

The Complete Guide to 3D Technology for MEP Workflows

Create a foundation of accurate on-site
data for new builds and retrofit projects



About This Guide



Whether you're constructing something new or completing a redesign of a building for repurpose, enhancement or maintenance, the success and timeline of the entire project relies on accurate and comprehensive data of the site. If there are any inaccuracies or clashes in that foundation, it can lead to unnecessary rework, higher costs and oftentimes a final result with less-than-ideal quality. 3D capture technology is easy to use and ensures building designs are accurate, so you can work with more confidence - and faster than ever before.

Learn more about...

- How different 3D data capture tools and software can bring value to your business
- The specific time and cost savings 3D technology delivers throughout every step of the MEP workflow, for both new builds and retrofit projects
- What industry MEP professionals have to say about using 3D solutions on-site

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3D Laser Scanners and Software Accelerate Nearly Every Aspect of the MEP Workflow

Significantly reduce the time you spend coordinating and verifying the built environment for new build projects.

Complete installation verification faster – and with greater accuracy

Manually inspecting the structural elements that have already been installed is extremely time-consuming, and tools like tape measures and total stations simply don't deliver the efficiency that MEP projects require.

Instead of relying on outdated tools, you can use 3D reality capture devices to verify the built environment with greater accuracy and in a fraction of the time. FARO® SCENE Software and FARO As-Built™ Software Suite makes it easy to convert the raw point cloud into tangible, actionable data, so you can make sure the built environment matches the intended design.

Simplify data organization and project collaboration

Reduce the risk of miscommunications or misunderstandings with more advanced collaboration tools. FARO Sphere is a cloud-based information platform that provides the most efficient exchange of data possible — including remote collaboration on 3D projects and provides a centralized, collaborative user experience across FARO point cloud applications and service-oriented platforms through a secure, single point sign-on (SSO) process. With Sphere Viewer, a cloud-based solution inside the Sphere platform, 3D point clouds, SitesScape LiDAR-based scans, and HoloBuilder 360° projects can be viewed and shared

all in one place. Ideal for 4D construction progress management where the ability to compare elements over time is critical, project managers and VDC managers can better democratize data and eliminate the need to use two platforms for their reality capture needs.

Compare existing structures with the BIM-coordinated model

Manually verifying and adjusting major MEP trades with a total station and/or tape measures based on the field environment is often a lengthy and tedious process, especially if you want complete accuracy. With FARO® BuildIT Construction Software, you can compare the installation of the trades and how everything is placed with the BIM-coordinated model. That way, you can reduce the time you would have spent adjusting the work.

Accelerate the speed of As-Built documentation

Instead of relying on a tape measure or total station measurements to develop 2D drawings of the existing systems, you can use an as-built modeler software to simplify the point cloud data and convert it into highly-detailed as-built documentation for more accurate and efficient projects.





Retrofit/Remodeling Projects

Most retrofit projects start out the same way: figuring out how much you can actually rely on the original design documentation (if it's even available to reference). But the tools you use after that make all the difference when it comes to the success and budget of the project.

Capture pre-existing conditions in a matter of minutes

Traditionally, you would have to manually inspect the existing conditions and take notes of anything that deviates from the original documentation, if it is available to reference. Because this process typically takes weeks to complete and requires multiple team members, it can be a major disruption to business operations or has to be completed during off-hours.

With 3D tools like the FARO Focus Laser Scanner or FARO Freestyle 2 Handheld Scanner, you can capture the pre-existing conditions of complex MEP systems and other structural components within minutes. It's not only a faster process but a more precise one. You can create a complete 3D view of the existing conditions to analyze and compare in detail.

Create highly-detailed documentation of existing conditions

With the FARO As-Built Software Suite, the VDC/CAD team has a detailed and vivid model of the current conditions to reference as they begin work. Having a more complete rendering instead of the manually-collected documentation from different sources allows them to coordinate and install new systems and equipment with greater confidence.

