Transforming Construction Design in London

Swanton Consulting is optimizing its workflow using point cloud processing software from Arithmetica to reduce the time taken to create usable 3D models from weeks to just a few hours.

Pointfuse software creates instant 3D models from laser scanner data, used here to design of a steel structure for supporting a protected building façade

Swanton Consulting is a specialist engineering company that provides unique skills for the alteration, demolition and construction of complex building structures. Comprising a team of experienced engineers and technicians, Swanton looks to create practical and cost effective solutions for their clients, specializing in the design of temporary works that facilitate deep basement construction, façade retention, specialist structural elements and contractor delegated design elements. Engaged across both public and private sectors, with particular expertise in working within the confines of construction projects at city centre locations; Swanton provides high quality and bespoke solutions to technically demanding commercial, residential and industrial builds.

The project

4-6 Stanhope Gate, London, W1, is a new development of prestigious serviced apartments. Located adjacent to Hyde Park and Park Lane, the Mayfair Park Residences aim to set a new benchmark for super-prime residential development in London. The real estate

BY FAITH CLARK

The redevelopment of a historic building in Mayfair, London, required preservation of the façade.

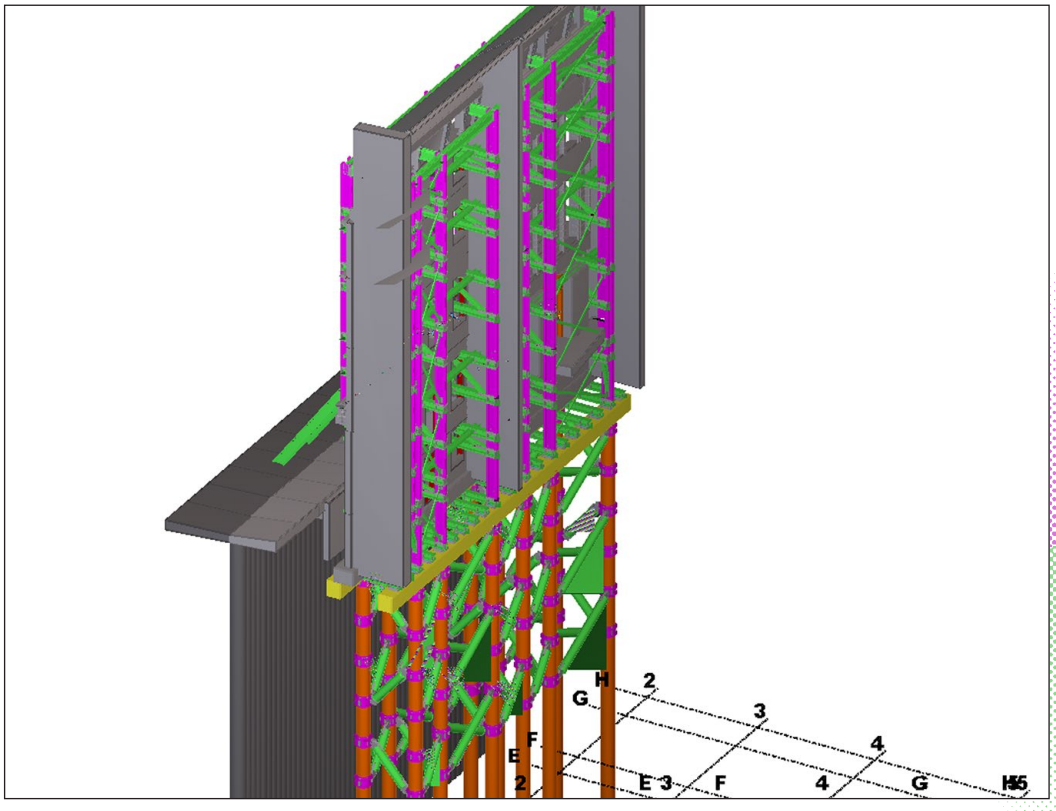
agents describe a development that incorporates a beautiful façade with views across Hyde Park that is Grade-II listed (a protection category awarded in England to buildings that are considered to be of special interest, warranting every effort to preserve them). The development will offer a range of 1, 2, 3 and 4 bedroom lateral and duplex apartments, serviced directly by an adjacent 5 star hotel, in one of the world's most exclusive hotel groups.

