

As-Built for Structures Workflow Guide





Save Time, Improve Quality and **Win** Business

Learn about traditional as-built workflows and how these can be transformed by leveraging 3D reality capture data to streamline your building construction projects.

If you are a design professional or contractor, you understand the need for documenting existing as-built conditions for your construction projects with reliable and measurable accuracy. Accurate as-built data safeguards against construction errors, misinterpretation of design plans, liability concerns and other factors that result in budget overages, cost disputes, and schedule delays that affect the building process and your reputation as a professional. The design and building process is collaborative, requiring real-time and accurate data to be shared with multiple stakeholders over many locations for the success of a project. Avoid wasting time and money through manual processes and walk-through after walk-through with data collection that can be shared easily and broadly.

Imagine a workflow that saves your design or construction business thousands of dollars and hundreds of hours on the job site while verifying proper adherence to your standards, project documentation, and providing collaborative and ongoing communication amongst project stakeholders.

Here's what your workflow probably looks like now — and here's how you can upgrade it to reduce or eliminate wasted money, time and material.

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The Growing Areas in the Industry

Designing and working with materials such as steel, wood, concrete, and masonry requires precise adherence to construction plans, details, specifications and other ongoing project information for successful project health and completion. Accurate and reliable as-built data and documentation is a critical component in this process for progress monitoring and construction verification. Each material comes with specific pros and cons that impact the way as-built data is collected and documentation is prepared.

For example, when combined with other materials, mass timber is becoming increasingly viable for multistory residential and office buildings, plus even more complex structures like long-span roofs and sports stadiums — as evidenced by the 5,000-seat timber stadium that's being constructed by Forest Green Rovers football club. As sustainability and "green" project initiatives are at the forefront of building our world of tomorrow, the need for low carbon solutions like timber construction will increase and their usage become broader across the industry. While it has long been prized for its aesthetically pleasing nature and thought of as a finishing material, structural timber introduces challenges like temperature stability causing elongation or shortening and member connection accuracy for fit-up and detailing. You can reduce these construction challenges by implementing workflows that put as-built documentation and reliably measurable 3D data at their core.

Another example is that of reinforced or post-tensioned concrete structures that quite literally can stand the test of time given proper design and construction. Even Roman structures made of concrete have survived

for over two-thousand years. Reinforced concrete is a common building type that is durable and reliable to withstand a wide range of gravity and lateral loading demands. Placement of reinforcement and post-tensioning cables is critical to the behavior and performance of the structure. The use of 3D scan data and point clouds can be utilized to efficiently ensure the job was done right and construction progress is on schedule.

Similarly, structural steel and masonry are widely used in a multitude of project types, large and small, that depend on proper fabrication, site installation, observation, and inspection for project success and completion.

As building projects become more complex and schedules and budgets become more aggressive, progress tracking and task completion visibility and insight become increasingly important for a successful project. No matter what material or building system is being used, accurate as-built data and documentation can be leveraged in three primary areas: Renovation, New Construction and Project Completion.



The Three *As-Built* Needs

1 Renovation Projects

Renovation projects require reliable and accurate data that mirror existing conditions to facilitate addition and/or modification of new architectural and structural features, demolition of existing structural elements like slabs or columns, or providing visual project context for the immediate scope of work. For many renovation projects, existing construction documentation may not be available, or site conditions have changed over time. Where original project information is available, it may not be easily interpreted or transferrable to digital formats that are reliably accurate.

Thus, the need for as-built documentation is essential to renovation work. The question becomes, do manual, time-consuming methods to produce as-builts offer dependable consistency, speed, and accuracy? If as-builts are inaccurate, it may result in re-work leading to additional labor and material costs and delays. As-builts created from reliable and accurate data eliminate re-work and offer insights that may reveal architectural or structural deficiencies can result in safety concerns if not addressed.

Oftentimes, it may take a design professional like a structural engineer being on-site performing inspections or observation to notice issues that could be harmful to project safety or project performance. However, being consistently on-site is not always feasible for design professionals with responsible charge or intimate involvement in the project. This may lead to unnoticed mistakes or less experienced professionals performing inspection duties and the creation of as-built documentation. Errors in as-built documentation can result in multiple trips to the site, re-work and wasted time. Multiple project stakeholders like owners, general contractors, sub-contractors, and others may utilize this documentation for purposes of establishing design drawings, bidding work, estimating and scheduling. Accurate, detailed as-built documentation of existing conditions is critical to mitigate liability, avoid construction disputes and successfully complete a renovation project on schedule and on budget.




