

CUSTOMER
BB Surveys Ltd

PROJECT
A 4,600 scan football stadium project

SOLUTION
Trimble X7 3D Laser Scanner and Trimble RealWorks



Scanning the stadium – a monumental project for BB Surveys

How BB Surveys successfully completed a vast football stadium project with over 4,600 scans and multi-sensor integration to create a range of high-quality deliverables.

Based in the East of England and operating throughout the UK, BB Surveys is an experienced and trusted land surveying company that undertakes a range of surveys including topographic, as-built, 3D Laser Scanning and high precision monitoring.

The survey team, under the leadership of Owner Barry Burrows, may be compact in size, but this understates the company's commitment to cutting-edge surveying techniques and advanced computer technology. Not only was BB Surveys the first practice in the UK to acquire a Trimble X7 3D Laser Scanner, the company also has the advantage of retaining the most experienced user of Trimble RealWorks software in the UK and Ireland in Scanning Specialist Jason Jones.

Trimble RealWorks is point cloud processing and analysis software for 3D laser scanning professionals. It includes automated tools and point cloud specific workflows allowing users to import point cloud data from virtually any source, then quickly process, analyse and create the high quality customer deliverables that BB Surveys is known for.

Solely responsible for processing all laser scanning jobs and experienced in using a range of different laser scanners since 2010, Jason switched to Trimble RealWorks over a decade ago and today RealWorks and Trimble Business Center (for transformation of field data into high-quality client deliverables) remain his go to software for processing scan data.

A vast project and finding the right solution

The main use of the Trimble X7 for BB Surveys is for measured building surveys, both internally and externally. These can range in size from a single barn or residential building to more recently, an entire football stadium. The team has an extensive KOREC supplied Trimble portfolio at its disposal and therefore can pick the best solutions specific to each project choosing from high accuracy total stations, four types of GNSS, including the R12i, the X7 3D Laser Scanner and also a Trimble SX10 Scanning Total Station.

BB Surveys was recently commissioned by Foxton Construction to carry out a laser scanning project at Aston Villa F.C. and in particular, to update information on the Holte End to assist in the planning and design of new seating proposals. The job would require both internal and external scans with a deliverable of 2D elevations, 2D floor plans and 3D Revit model.

Most rated benefit of the Trimble X7 for BB Surveys:

On-board registration with the Perspective software

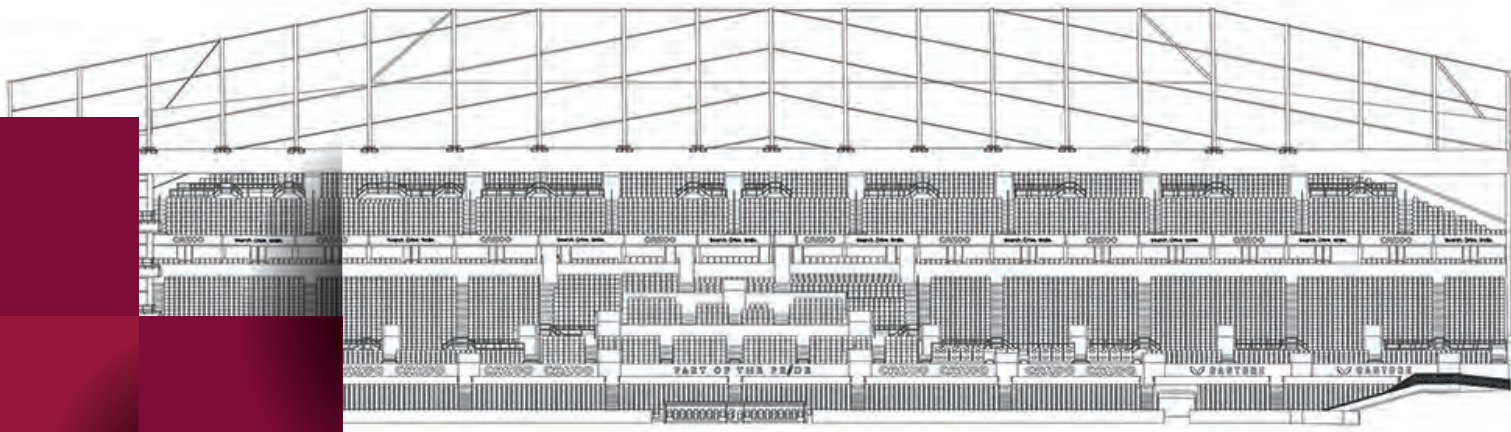
This saves hours of processing time and makes it easier for companies like BB Surveys where they have different teams for data capture and processing. Plus, you can see your fully registered point cloud before you leave the site, avoiding any gaps through missing scans.