The challenge

The first stage of development was to demolish two existing properties on the site. Due to the Listed status of the existing façade, all demolition, excavation and construction related to the new development, needed to be completed while keeping the façade intact.

The retained façade, comprising two separate structures, required support in the temporary condition. This would allow for excavation three storeys below the existing basement level and extending the basement footprint to approximately 5 meters out under the street. Throughout this phase of the development, the façade would be effectively left in a floating state.

The scheme also had to be designed and developed to de-risk the programme and the critical path activities that had been incorporated into the project during the initial development with the client. The façade retention was only part

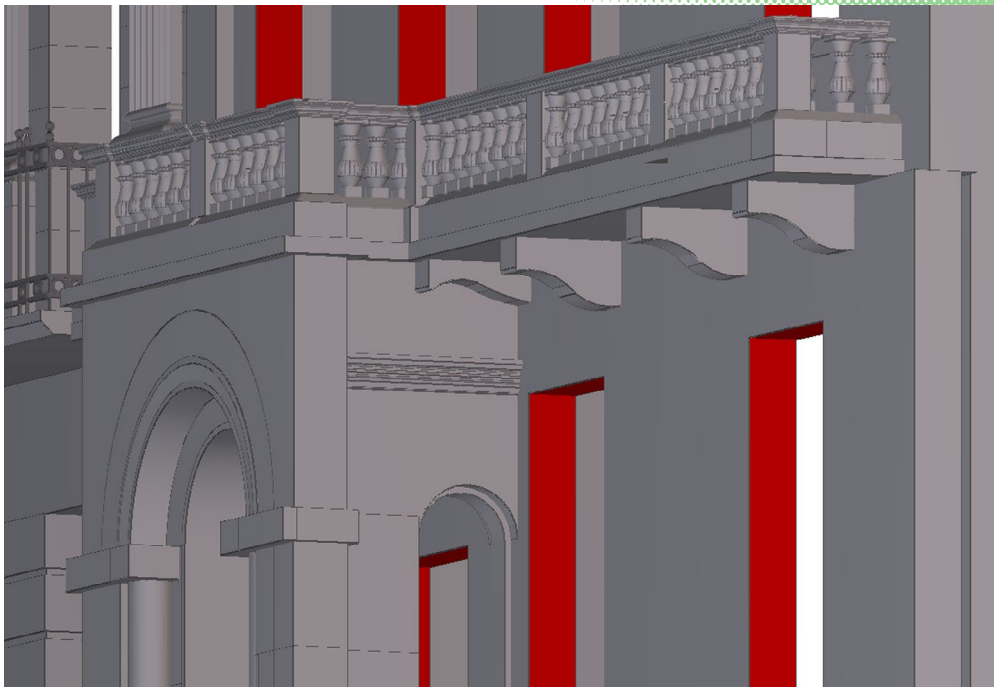


Creating usable 3D models used to take two weeks but with Pointfuse software, output was ready in less than a day.

of the temporary works on the project for the demolition and basement phase.

The solution

The Swanton team developed a façade scheme positioned horizontal and vertical steel structures around the façade's stone features, porticos and permanent piles and columns. The layout of this scheme was heavily driven by 3D modelling and point cloud surveys. The façade steelwork had to be designed to allow installation in a tight central London site where the use of cranes was restricted and the neighbours, including the adjacent hotel, played a large part in logistics and planning. With differential settlement also a risk,



The 3D model generated from point cloud data allowed useful visualization of the scheme.

The laser scan point cloud comprised more than six million cross hair points.

the façade support was developed with consideration to jacking points which could, if required, be used to control and counter any settlement of the façade.

