

User Story

Laser Scanning Architecture

FARO



Digital data model: from analyses and visualization to securing evidence.

Laser scanning revolutionizes architecture and the building industry

AS BUILT DOCUMENTATION / FURNISHING OF COMPLETE PROJECTS *The wealth of analysis options makes 3D laser scanning very attractive when taking detailed surveys of even the most complex building structures. Thanks to modern hardware and software solutions, the cost of scanning services has dropped sufficiently to become competitive with manual measurement methods.*

Detailed, reliable measurement data is particularly necessary when surveying and designing buildings, making conversions, and building interior spaces and outdoor facilities. Because accuracy and error-free measuring are the basis of all sound planning based on the prevailing conditions, 2D charts are no longer enough for architects.

The following user report shows how planning errors can be avoided and the efficiency of projects increased with the fully-automatic, Focus^{3D} laser scanner from Faro.

The architects at laser scanning architecture were commissioned with verifying the existing survey plans for an office building against the as-built situation. Measurements of the shell of the administrative building being renovated were taken with the FARO Focus^{3D} laser scanner. Architect Johan-

nes Rechenbach made 30 individual scans in just five hours, comprehensively documenting 2,800 square metres of facade surfaces and 1,500 square metres of floor space in 3D.

Since architecture offices still work mainly with 2D charts, which requires an undistorted 2D representation as a basis for the planning of buildings, interior spaces or outdoor facilities, any number of 2D images such as plans, sections or elevations can be generated from the three-dimensional scan data. These can then be imported, true to scale, into CAD programs. Planning progress can then be very conveniently adjusted to the existing building. Planning errors are identified in time and can be remedied before the construction phase. It avoids substantial liability risks and ensures that the major requirements with respect to accuracy and efficiency

are calculable. In the concrete example of the office building survey, differences to the laser scanning method are obvious. In comparison with CAD planning, deviations around the central supports and the right hand exterior wall are clearly recognizable.

If these deviations were first noticed during construction, significant additional costs could arise and they result in functional disadvantages in the design. But the required planning certainty was achieved using 3D measurements taken with the FARO laser scanner. The differences between existing and planned dimensions on all floors of this property amounted to approx. 30 square metres. Thus, a potential loss of rentable floor area was identified and communicated in time. The Focus^{3D} measurement results would also be used for the facade measurements. >>

Laser Scanning Architecture

www.laser-scanning-architecture.com



Differences between survey documentation with the aid of laser scanning and manual measurement.

>> Following the analysis and direct comparison with individual manual measurements at exemplary points, it was found that the required accuracy of no more than 5 mm per window opening could not be reliably maintained. Deviations of between 0 mm and 15 mm were identified. However, the result could have been optimised by using a parallel tachometric calibration. But this would have involved a considerable amount of time.

Visual control of axis grids, lintel heights and detail points is in fact possible using scan data overlaid on the manually measured facade plans. This as well is a valuable aid in avoiding planning errors and ensuring a smooth construction process. The Focus^{3D} measurements show that the steel columns of the roof structure in this property are not centred over the masonry columns of the full floors. With this knowledge, the column cladding in the roof can now be positioned off-centre to achieve the desired uniform facade appearance. The unique features of 3D laser scanning with the Focus^{3D} in comparison to other measurement methods lie in its ability to take integrated surveys of existing conditions and make multi-functional data analyses. Axonometric or perspective views from any standpoint can be generated from the scans and video animations can be created with continually changeable camera tracks. In this way, the contents of the 3D scans form a database for a large selection of innovative visualization possibilities.

As part of securing evidence, 3D scans with the FARO Focus^{3D} serve to prove and display the flatness of building components. The areas shown here in red

are 2.5 cm in front of the reference plane. The areas coloured in blue are 2.5 cm behind it. This allows the building state to be accurately and incontestably documented, even years later. 360° photographic-quality panoramas can be made with SCENE software, enabling visual and geometric analyses of the property. The data density it delivers is so high that plans can also be prepared far from the site. Repeated visits to the building for follow-up measurements are suddenly a thing of the past, saving time and money. As part of the bidding process, participating companies can view the high-resolution panoramas on the Internet, allowing them to submit accurately-calculated bids. This also reduces construction costs. These panoramas can be integrated into the architect's or building owner's webpage home page as required.

LASER SCANNING ARCHITECTURE

Dipl.-Ing. Johannes Rechenbach, Architect BDA, owns his own architecture office for more than 12 years. He has specialized on general architectural activities and building measurement with 3D laser scanning. He offers scanning services with the FARO Laser Scanner. He supports users already having their own FARO Focus^{3D} or intend to buy one during their own scan projects phase on site or during data processing. His innovative website shows the added value of such an innovative kind of as built documentation with the help of examples and descriptions.

@ WWW.LASER-SCANNING-ARCHITECTURE.COM

– 4 GOOD REASONS –

- 1 Accurate: the high level of automation delivers highly-accurate data indispensable for measurements.
- 2 Automation: The manual effort in post processing data is drastically reduced, thanks to the multi-sensors in the Focus^{3D}.
- 3 Flexible: flexible control in a WLAN enables 3D documentation practically everywhere.
- 4 Networking: SCENE software enables sharing of scanned projects and networked collaboration between several participants in a project.



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SUMMARY

The wealth of analysis options makes 3D laser scanning very attractive when taking detailed surveys of even the most complex building structures. Thanks to modern hardware and software solutions, the cost of scanning services has dropped sufficiently to be competitive with manual measurement methods. The digital data model enables analyses, visualizations and preserves evidence in a way that was inconceivable until recently. By optimising planning procedures, the building process is made more efficient, reducing costs.

“3D documentation is revolutionizing surveys and enabling a more effective planning process. The Focus^{3D} is the tool for architects.”

ARCHITECT JOHANNES RECHENBACH