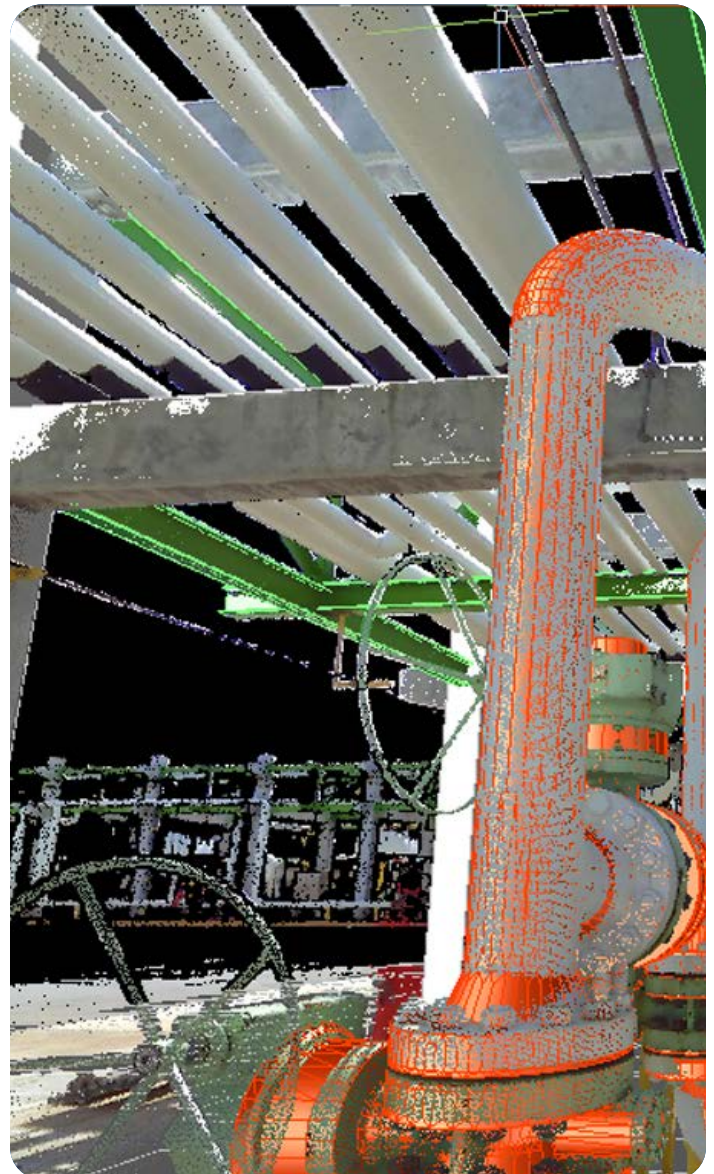
Easily share data with all project stakeholders

Instead of relying on team emails to share 2D documentation with all involved stakeholders, you can use FARO Sphere to share the 3D as-built documentation. The complete model can also be viewed in the Sphere Viewer within a web browser, eliminating the need for slow and often pricey data storage programs.

All future MEP coordination will be based on more accurate documentation

3D capture solutions benefit your team on this project and any subsequent ones. Future repurpose, enhancement and maintenance projects will be performed using the accurate 3D documentation you've generated on-site with 3D technology instead of manual drawing notes and measurements.

And with Hybrid Reality Capture™, powered by Flash Technology™, which combines the accuracy of a 3D laser scan with the speed of a panoramic camera, future 3D documentation is even faster and more accurate. And by addressing the speed-accuracy tradeoff (SAT) users can expect to save up to 2.5 days of scanning for projects that require five scanning days.



Hardware Specifications

Focus Premium Laser Scanner



The FARO Focus Premium creates accurate, photorealistic 3D representations of any environment or object in just a few minutes – even in the most extreme outdoors conditions. For best on-site data capture, Focus Premium connects with the FARO Stream app, bridging FARO hardware to the FARO Sphere cloud environment. Pre-registration scans are fed directly into the cloud, so jobs can be done more efficiently.

