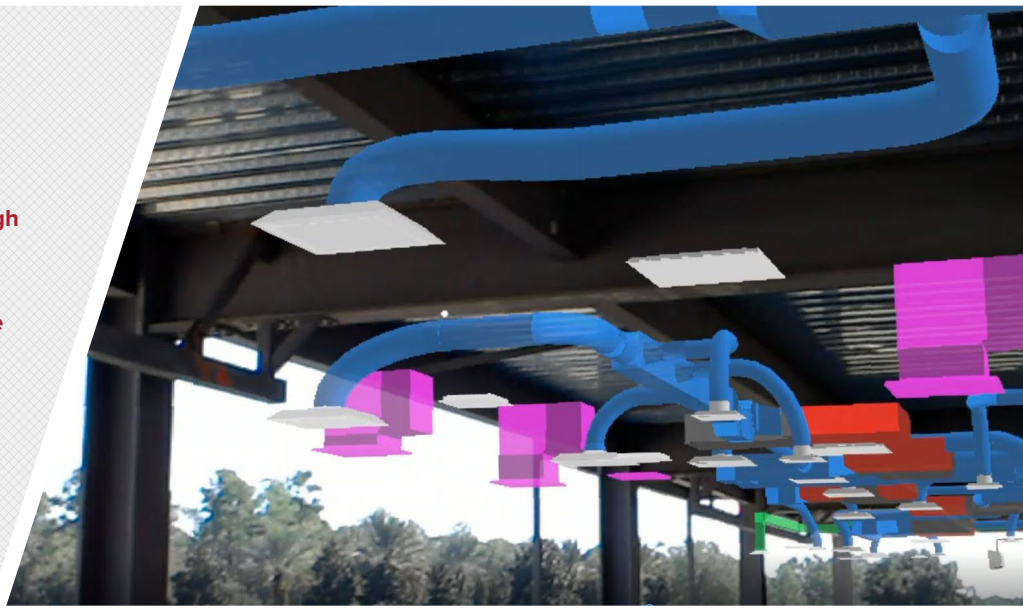
Confirming accuracy on the job site

Once construction is underway, augmented reality can help confirm site conditions to **ensure a more accurate and efficient construction project**.

real time

FOR EXAMPLE:

We're able to walk through an active job site with an HVAC subcontractor and show them exactly where everything should be installed according to the digital model created by our designers.



We can look through a tablet's camera and overlay images from the digital model on top of the real-world conditions. Plus, those features appear to scale, in real time, and they maintain proper perspective as you move around because the software understands where the tablet is located in space, and continually updates accordingly. This helps prevent mistakes and avoids time delays by giving crews a more comprehensive view of the project.



Visualizing a site before construction

Before groundbreaking occurs, augmented reality can help owners visualize their new facility in the context of the site. By simply holding up a tablet to the empty plot of land, you can see a digital representation of the completed building in relation to its surroundings. You can even walk around the "structure" and the model will adjust to your perspective in real time.

AR TECHNOLOGY IS HELPING OWNERS, DESIGNERS & CONSTRUCTION TEAMS

make more informed decisions before the first shovel even hits dirt.



BEYOND THE TABLET: TRUE 3D WITH HOLOLENS

Since tablets offer a two-dimensional viewing screen, they aren't ideal when it comes to truly understanding depth perception. A solution we've begun using at Stellar is **Microsoft's HoloLens**, billed as "the first self-contained, holographic computer, enabling you to engage with your digital content and interact with holograms in the world around you."

The device is similar to a virtual reality headset, but rather than blocking out the real world, the transparent glass allows you to see the digital images superimposed onto your surroundings. The HoloLens allows our teams to walk around an active job site and see how different layers of the model look in context, including plumbing, electrical wiring, HVAC systems, structural components and more.

Tablets are more widely available and more affordable than devices like the HoloLens, but we're seeing this technology become more widespread as the applications of augmented reality continue to grow.

DRONES

Unmanned aerial vehicles (UAVs), or drones, have become popular across a variety of industries, but today's software allows them to do a lot more than just capture photos and videos.



