CUPIX
BUILD SMART

eBOOK

Beyond 360° Photo Documentation

Unleashing the Power of Cupix's Spatial Digital Twins

What's inside

01
Introduction

Overview of Photo Documentation

Photo documentation is a powerful tool for recording construction data and preserving visual records across the entire construction lifecycle. Its effectiveness lies in its ability to capture spatial context, communicate complex information, and serve as a valuable collaboration tool for remote colleagues.

Among the many benefits of photo documentation, construction and engineering professionals bridge the gap between design and onsite construction by:

- Documenting step-by-step procedures and workflows
- Assisting in quality control and quality assurance
- Capturing visual records of construction projects
- Preserving historical or chronological project information
- Amending design models when the project is complete

Overview of Spatial Digital Twins

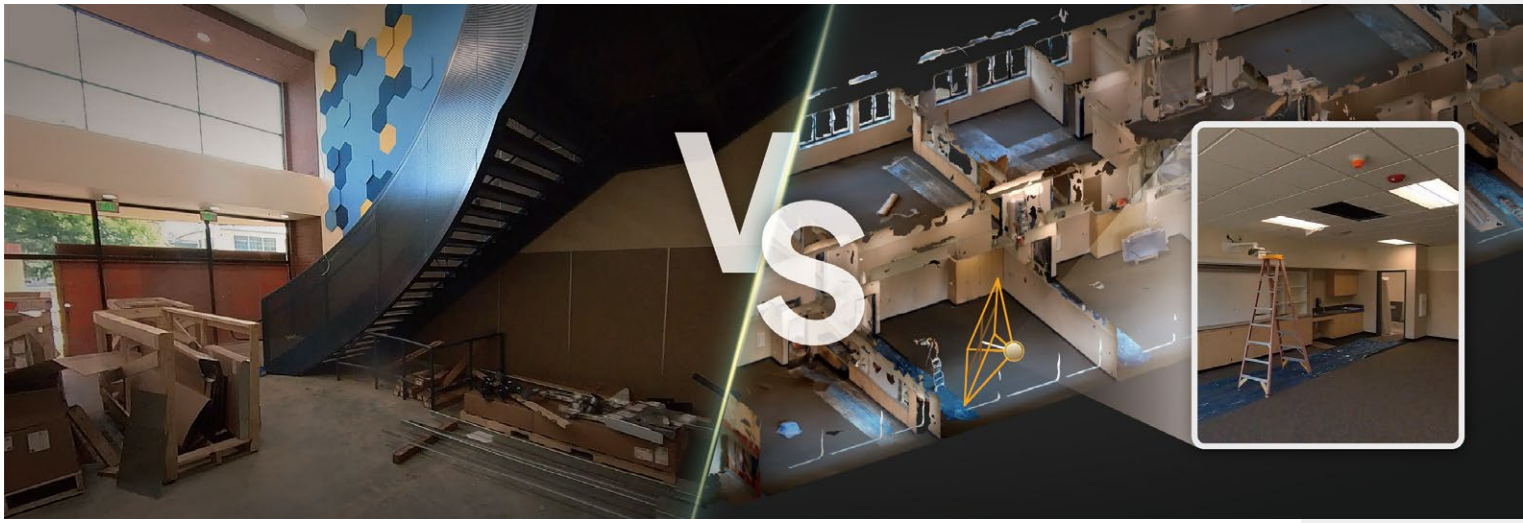
Spatial digital twins are a type of digital twin that represents a physical space or environment, such as a building or city. Understanding spatial context solely at eye level can be challenging. When combined with Building Information Modeling (BIM) it can provide a range of benefits in the construction industry, such as:

- Design and build smarter: Model potential designs, spot problems faster
- Construction: Clear task identification and real-time updates on changes
- Effortlessly assess distances, volumes, spatial clearances, and topography in 3D for site surveys, quality assurance, and logistics planning

Because of these benefits, capturing spatial context reduces costs and time by detecting problems faster and improving sustainability by reducing errors. Thus, more efficiency by increasing security and quality in view of the ease of communication and collaboration for direct access to specific information.

02

How Do 360 Photo Documentation & Spatial Digital Twins Differ?