- **Super-High Color Resolution** — Capture scans with up to 266 megapixel color information
- **Multiple Point Clouds, Multiple Devices** — Work seamlessly with the FARO Freestyle 2 Handheld Scanner, thanks to its “Snap-In” feature
- **Up To 50% Faster Scan Times** — With the Flash Technology add-on and required PanoCam, a typical scan takes less than 30 seconds and can save up to 2.5 days of scanning for projects that require five scanning days
- **Software Compatibility** — Process your Focus Laser Scanner point cloud data with any software tool that fits your workflow, including FARO software solutions and third-party software such as Autodesk® ReCap™
- **Impressive Scanning Range** — Up to 350m scanning range, leading to superior area coverage per scan position
- **On-site Registration** — The process of combining multiple scans using common overlap, means faster project completion and real-time awareness of scan errors or missing data
- **Flash Technology Enabled** — For fastest scans with greatest accuracy featuring colorized clarity at an affordable price
- **Subscription-Based Scanning** — Hybrid Reality Capture scan mode is a subscription option through the FARO Stream App, accessible through Sphere
- **Smartphone-Enabled** — Remote control capabilities, limited only by the range of a Wi-Fi network

Freestyle 2 Handheld Scanner

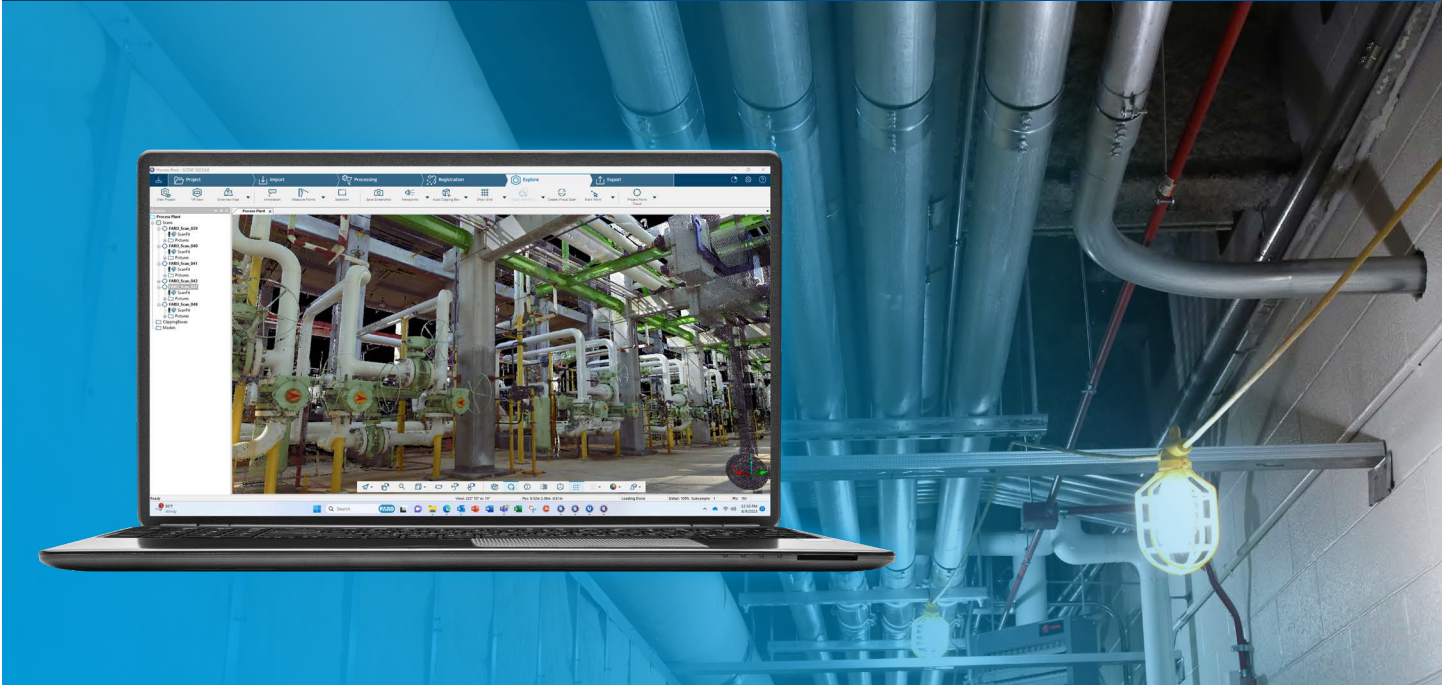


The FARO Freestyle 2 Handheld Scanner is a lightweight and mobile model perfectly suited for complex construction projects. It can be used on its own or in conjunction with a FARO Focus Laser Scanner. Because it is handheld, you can easily maneuver around the site to accurately document intricate details in confined or cluttered spaces that would be hard to reach otherwise.

- **Lightweight and Portable** — Compact design makes it easy to use anywhere
- **Speedy Capture, Speedier Results** — Quickly capture photorealistic detail
- **Easy-To-Use** — And only requires one person to operate
- **Real-Time Visualization** — Complete with guided scanning with haptic feedback