2 New Construction Projects

New construction projects involve many different entities and stakeholders that depend on project information in the form of drawings, submittals, imagery and models — to name a few. This information comes in different forms, whether it is a PDF or specific file format compatible with a multitude of software and hardware solutions used on a project.

On every project, there are several specialty sub-contractors or engineering disciplines involved — and each one is doing something different related to their own trade. Progress is made as each party moves through the project following sequenced schedules. When following another contractor or trade, accurately documenting the immediate work preceding your work becomes critical. It may lead to simple verification that you are ready to proceed, or it may uncover issues that need to be resolved prior to work. This ensures the design of what you're building fits within the spatial requirements of existing conditions at the site. In the scenario where a design utilizes prefabricated materials and components, there is more emphasis on installation verification before proceeding to the next stage. This is a perfect application for utilizing the efficiency of 3D data collection and application.

There are times when trade contractors don't build exactly what was designed for and coordinated and must improvise and modify to make things work. This is understandable when field routing is required. However, if the trade performing work prior to and after your involvement doesn't provide accurate as-built data documentation after any deviations have occurred, this can have severe negative consequences downstream for other trade contractors resulting in lost time, money and project delays. As-built documentation empowers you to react early and avoid costly delays for any new construction project you are a part of.

3 Project Completion

A photograph showing a FARO Focus 3D scanner mounted on a tripod in the foreground. The scanner is black and white with the 'FARO focus' logo. In the background, there is a large, modern building under construction with many windows. The ground is dirt and there are some construction materials visible.

As-built documentation fulfills contractual obligations between you and the owner or other stakeholders that the job has been completed and done right. Leverage the capability of accurate and reliable 3D data that leaves no doubt that your work was performed correctly, on-time and on-budget. Owners want a record of their assets and accurate documentation. This enables visibility into conception versus reality and what changes or modifications were required during the journey. Capture the design deltas and document the final product through as-built deliverables. Feel confident in the work you have performed and get paid. Dramatically reduce the time between completion and indisputable as-built deliverables using 3D reality capture solutions.



The Challenges of the Traditional Workflow

While not ideal, there are always challenges in the spectrum of a project from conceptual design through operation. Specific to the Plan and Build segments of this spectrum, deviations between fabrication and shop drawings and field installation are sometimes unavoidable to get the job done properly. When this occurs, it is essential that any deviation or modification get communicated back to the office and to design and construction teams for updates to BIM models or CAD drawings. Collaboration is key to successful project performance and progress.

Your traditional as-built workflow might involve a tape measure and as-built “redline” drawings. Accurate measurements with manual tools like tapes are heavily dependent on numerous factors. For example, under pressure and time to get the work completed, was the number interpreted and recorded correctly and legibly? For longer distances, was more than one person needed to obtain accurate measurements with a tape measure? Documenting completed work that has taken weeks or months to perform with precision requires commensurate methods for capturing the accuracy of the work.

In addition to a tool as simple as a tape measure, a smartphone camera can be used to supplement the redline drawings and add clarity — but now those 2D pictures are constrained to the device without any context. After using a tape measure to conduct the as-built survey, redline drawings should be in close agreement with actual conditions. The “redlines” are oftentimes handwritten and done so hastily to get the information collected and passed on as quickly as possible. Illegible and potentially incorrect redlines cause confusion to all parties requiring the information. And of course, none of this information is readily available in your design programs — turning a three-dimensional effort into a two-dimensional result.

When human error does occur and a measurement or a number is written down incorrectly or misinterpreted, an immediate financial and time loss has occurred. It cannot be undone. Errors necessitate costly second — and sometimes third — walkthroughs and measurements.

Redline drawings are often the final step of the contractor’s job — to document your work and provide closure on the project for the owner. They are required for you to get paid for your work. Naturally, this is a critically important step in your workflow. With as-built documentation being integral to payment, this can sometimes lead to these redline drawings being rushed and prone to error.

Furthermore, it’s an unfortunate reality that many projects end up in dispute. In these all-too-common situations, having 3D reality capture data that leaves no doubt as to when work was completed and in what condition can be essential to saving your organization from drawn-out disputes and loss of reputation.