360 photo documentation is a popular technique involving the use of consumer-grade 360 cameras for capturing panoramic photos or videos to create a virtual tour of a site. This easy-to-use method, widely adopted by busy engineers onsite, brings a novel way of recording existing as-built site conditions for visual progress sharing or evidence collection for potential future disputes. Vendors like Insta360 and Ricoh offer some easy to use and affordable hardware to collect his type of data.

By contrast, Spatial digital twins represent a more detailed approach to site documentation. This method captures the site context in 3D, by using reality capture systems such as drone photogrammetry or laser scanners. It's invaluable in industries like construction, civil engineering, and facility maintenance for its ability to provide both visual context and measurable dimensions. Previously, however, it was typically limited to well-funded or mission-critical projects due to its high resource demands. As a result, while they can be valuable utility features offered by vendors, they may not serve as the primary method for creating comprehensive Spatial digital twins of sites. Now due to advances in AI, **Spatial digital twins are now more affordable**.

The Pros & Cons of 360 Photo Documentation

Pros

Simple and cost-effective

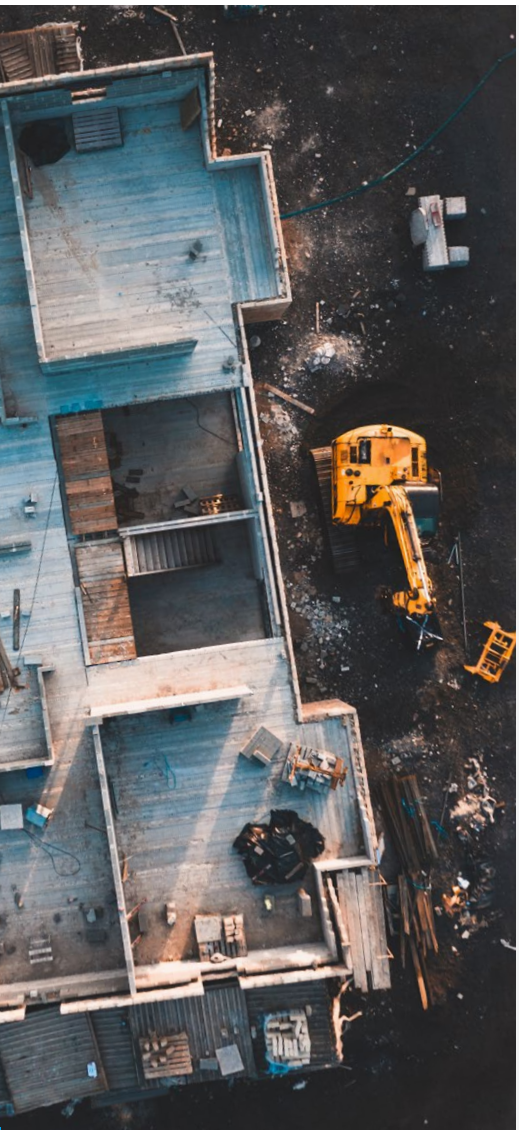
Only a consumer-grade 360° camera is required, making it accessible to individuals with basic photography skills.

Easy to collect visual information

A single video can capture an entire scene, providing a comprehensive view of the surroundings and reducing the need for numerous photos.

Provides visual documentation of a site

Photo documentation holds value for various purposes, including documentation, presentations, remote visual inspections, and as evidence of work for potential disputes.



Cons

Lack of depth information

360° photos provide a flat representation, making it challenging to measure distances or understand spatial relationships.

Limited interaction and visualisation

Viewers are typically limited to navigating the image from a human-eye perspective, without the ability to explore the scene from a bird's-eye perspective or in a more interactive manner.

Limited mapping accuracy

In mapping, 360° photo documentation may not offer optimal accuracy, leading to potential locational confusion when comparing captures from different dates or design data like BIM.

Only visual comparison with BIM

When comparing captured images with a BIM model or other data sources, 360° photo documentation has limitations. It primarily serves as a visual reference for comparison rather than directly integrating or aligning with the digital model.