- **Scan Space Versatility** — Scan cramped or cluttered spaces with ease
- **Wide Range Scanning Distance** — Scan from distances from 0.4 m to 5 m
- **Works in Practically Any Environment** — Scan outside or in complete darkness
- **Eliminate Calibration Headaches** — No annual calibration required
- **Superior Device Interoperability** — Complements FARO Focus Laser Scanner

Software Specifications

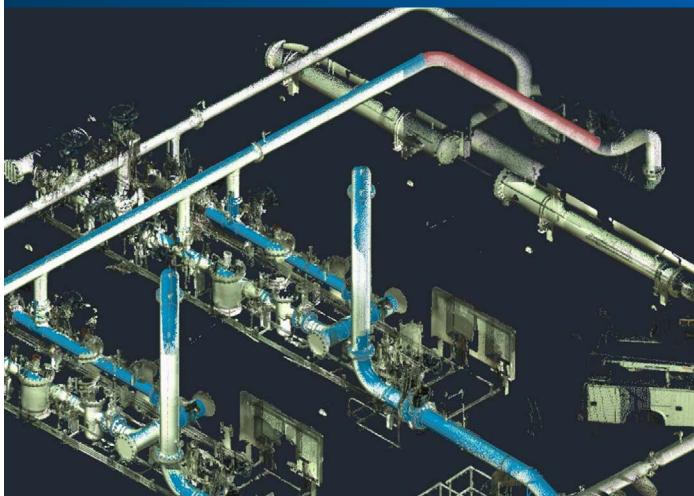
SCENE



FARO SCENE is designed for efficient 3D point cloud capture, processing and registration to enable simplified scan-to-BIM and faster, more accurate building projects. Create vivid 3D visualizations of real-world objects and environments, and export that data in various formats. And with the immersive virtual reality (VR) view feature, it's easier than ever to visualize the exact geometries of your project.

- **Visualize Data in Multiple Formats** — Explore scan data with unmatched clarity and vivid quality in 2D, 3D and VR
- **CAD/BIM Conversion** — Convert scan data into usable CAD/BIM objects with the FARO As-Built Software Suite
- **Diverse Registration Methods** — Automatically place scans by detected targets, cloud-to-cloud or top view based
- **Unlimited Scans** — Cluster an unlimited number of scans for any one project and organize them with a project database with project history
- **Intuitive Data Organization** — And a straightforward user interface for more efficient management of large projects
- **Complete Sphere Integration** — Fully integrates with Sphere Viewer, a cloud-based solution inside the Sphere platform, so that 3D point clouds, SiteScape LiDAR data, and HoloBuilder 360° projects can be viewed and shared all in one place
- **Efficient Data Processing and Filtering** — Data is processed efficiently and filtered for cleanliness and color balancing
- **Automatic Removal of Unwanted Objects** — Moving Object Filter automatically removes unwanted objects from registered scan data, such as people or vehicles passing by