Redline drawings are limiting. They represent complex, 3D structures in 2D and don’t always portray the bigger picture. They oftentimes are left in a 2D state and never transferred to coordinated 3D BIM, 4D or 5D models. Even when manual as-built drawings are perfect, chances are they are not digitalized and become siloed. With BIM collaboration being an essential aspect of today’s construction workflow, and 4D and 5D solutions at the forefront of future workflows, providing digital as-builts and other captured 3D data can often be the difference between winning a project or not.

Your Ideal As-Built Workflow

If you want to save time, save money, save material waste and win downstream business for your organization, consider 3D reality capture for your as-built documentation needs. When incorporated into your workflow, this technology alleviates the pain points that come from working with manual methods like tape measures and redline markups — regardless of the material.



Save Time on the Job Site

For renovation and adaptive reuse projects, understanding the built condition is critical to the design process. Architects, engineers, and general contractors can document existing structures in 3D using laser scanning for pre-construction purposes. By capturing complete 3D data and documentation in a single visit, you can eliminate return visits and re-work to verify markups or capture additional measurements that were not initially planned for — no more searching for scraps of paper and photos from the job site. Using the FARO® Focus Premium Laser Scanner and FARO Stream app, you can pre-register your scans on-site to ensure complete coverage of capture and be certain of successful registration. By uploading to the FARO Sphere Cloud Platform directly from the job site, a point cloud is available for the entire design team to immediately explore an accurate representation of the project and site, take measurements, aid in design modeling requirements and enable virtual job site access all on demand.

Pre-Construction



Ensure Structural Safety

General contractors and structural engineers have a responsibility for safe structural design and execution. Contractors can laser scan with the Focus Premium Laser Scanner during construction to verify the accuracy of concrete placement and steel and timber erection, among many other uses. This is done by comparing laser scan data and design models using FARO BuildIT Construction Software to identify deviations early in the construction process before they can impact the schedule. Analyzing structures in 3D enables the discovery of issues where single point measurements typically are not taken. On the job site, using laser scanning provides a safer work environment, mitigating risk, for verification of structural element installation and connection with no need to tie-off on man lifts or work with fall-hazards.

Construction





Save Material Waste

Laser scanning enables contractors to make smart, preemptive work and scheduling decisions that can be impacted later in a project. Work completed within allowable tolerance may have an impact on subsequent trades with tighter tolerance requirements. Early identification is key to limiting wasteful change orders or material waste — which can be especially valuable with increasing cost of materials like concrete and lumber. Import point cloud data from the FARO Focus Premium laser scanner into Autodesk® Navisworks® or similar software and perform clash detection to identify areas of concern. Structural elements that may impact wall layouts or architectural intent can efficiently be identified and resolved with confidence before the schedule is affected by potential errors.

Construction



Point Cloud Data

Photograph



Win Business Downstream

Highly detailed and accurate 3D as-built models, derived from laser scanning, confirm completion of contractual obligations to the owner when final payments are submitted, allowing close-out to be completed quickly. Ownership will appreciate the transparency that the model provides and how it can be used for facility operations, ensuring preferred contractor status for future projects.

Project Closeout



The Tools That Can Make Your Job Easier

FARO Sphere™ Cloud Platform

The Sphere ecosystem enables you and your global, remote teams to access 3D data for analysis and collaboration.

Your teams and their project data and devices are connected in a unified interface that features remote access through seamless, wireless connectivity via the FARO Stream mobile app, which is available on the App store. FARO Stream, used in combination with a FARO Focus Laser Scanner, makes your on-site as-built capture faster, more efficient and automates data uploads directly into the Sphere ecosystem. By putting desktop applications at your fingertips, no matter where you and your teams are located around the world, Sphere can be used for customized as-built workflows that improve your time to decision by up to 150%.



With FARO Sphere and FARO Stream, you can capture data, preregister your scans, process the scans, and then share that project with anyone in the world — all without using a computer or ever leaving your job site.

FARO As-Built™ Software

Simplified conversion of laser scan data into 3D CAD and BIM models based on comprehensive model object library.

Redesigning a building for enhancement or maintenance requires on-demand, accurate and complete information of the as-built site to ensure your ideas will work. Failure in design results in cost overruns, unnecessary rework and diminished quality. The FARO As-Built Software solutions — including **As-Built™ for AutoCAD® Software** and **As-Built™ for Autodesk® Revit® Software** — ensure you efficiently create building designs based on precise as-built data that's fully compatible with your CAD and BIM systems. As-Built Software reduces the time for information extraction from point cloud data and gets the job done right, so you and your customers can tackle the next big project.