360° photo documentation offers a simple and cost-effective method for capturing visual information of a site. It can provide stakeholders with an immersive view and serve as a valuable visual documentation tool. However, it is important to consider the limitations of 360° photos, including the lack of depth information, limited interaction and visualisation, limited mapping accuracy, and the reliance on visual comparison with other data sources. By understanding these pros and cons, you can make informed decisions about when and how to best utilise 360° photo documentation in your specific projects or applications.

The Pros & Cons of Spatial Digital Twins

Pros

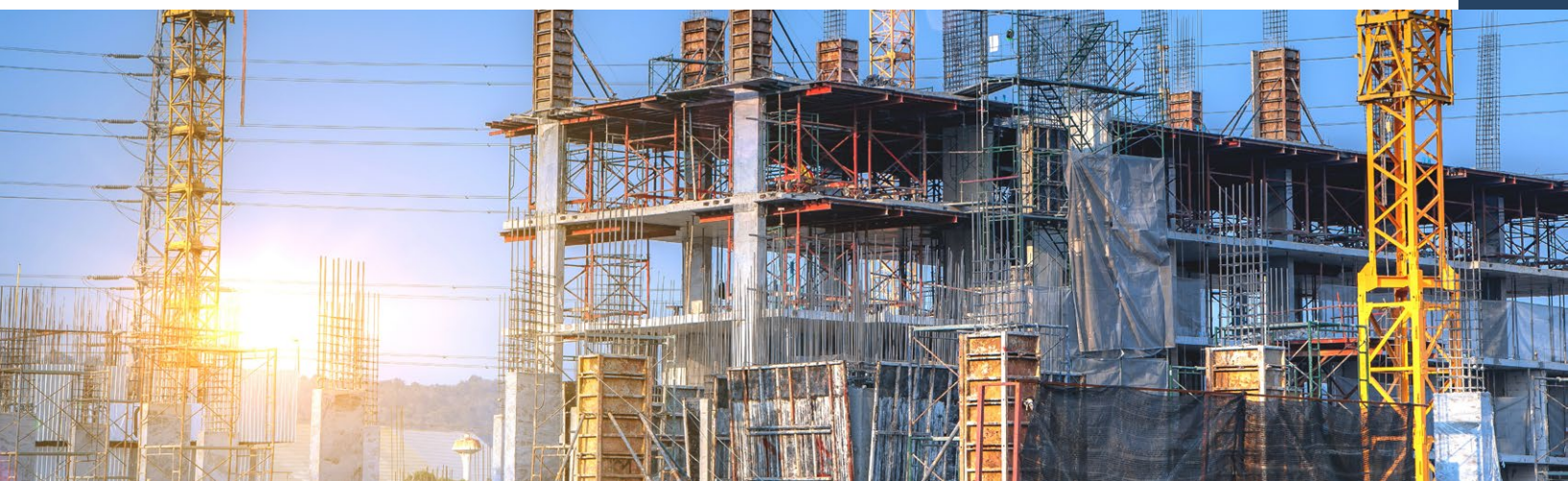
Provides detailed spatial representation of a site

This approach captures extensive spatial data, leading to a highly realistic representation of the site.

Versatile applications

3D digital twins can be utilised for various purposes, including

- As-built 3D documentation
- Survey-grade QA/QC (e.g., flatness, plumbness, contouring)
- Day-to-day QA/QC (e.g., pre-concrete pour, rebar spacing, component placement)
- Scan2BIM or Scan2Drawings (creating as-built BIM or drawings)
- Progress tracking
- Safety inspections
- Logistic planning
- Program planning