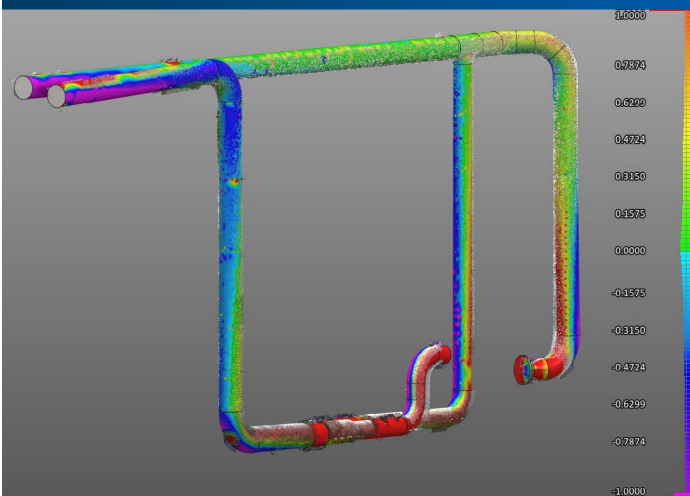
FARO As-Built Software Suite



Generate on-demand, accurate as-built data for building design and retrofit projects. With more precise and comprehensive data, you can ensure the design will work. You can also validate the design by comparing the virtual overlay and the as-built data of the site to perform clearance checks and clash detection.

- **Extract Objects and Object Systems** — Use automatic tools to extract objects and object systems or apply constraints to the design for MEP engineering
- **Avoid Clashes and Ensure Clearance** — Virtually overlay the design with the as-built site to avoid clashes and ensure clearance requirements are met
- **Fast Development of Floor and Elevation Plans** — Accelerate the development of floor and elevation plans with automatic tools
- **Millimeter-Precise Measurements** — Take incredibly precise measurements (accurate to the millimeter) of distances, clearances, areas, volumes or tie-in points
- **Automatic Surface Deviation Analysis** — Minimize rework with tools that run automatic surface deviation analysis and crash/clearance detection
- **Common CAD Exchange Formats** — Extract surfaces and export them in common CAD exchange formats to turn the point cloud into a CAD model

BuildIT Construction



BuildIT Construction is the first fully-integrated tool for continuous construction, verification building life cycle quality assurance and quality control management. Easily and continuously monitor projects with rapid comparisons against CAD/BIM designs and regional standards using detailed 3D scan data, minimizing waste and expensive delays improving overall project quality.

- **Visualize Construction Site Deviation** — Clearly visualize exactly where the construction site deviates from the design, measure the differences and adjust accordingly
- **Procore Project Management Integration** — BuildIT integrates with procore Project Management programs for seamless workflows, from issue identification to resolution
- **Intuitive Report Generation** — Helps create easy-to-read reports for field crews
- **Embed Tolerances into Charts** — To document and rework any spots that are out of the agreed tolerance
- **Poor Placement Detection** — Quickly identify poor placement and assign issues to the related trades earlier in the process, preventing on-site clashes
- **Continuous Data Synchronization** — Ensures it's virtually impossible to lose data and allows you to share point cloud data uninterrupted

Sphere



FARO Sphere is a collaborative SaaS platform that enables secure, cloud-based data sharing from anywhere in the world. With Sphere, all project stakeholders have easy web-based access to the recorded 3D reality data, so everyone on the team can make more informed decisions, monitor progress and easily collaborate throughout every step of the process. Sphere also provides a one-stop user experience across FARO's leading software applications and customer support tools, including HoloBuilder™, a global construction progress management solution that delivers hardware agnostic image capture, registration, and SiteScape™, LiDAR-based projects, which enables mobile devices to easily capture indoor spaces digitally, providing a readily available entry-point to scanning physical spaces for a broad range of applications.