ASSESSING GREENFIELD SITE CONDITIONS

Before construction begins, owners can have a better understanding of their land investment by flying a drone over the property. Airplanes were previously used to capture these aerial photographs, but drones have become a much more efficient method for a variety of reasons:

Drones are more **COST-EFFECTIVE** because they eliminate the overhead cost of the plane, pilot and fuel

Planes often wait until they have several projects to photograph to make the flight time worthwhile, but drones can **EASILY FLY AND CAPTURE IMAGES ON-DEMAND**

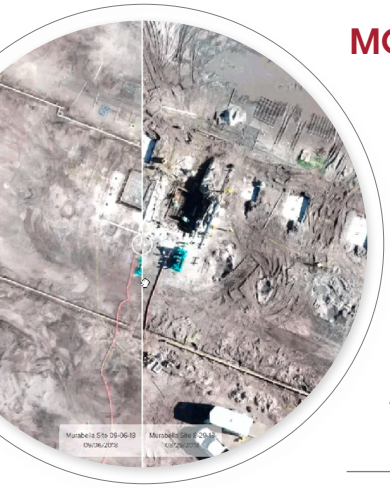
Since drones can fly at lower elevations, they **AREN'T IMPEDED BY CLOUD COVER** that would otherwise prevent a plane from capturing images

In addition, many sites require **earthwork to prepare the land and soil for construction**. In conjunction with data software, drones can measure dimensions, detect elevation changes and estimate the volume of dirt at a site. This gives owners a better idea of what they've purchased, and it informs the builder of how much dirt is needed to fill holes and level the site.



AIDING WITH SITE PLANNING AND LAYOUT

After a drone captures aerial images of a greenfield or renovation site, those photographs can be combined with the site plan to create more accurate layouts. By superimposing the drawing over an image of the actual site, designers (and owners) can easily visualize where various features — such as buildings, parking lots and landscaping — will be located. This gives construction teams a tangible understanding of the site plan in the context of the land so they can easily and accurately accommodate for geographic features and other variables.



MONITORING CONSTRUCTION PROGRESS

Drones also allow project managers to easily monitor the progress of construction and ensure the project stays on track. They can gain insight into what's happening on the ground from a bird's-eye view. If the building's foundation is 40 percent complete based on the drone, but the schedule says it should be at 80 percent by that point, project managers can detect that discrepancy and take corrective actions to make up that time.

Furthermore, drones can be programmed with **geospatial coordinates**, allowing them to fly the exact same flight pattern over the lifecycle of construction. This allows construction teams (and owners) to better visualize progress by layering images and videos from different stages of construction to compare.

PERFORMING 3D SCANS OF EXISTING STRUCTURES

As mentioned earlier, drones can be utilized in laser scanning as well. These aerial photogrammetry scans can produce high-resolution photos to create a 3D point cloud model, allowing designers to measure everything from the windows on a building to the cars in the parking lot. This is especially useful for constructing renovations and additions, since it provides an accurate real-world representation of the existing conditions. The designer can also import the 3D point cloud model into the Revit software as a reference for model development.

MANAGING EQUIPMENT WITH ASSET TAGS

One of the more complex aspects of a construction project schedule is managing the specification, delivery and installation of equipment.

Asset tags with unique QR codes organize various equipment and components of a facility. These identifying labels can be affixed to a particular component, and then data for that component can be assigned to the label's unique, scannable QR code.



ASSET TAGS WITH UNIQUE QR CODES ORGANIZE VARIOUS EQUIPMENT AND COMPONENTS OF A FACILITY.

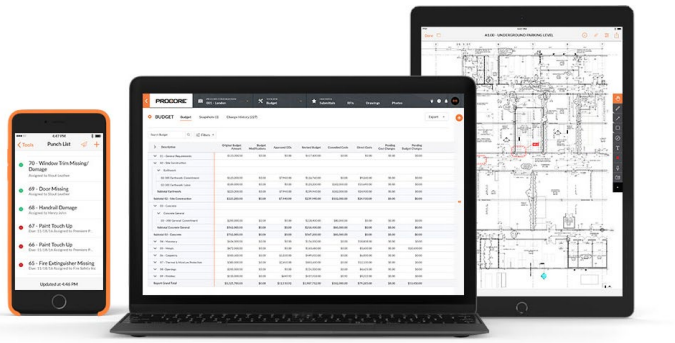
For example, if a specific rooftop HVAC unit has been specified for a building, we can track when that unit has been ordered, shipped and delivered. When it arrives on site, crews can attach an asset tag to it so, when it's installed, they can embed it into the 3D model to ensure the unit is installed in the right spot.