Cons

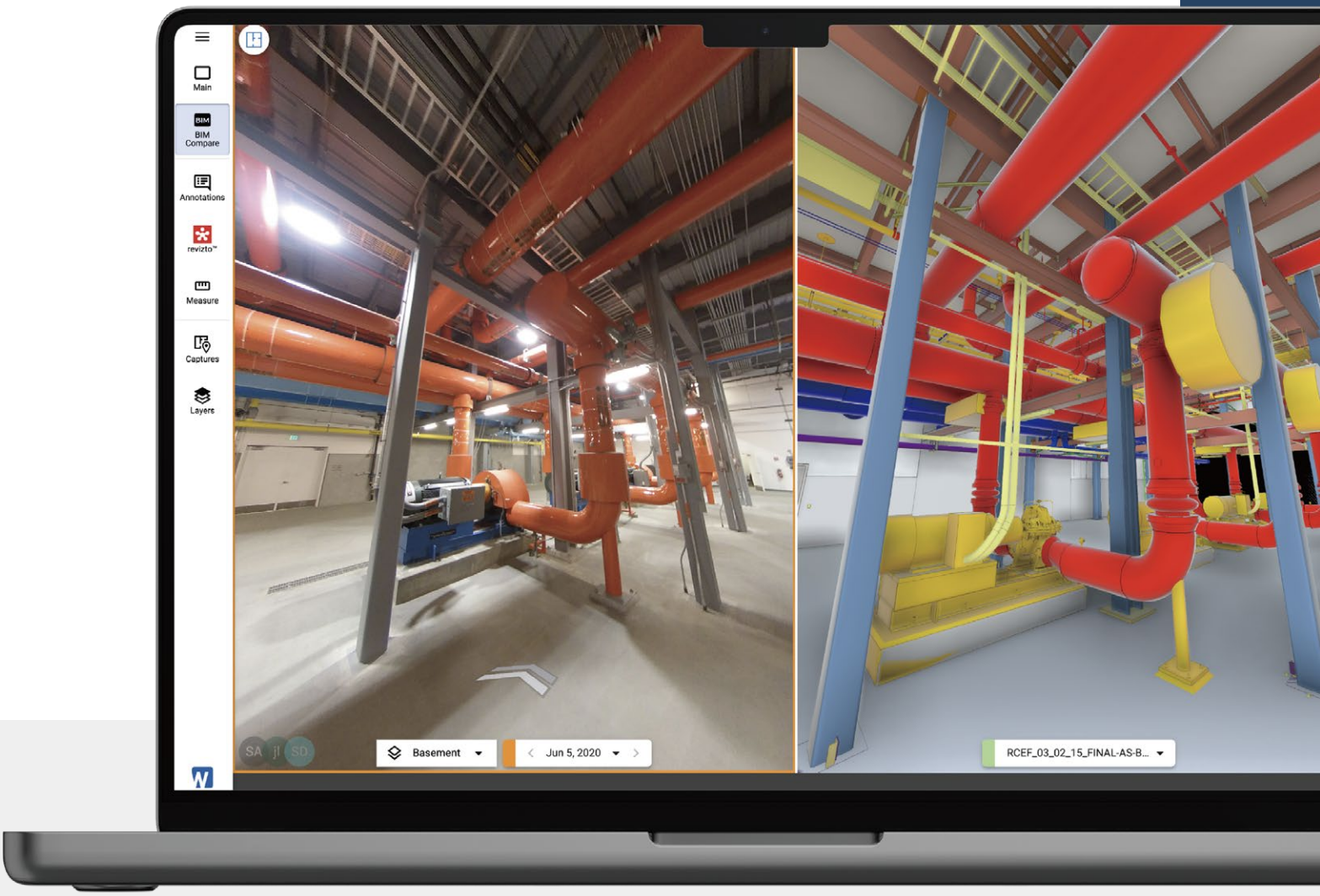
Complexity and cost

Implementing some 3D digital twins was previously complex and expensive due to the specialised equipment and software required for data capture and processing. However with the rise of AI and new technologies, **this is now affordable**.

Cost scalability

Previously, before the advancement of AI (from Cupix), the costs of Spatial digital twins could escalate with increasing site size. Larger areas might exponentially increase the time and resources required, making it unfeasible to use this method.

Spatial digital twins provide a detailed data representation of sites, facilitating a broad range of applications across diverse industries.