Integrating SiteScape's LiDAR capture capability into the FARO Sphere Platform is a further step in streamlining multiple capture methods into a centralized environment to be accessed in a single environment on a single coordinate system. This unique capability enables MEP customers to access the widest portfolio of reality capture methods in the market, which now ranges from low-resolution Lidar, 360°photo, video, mobile mapping and terrestrial laser scanning.

With Sphere and its related applications users can:

- **Increase Workflow Effectiveness** — Close existing workflow gaps by enabling remote collaboration and project completion from anywhere in the world
- **Improve On-Site Efficiency** — Eliminate additional site visits due to registration failure or incomplete scans
- **No More Failed Communication** — Inform project stakeholders that a scan is complete and that modeling can begin, speeding job completion times yielding significant savings per project
- **Point Cloud to 360° Photo Integration** — De-silo data by connecting your point cloud to a 360° photo project
- **Complete Projects Faster** — Simplify operations with secure single point sign-on to provide faster access to reality data and improve time to decision
- **Eliminate Geographical Boundaries** — Collaborate with colleagues, project managers, engineers, contractors and other project stakeholders in a seamless, centralized digital hub from anywhere in the world
- **Ensure Accuracy and Quality Control** — Pre-register scans in the FARO Stream app and upload to Sphere speeds time to completion and reduces the need to return on-site should any off-site registration failures occur
- **Dynamic Data Management** — Sync on-site reality data to a cloud-based data hub to ensure project stakeholders have complete line-of-sight on project completion no matter where they reside or where they log in

Case Study

How the UK's Survey Company: Red Laser Scanning Helped Give a ROCKWOOL Factory Upgrade the Green Light

The power of 3D laser scanning was demonstrated recently when London-based [Red Laser Scanning](#), a measured building survey and 3D laser scanning company that provides service for the architecture, construction and infrastructure industries, offered their professional expertise to a ROCKWOOL Ltd factory in Wales. With one factory in Bridgend, South Wales and over 500 employees across the UK, the company provides a full range of high-performing and sustainable insulation products for the construction industry.

In this particular case, the company sought to document a 9,585 m² area of their South Wales facility in order to establish the interfaces with the equipment upgrades needed as part of their as-built capture and modeling.

In order to achieve that aim, Red Laser Scanning used a FARO Focus Premium Laser Scanner, a FARO Focus S70 and a total station. Scans were registered — registration is the process of aligning multiple scans in a parent coordinate system using reference positions common between scan — using target registration with spheres, checker boards, and manual targets. Red Laser Scanning also applied survey control.

One of the projects key challenges included measuring the factory's confined spaces with the Focus scanner since most of the equipment was placed close to each other. In order for Red Laser Scanning to capture all the required details they had to take many extra scans, positioning the scanner in the gaps between the equipment.

Thanks to the company's expertise and FARO technology, including hardware, software and its cloud-based SaaS collaborative platform, the project was successfully brought to completion with the delivery of a point cloud of the area in question.

Data processing and registration took place in FARO SCENE Software and was delivered in Autodesk RECAP (.rcp) format. SCENE enables users to create impressive 3D visualisations of real-world objects and environments and export that data in various formats. Red Laser Scanning also benefited from its use of FARO WebShare, a web-based project management tool.



“We aim to build long-lasting relations with industry professionals, by delivering efficient service, high-quality and accurate as-built drawings and models, and a flexible approach. And the FARO Focus Premium Laser Scanner helps us achieve that goal.”

Pawel Sipta

Managing Director, Red Laser Scanning

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