A point cloud survey was carried out by Swanton's in-house specialist services division, Swantest. Using a Leica ScanStation laser scanner, the scans were registered and cropped in Cyclone. The resultant point cloud comprised more than six million points.

Transforming design

To design their developments, Swanton utilise a 3D construction modelling software platform from Trimble, Tekla Structures. Conventionally, a point cloud survey would be imported into Tekla Structures using its point import

HIGH FIDELITY MODELS

Pointfuse V2 is a powerful modelling engine that delivers a fast, precise and flexible way of converting the vast point cloud datasets generated by laser scanners or photogrammetry into high fidelity vector models. Designed for anyone capturing or using point cloud data, Pointfuse V2 uses advanced statistical techniques to create vector models which can then be manipulated using any industry-standard CAD system.

Pointfuse improves the processing of laser scanned point cloud data and converts it into 3D third party software. Arithmetica recently announced a new innovation dubbed "simplified surfaces".

"Pointfuse is all about making laser scanned data more usable," commented Mark Senior, Business Development Manager at Arithmetica. "Pointfuse bridges the gap between the laser scanning hardware solutions, increasingly being developed to capture more data, faster and with better accuracy, and the huge array of specialist software solutions used within the heritage, architecture, engineering, construction, manufacturing, infrastructure and mapping sectors, for example."

"Simplified surfaces, due out later this year, will significantly reduce the file size of 3D vector models created from laser scanned point clouds. In simple terms, it recognizes similar characteristics across a surface and then, rather than duplicating the same data, groups or simplifies data by the shared attribute," continued Senior. "This results in a reduction in model size by a factor of ten, making ongoing use of the model easier, faster and more efficient for users such as Swanton."

tool. Once imported, each data point in the point cloud would be saved as a cross hair point. In the case of the point cloud of this façade, the resultant DXF CAD files totaled 1.5Gb in size, that would take almost two weeks to manually digitize into a usable model onto which the steel structure framework could be designed and positioned. Realising the impact on the project lifecycle of prolonged data processing, Swanton undertook a review of alternative solutions. Pointfuse V2 from Arithmetica was identified as providing a way of improving the processing workflow efficiency. Pointfuse can be directly downloaded from the company's website for immediate use as a free trial. Pointfuse V2 was released towards the end of 2016 and represents a major change in the way that point cloud data is automatically converted to three dimensional vector models. Offering a "one button" approach, the new techniques in Pointfuse V2 not only convert point clouds into 3D vector models with accurate geometry, but also enable discrete surfaces in these models to be isolated and manipulated in third party software to a greater extent than before.

Swanton needed to convert the point cloud of the façade into 3D model, before importing into Tekla Structures to undertake the engineering design of the steel supports. Converting the point cloud into a 3D model for this purpose was an automatic process using Pointfuse V2. The resultant model was exported from Pointfuse V2 in the open IFC format for onward use in a variety software packages used on this project, including Tekla Structures and AutoCAD Revit. Specifically, the Swanton team were able to perform operations such as clash detection to the steel supports, directly within the Tekla Structures design environment, without needing to be concerned about digitizing the point cloud first. Rather than taking nearly two weeks to create usable models, the Pointfuse output was ready for use by the steel work designers in less than a day.

Increased use of laser scanning

Swanton admits that the original processing workflow was not arduous or resource-heavy, other than being computer-intensive. However, the impacts on the project lifecycle were significant to the degree that they now influence the extent that Swanton uses specialist point cloud surveys on future projects. Where efficiencies gained through the use of laser scanning for capturing accurate 3D survey data were being offset by inefficiencies in the time taken to process the point cloud into a usable data model; Swanton is now confident that Pointfuse makes extensive use of laser scanning viable again.

"Pointfuse will transform our use of laser scanned data," comments Pearse McMahon, Senior Technician at Swanton Consulting. "With highly accurate vector models available for use by design teams in hours rather than days, we are more efficient and more effective. Savings we can pass on to construction partners and end clients."

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