FARO BuildIT Construction Software

Comprehensive tools for the comparison of point clouds to 3D CAD and BIM models and analysis reporting for quality control.

What if you could take the guesswork out of construction quality control, resolve site issues faster and enhance operational transparency? As the first fully integrated tool for building life cycle quality assurance and quality control management, FARO BuildIT Construction Software allows you to continuously monitor projects with real-time comparisons against CAD/BIM designs and regional standards using 3D scan data. With BuildIT Construction, architects and contractors can reduce waste and costly delays and deliver higher-quality projects in time to accept new business at an accelerated rate.



“We need to measure the as-built situation in millimeters precision. With traditional methods, this is a multi-step and time-intensive process. For complex situations, it could happen that we need to visit the site multiple times until we’ve captured all the details.”

Franz Müller
Stair Builder

FARO SCENE Software

Designed to easily process, register and manage numerous scans of construction projects and provide single output files.

So, you’ve taken 3D laser scans of the building you want to document, or you’ve captured the as-built data you need: What next? FARO SCENE Software is where data processing and scan registration happens. With SCENE Software, you can create stunning 3D visualizations of real-world objects and environments and export that data in various formats. SCENE also delivers real-world information right into the BIM. By visualizing the precise geometries of existing properties as the basis for conversions or extensions, SCENE enables out-of-the-box thinking for different concepts of building use. Your as-built workflow for structural construction elements is faster and more accurate with SCENE on your side.



FARO Focus Premium Laser Scanner

Capture accurate and complete measurements of buildings, facilities and complex environments with confidence.

Use Focus Laser Scanners to capture as-built data for building information modeling (BIM), renovations, infrastructure projects and more. The accurate, complete 3D reality capture data creates a strong foundation for conversions, extensions, space optimization, structural analysis and maintenance. It captures as-built measurements of complex geometries and structures in minutes, for a complete recording of the current physical status of buildings and construction sites. And with the all-new FARO Stream app for Android tablets, iOS and Android smartphones, project setup and scanner configuration is easier than ever.



“We recently needed to completely rework a project. Because of wrong measurements, the roof panels couldn’t be installed. With \$70,000 in rework costs, the FARO solution would have paid itself off immediately, and the measurement operator would still have his job.”

Hubert Schmid
General Contractor



HoloBuilder™ Software

The world’s leading construction progress tracking platform, powered by 360° reality capture.

Construction progress management is essential for your project to remain on schedule and on budget. Especially if you’re using traditional documentation methods, this can be difficult. The HoloBuilder construction progress tracking software provides you with powerful photo documentation for capturing the progress of your construction site in the most efficient and effective way possible with 360° photos, automatically organized by project, sheet and time. Use the virtual version of your construction site to view it in 360° online from anywhere at any time. Be confident that your progress is recorded with construction photo documentation — accessible whenever and wherever you need it. HoloBuilder software is your 360° reality capture solution for a more efficient and effective way to track construction progress.

How to Make Your Job Easier and Win More Business

Capture the accurate as-built data you need by using 3D reality capture on your job site.

- It saves you time while keeping or improving the quality of your projects.
- The data provides infinite measurements and panoramic pictures that are available to you any time. You can share this data with other people involved in the project.
- Whatever existing tools and software your company already uses, FARO software is fully compatible with it.
- 3D reality capture allows you and the project stakeholders to make fast, informed decisions based on the exact conditions of your job sites.
- It gives you confidence that you won't run into any surprises during installation, allowing prefab elements to start sooner.
- It keeps your company out of costly rework and thus reduces material waste on the job site — a necessity when timber, concrete or metal prices are high.
- You won't have to pull workers away from their job to hold the tape measure; 3D reality capture solutions only require one person to operate.
- Adding 3D reality capture to your as-built construction workflow speeds up the project's schedules and timelines, allowing your company to win more business downstream.



Thousands of construction professionals across the world are adopting 3D solutions to improve their work. Get in touch with a FARO expert today and we'll bring an equipment demo to your job site so you can test it out in action.

[Consult With Our Experts](#)

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“I just need to visit the site once for a complete measurement. That means for me, four hours in time savings, or a decrease in measurement time of 60%.”

Franz Müller
Stair Builder

Local offices in over 25 countries around the world. Go to www.faro.com to learn more.

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