"Before being able to register 'as you go', even a simple fifty scan job over one or two levels was a pain due to needing site diagrams showing scan locations and links between levels, let alone a job like this with literally thousands of scans."

Jason Jones, BB Surveys



3D model of the stand



Pitchside elevation drawing

The job then expanded to include a scan of the externals of the entire stadium as well as full internals of 3 of the 4 stands and the entire bowl seating areas. Further deliverables included 12 external elevations across all 4 stands, 4 pitch-side elevations, a full seating plan of all 42,000+ seats, 16 floor plans, a 3D model of the Holte Stand, internals and externals, and multiple sections through the stadium's hospitality suites.

Combining data from 4,600+ scans and multiple sensors

Jason Jones knew that a job of this scale demanded the use of a range of survey methods and sensors. However, as an experienced Trimble Business Center (TBC) user, he also knew that, if the data capture was handled correctly, it would be a relatively straight forward process to combine all the collected data into a single software package, in this case TBC, to help streamline and speed up the processing.

On site, a range of sensors were therefore used:

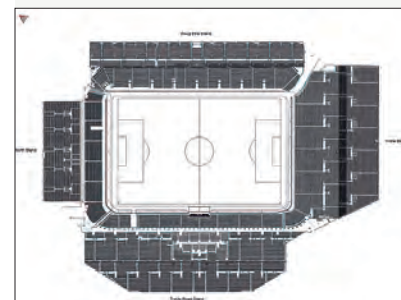
Trimble SX10 Scanning Total Station: The BB Surveys team traversed in ground control using the SX10, carrying out some laser scans as they worked. These scans, once processed, formed the primary control for the Trimble X7 scans to be registered to.

Trimble X7 3D Laser Scanner: The team supplemented their existing X7 with an additional one hired from KOREC to handle the high volume of work. Scans were undertaken internally and externally. For a project this size, Jason felt that Perspective software for in-field scanner control and registration was key to the success of the work.

The surveyors on site were able to split the scans into multiple registration sets on the controller. This not only kept the enormous amount of scans organised for the on site scan team, but also these registration sets transferred over to RealWorks as Groups helping to speed up the registration/refining process. Being able to rename registration sets in the Perspective software was of significant help once the data was in RealWorks.

Trimble R12 GNSS: a Trimble R12 was used to survey the ground control and this allowed the team to accurately place the project onto the OS Grid although this was kept at a scale factor of 1.

Rotary drone: additionally, the team captured aerial imagery of the roof which was then fixed to the ground control and the point cloud was then brought into Trimble RealWorks to be combined with the point cloud from the terrestrial scanners.



Seating plan

“KOREC has been a great source of support and advice over the years from providing my original training in the software to helping with technical advice on the Villa Park project.”

Jason Jones, BB Surveys Ltd

In total, BB Surveys carried out 4,647 scans with the Trimble X7 plus additional scans with the SX10, generating over 24, billion points and more than 1,000 GB of data across four RealWorks projects.

Handling the data

Back at the office, the SX10 and R12 data was imported into TBC to process the traverse and then the point clouds were exported into Trimble RealWorks. All data from the X7 was imported directly into Trimble RealWorks before being exported for drawing/modelling.

Trimble RealWorks was used to process and combine all the laser scans. Once in the software, the data was split down into four separate projects, one for the externals and pitch side scans, and another for the internals of each of the three stands scanned. This helped keep the file sizes smaller and consequently, more manageable.