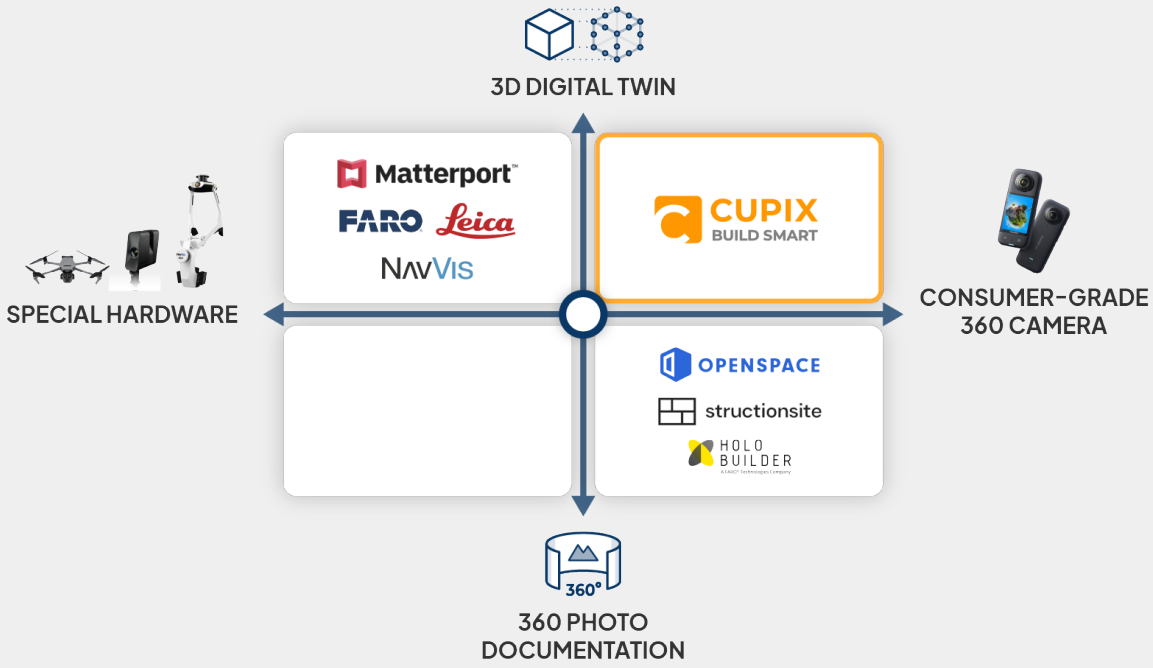


03

Here Comes the Game-Changer — “Spatial Digital Twin Creations from Consumer-Grade 360 Camera”

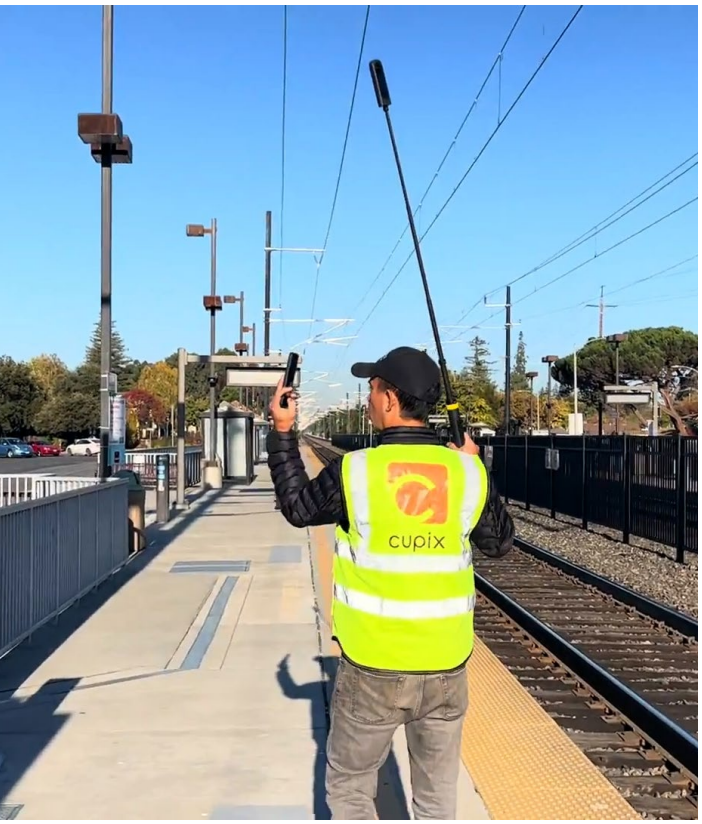
Fueled by groundbreaking technological advancements, an innovative trend is emerging that masterfully blends the benefits of both 360° photo documentation and Spatial digital twins. This pioneering approach, known as “Spatial Digital Twin Creation from 360 camera,” is led by industry forerunners such as Cupix and Matterport.