Having easy access to that metadata is also important for commissioning, from establishing proper electrical connections to ensuring the start-up checklist is accurate.

In addition, these unique labels are also helpful over the life of a building, because they can simplify ongoing maintenance. For example, a maintenance worker would simply have to scan the QR code on a piece of equipment and all of the relevant information for that asset would populate on his or her tablet or smartphone.

simplify ongoing maintenance

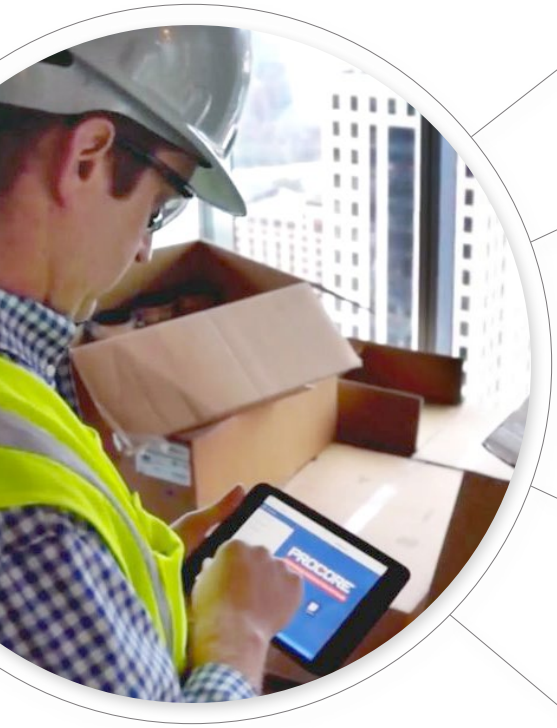
MODERN CONSTRUCTION MANAGEMENT SOFTWARE



A forward-thinking contractor incorporates the latest technological tools into every aspect of the construction process. Perhaps the most important part of this equation is organization and effective communication.

A good construction management software keeps projects on track, increases transparency and facilitates communication between different teams.

At Stellar, we utilize the Procore platform, which benefits owners in four major ways:



1. **INCREASED TRANSPARENCY FOR OWNERS**
Owners have on-demand access to more project information such as drawings, job-site photos, specs, submittals and requests for information (RFIs).

2. **CENTRALIZED PROJECT MANAGEMENT**
Procore allows Stellar to have complete team collaboration from everyone involved in the project, from the owners to the design team to the subcontractors to the field teams.

   Everyone can view project elements in real time and work together rather than waiting for information to be passed along to them. Now, the various elements of a large-scale project occur simultaneously, not sequentially, accelerating its overall pace.

3. **INCREASED ACCOUNTABILITY**
Compared to different departments working in their own “silos,” Procore fosters true collaboration and maintains accountability for tasks waiting to be completed. Every team member on the project has documented tasks with corresponding due dates that align with the overall project timeline.

4. **FASTER RESPONSE TO POTENTIAL JOB-SITE ISSUES**
Field crews can easily upload job-site photos with the software. Instead of transferring photos to a computer and uploading those to the cloud, team members can take a picture with their smartphone and upload it immediately via the mobile app.

   Since job-site photos are uploaded to the system daily, if something doesn’t look right, we can address it right away. Instead of “walking back” to correct an issue that was missed, we can now monitor quality control more frequently and keep projects moving forward efficiently.

NOT ALL CONSTRUCTION FIRMS ARE **CREATED EQUAL**



Partner with an experienced firm who understands the latest construction technology and applies it on the job site. These tools don't just benefit the crews that use them — they produce a more efficient timeline, a higher quality product and cost savings on your next capital investment.

PLANNING YOUR NEXT FACILITY?

Contact us at **1-800-488-2900** to schedule a complimentary, no-obligation consultation.

ABOUT STELLAR

Stellar is a fully integrated design, engineering, construction and mechanical services firm that provides the industry's most comprehensive range of self-performed services, including planning, design, preconstruction, construction, refrigeration, mechanical and utility, building envelope, and total operations and maintenance services. More than 700 Stellar employees worldwide create award-winning food processing plants, refrigerated warehouses, distribution centers, commercial buildings and military facilities. or more information, visit stellar.net.

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