

# Fonthill Castle, John Smits

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## Background

Conserving a landmark building is always a challenge, but when that building's design is as complicated, both on the interior and exterior, as the Fonthill Castle the architect is presented with an extra set of issues when it comes to documentation of the existing conditions.

The Castle was built in 1852 by a famous Shakespearean actor and his wife. Fonthill is a Gothic Revival style building consisting of a cluster of six octagonal towers at varying heights, built of hammered grey stone. Five of the towers radiate from a three story central tower. In 1980 it was listed on the National Register of Historic Places.

To accomplish this, they turned to TRA Studio Architecture, an innovative firm based in New York City. Eric Yang, who is an Architectural Designer was given the assignment of documenting the existing conditions. He had been investigating the idea of using 3D laser scanning on previous projects and decided that the Castle was the right project to test out this new approach.

As part of his research Eric contacted FARO®. They provided him with a demo and although the scanner seemed relatively easy to use they decided that it was too risky to introduce the technology with a new client. The decision was made to hire an experienced 3D laser scanning consultant from the New York City area. Eric contacted John Smits, the founder of New York City - based Actus3D. John is an architect with over 30 years of experience and an established track record of using 3D laser scanning on a number of challenging projects. Since this would be TRA Studio's first use of 3D data capture, Eric wanted to get a first-hand understanding of 3D laser scanning so he convinced John to let him be his assistant.



Figure 1. Current view of Fonthill Castle, built in 1852.

## The Project

The project consisted of accurately documenting the interior and exterior dimensions of the Castle as well as the condition of the structure itself. The masonry needed to be repaired in a number of places and there were cracks that indicated the possibility of structural issues. The interior spaces were very complex and there were multiple levels that presented a number of measurement challenges.

The decision was made to scan the exterior and take photographs so that the scans could be colorized to better highlight the damaged areas. John adjusted the density of the scans as collected to match the requirements for detail. Spheres and checkerboard targets were placed in key locations to insure that the scans could be tightly registered into an integrated 3D model. Additional control surveys were not required.



Figure 2. The completed exterior scan project via SCENE Software.

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Figure 3. Top view of Fonthill Castle of all 19 exterior scan positions.

John used the FARO<sup>3D</sup> X 330 Laser Scanner to capture a total of 19 scans outside and 91 scans inside. The light weight and portability of the FARO scanner allowed the project to be completed in just two days with the two-person crew. It would not have been possible to collect the quality of data using traditional survey methods, plus the scanning eliminated the need for return visits. Eric noted, “The ornate details of the Castle would have been impossible to document with traditional survey procedures.”

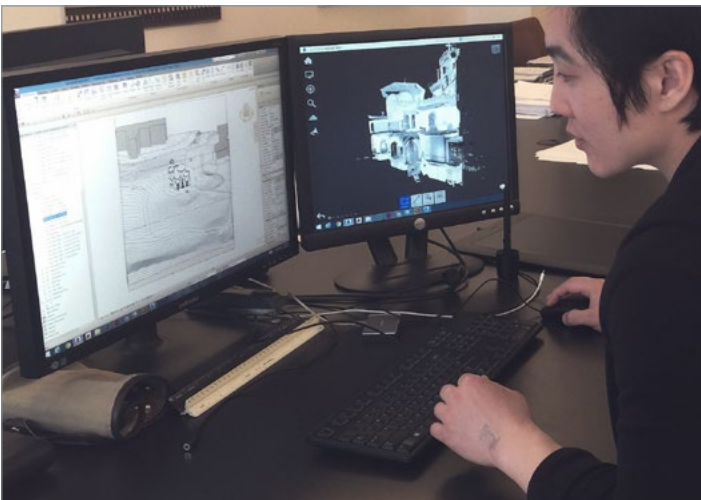


Figure 4. Processing scans in FARO SCENE and ReCap<sup>®</sup>.

Actus3D processed the data using FARO SCENE and the files were then exported to Autodesk<sup>®</sup> ReCap<sup>™</sup> where they were converted to RCS format so that they could be imported directly into Revit<sup>®</sup>. Eric's firm is a Revit<sup>®</sup> shop and they are familiar with working with 3D design models.

To correct for slight rotation in the scans in the more remote areas, cloud to cloud registration was used. John found that overall the dimensions obtained were accurate to within an inch and in most cases it was likely closer to 0.5 inch.

“Overall I was very impressed with the 3D data capture. The challenge that I found was with the software...” Eric commented. He found the large datasets were difficult to manipulate within the computer programs, and would have preferred to work with a photo based surface model. However, current cost effective software is lacking in this ability, and the point clouds generated by FARO SCENE and ReCap<sup>®</sup> became a good compromise, providing the needed level of documentation for his use. On the manipulation of large datasets within CAD Eric continued, “I think this is an area that could definitely be improved in the future.”



Figure 5. Trimmed point cloud ortho view aligned to exterior CAD elevation.



Figure 6. Point cloud section view through building

To provide Eric with the ability to view the point clouds John provided a complete copy of the processed and aligned data along with a link to the free FARO SCENE LT viewer. The scanned data was used by TRA Studio to create a series of fly throughs which were used to inform the client of the progress and convince them to provide the additional funds needed to complete the project.

### Looking Ahead

Based on the results from this first use of 3D laser scanning TRA Studio has been introduced to a powerful new approach to building documentation. Eric noted, “We were definitely impressed with the 3D documentation capabilities of the scanner and although we would like to see improvements in the software and data handling, overall we will use 3D scanning in the future on projects with this level of complexity.”

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