The new approach takes advantage of utilising a consumer-grade 360 camera, similar to other tools used for 360° photo documentation. However, what sets Cupix apart is its ability to generate a 3D map using AI technology. This combination of a familiar tool and the innovative application of AI creates a unique and novel solution. Consequently, it fills in the voids left by 360° photo documentation by offering depth perception, a bird’s-eye view of the site, dimensional measurements, and an immersive integration with the BIM workflow.



04

Can Consumer-Grade 360 Cameras Replace Specialised Hardware in Spatial Mapping?



When it comes to data accuracy, utilising AI and computer vision technologies and video footage from an off-the-shelf 360° camera to generate digital spatial maps falls behind laser scanners. The price tags of specialised hardware solutions are often reflective of the level of accuracy users can expect.

Therefore, for use cases that require survey-grade QA/QC or highly accurate Scan-to-BIM, relying solely on 360° video-based mapping is not suitable. Specialised hardware solutions remain indispensable for achieving the highest levels of accuracy and data quality in these scenarios.

05

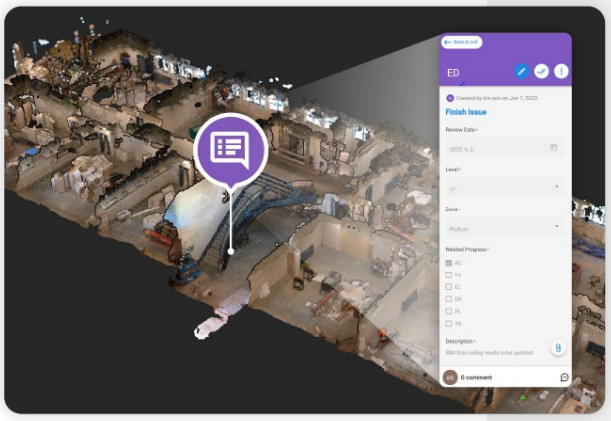
Spatial Digital Twins Still Reign Supreme Over 360° Images

Despite the fact that laser scanners offer highly accurate data, they typically entail substantial resource demands and costs. However, Cupix's Spatial mapping capability opens up a wide array of exciting possibilities. Cupix's user-friendly interface and cost-effectiveness position the solutions as an accessible do-it-yourself (DIY) tool for creating as-built spatial documentation, enabling a diverse range of use cases.

Spatial Digital Twin Creation from 360° cameras adding value:

Unlocking the Bird's Eye Perspective

A spatial map provides remote collaborators with a comprehensive view from above, allowing them to gain a deeper understanding of the site conditions and valuable intuitive insights. On the other hand, 360° photo documentation only offers perspectives limited to the camera locations.

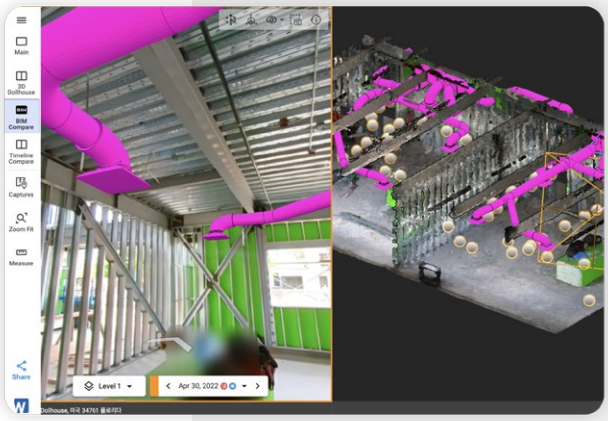


Information Geo-Tagging in 3D Coordinates

3D coordinated geo-tagging of site information, such as issues and annotations, minimises misunderstandings and miscommunication among stakeholders, thereby promoting more efficient collaboration and reducing reworks.