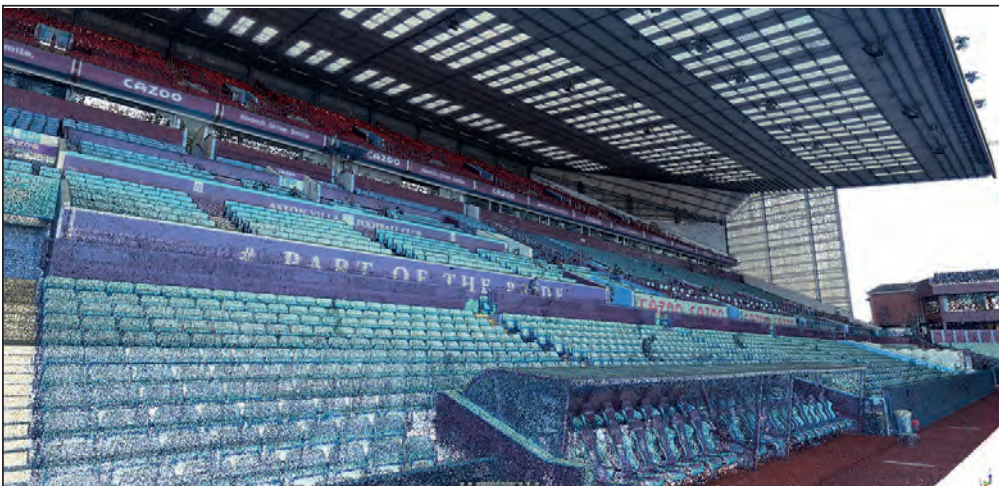
RealWorks has the ability to export the registration to the RAW scan files. This allowed Jason to bring individual scans into multiple projects to ensure continuity between projects without needing to export point clouds or re-register scans.

RealWorks is also able to show multiple projects at the same time and this helped him to monitor the quality of the registration between projects throughout the processing of the data, without needing to combine all the scans into a single project.

Reflecting on the highly successful completion of this job, Jason has no hesitation in attributing a significant portion of its timely accomplishment to the combination of the Trimble X7 Laser Scanner and Perspective software, notably its on-site registration capabilities. "Before we had the ability to register scans as we went along, even a job involving just fifty scans across one or two levels could become quite cumbersome, necessitating site diagrams illustrating scan positions and inter-level connections. Imagine the complexity of a project like this one, with literally thousands of scans. The X7, Perspective software, and RealWorks have proved to be an invaluable combination."

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Point cloud generated by the Trimble X7

Top benefits of the Trimble X7 for BB Surveys

On-board registration with the Perspective software – this saves hours of processing time and makes it easier for companies like BB Surveys where they have different teams for data capture and processing. Plus, you can see your fully registered point cloud before you leave the site avoiding any gaps through missing scans.

Top 4 Trimble RealWorks takeaways from Jason Jones on this project:



Barry Burrows (left) and Jason Jones (right)

- For especially large projects, when you are importing your TDX files into RealWorks, choose a larger Spatial Sampling distance (20mm). This should still be enough to register the data together but won't slow the process down with too many points. Then once registered, you can bring in more points for drawing/modelling/exporting using the Create Sampled Scans tool or Limit Box Extraction. Also applying a maximum distance on the data loaded will help reduce the number of points.

- Rather than using checker boards or other targets for georeferencing, we used SX10 scans coordinated using site control. This way we had millions of points to fix to, rather than just a handful of control points.

- Split your project up into groups for registration and in particular for refining the registration. These could be entire floors of a small building or a group for each room/corridor/stairwell if you are dealing with much larger spaces. Registering and then refining each of these groups in turn and then registering these groups together keeps the data sizes down for each process on larger projects and helps speed up the processing. These groups and subgroups can then be merged once the registration has been finalised.

- Keep your RealWorks Project saved on your root drive whilst registering and not buried in a series of multiple sub folders with long names as this can cause the software to crash or run slowly (eg. D:\Wall Scan.rwp rather than D:\Workarea Laser Scanning\Project 0001 – Client – Building Project\Wall Monitoring\RealWorks\Wall Scan.rwp)

On-board calibration – both the time and monetary saving of this is huge. With previous scanners used by Jason before he joined BB Surveys, he was aware that the calibration cost was around £4k and the process could leave them without a scanner for several weeks at a time.

TDX file format – the X7 data works smoothly with all of BB Survey's software packages allowing the team to switch easily between TBC and RealWorks and for combining data from the X7 and SX10 seamlessly.

The X7's indoor mode – a useful way for speeding up internal scans, saving 10 seconds each time, which adds up on a project of this scale.

KOREC support – BB Surveys states that over the years KOREC has been a great source of advice, technical support and training.

CONTACT US

Please do get in touch for further information on any of the products or services mentioned in this case study, a demonstration, support or just a chat about your requirements.

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