Dimension Measurement

Spatial maps facilitate a range of measurements, including distance, volume, spatial clearance, and topography, serving applications such as site surveying, quality assurance, logistics planning, among others.



In-Depth Integration with BIM/VDC Workflows

The Spatial digital design as-built context can be deeply integrated into BIM workflows, streamlining processes such as installation verification, coordination with subcontractors, and enabling eFacility, which uses BIM as the central representation of the facility once construction has been handed over to the owner.

Scalable Construction Project Tracking

Some vendors utilise AI photo analysis for monitoring project progress. However, methods that rely solely on photos can potentially hinder scalability over time. By leveraging the 3D map, automatically generated from consumer-grade 360 cameras, this solution can prove to be more attainable and cost-effective in the long run.

Geo-Centered System Integration

Spatial geo-tagged site context functions can be used as a powerful, unified data hub throughout built-world ecosystems, covering areas such as project management, safety inspection, facility maintenance, asset tagging and tracking, and GIS.

06
So, What Makes Cupix Unique?

Cupix is spearheading this transformative wave with its unparalleled “Spatial Digital Twin Creation from Consumer-Grade 360 camera” solution. Utilising a proprietary AI-Engine, Cupix can convert user-captured 360 videos into Spatial digital twins. What distinguishes Cupix in this arena is our simplification of the process, high-quality spatial map generation, all-encompassing integration with BIM, and the ability to utilise traditional Spatial digital twin data from laser scans or drone photogrammetry for BIM verification.

Moreover, Cupix’s spatial maps have the potential for applications beyond traditional use cases. With our affordability and accessibility, we enable individuals to discover creative and innovative ways to leverage Spatial mapping technology. These maps can find utility in diverse fields, such as engineering-level site survey, yard condition documentation, and integration with Computerised Maintenance Management Systems (CMMC).

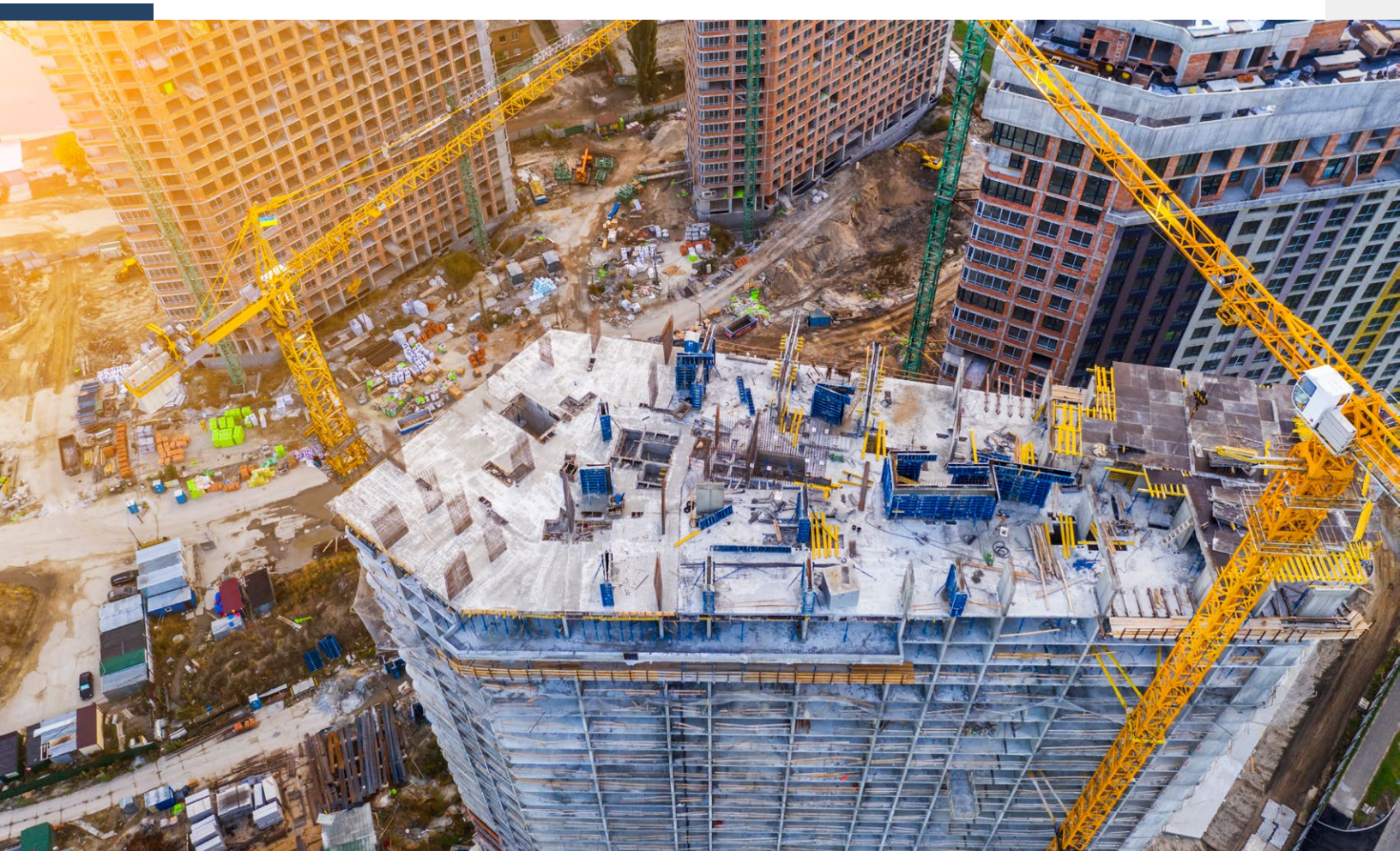
07
Looking to the Future

The new approach takes advantage of utilising a consumer-grade 360 camera, similar to other tools used for 360° photo documentation. However, what sets Cupix apart is its ability to generate a Spatial digital design map using AI technology. This combination of a familiar tool and the innovative application of AI creates a unique and novel solution.Consequently, it fills in the voids left by 360 photo documentation by offering depth perception, a bird's-eye view of the site, dimensional measurements, and an immersive integration with BIM workflows.

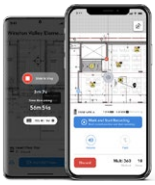
To experience the transformative power of Cupix's solution and unlock a new era of Spatial digital twins, get in touch with our team and start your journey today.

Discover the simplicity of the data collection process, 3D spatial map generation capabilities, seamless BIM integration, and explore the endless possibilities for creative applications.

Join us in shaping the future of site surveying, documentation, and beyond. Build Smart with Cupix.

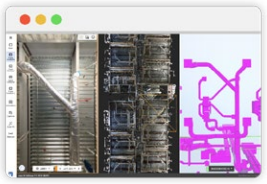


CupixWorks System at a Glance



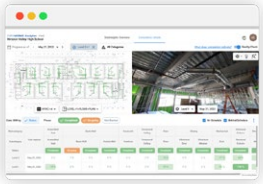
Mobile Capture App

Cupix mobile app controls 360 cameras and makes it easy to take 360 captures of your sites.



SiteView

Browser-based virtual site viewer supporting collaboration, annotations and report generation.



SiteInsights

Stay On Time, On Budget Automatically Report Work Areas Monitor Projects of Any Size.

Cloud Server

Application and database servers. AI-powered capture processing. File hosting and streaming.

Cupix Connect

Desktop application for fast & reliable upload of 360 photos and point clouds to your CupixWorks project.

Offline Viewer

Desktop software to open locally stored SiteView content without Internet connection.

Custom Apps

Custom developed apps can be connected to Cupix's cloud backend through APIs.

About Cupix

Cupix offers the construction industry an advanced Spatial Digital Twin platform that enables construction sites to be mirrored into virtual spaces, with measurable spatial context, in minutes.

The flagship product, CupixWorks, is a SaaS platform that transforms 360° photos taken by off-the-shelf 360 cameras into a virtual Spatial digital twins and provides a cloud-based unified platform for industry data formats. It leverages AI to provide construction progress insights to customers and is used by building and infrastructure clients across various projects. For more information and/or demo go to www.cupix.com.

Call Australia: +61.1800.569.114

Email: apac@cupix.com

CUPIX
BUILD SMART