Bentley
Advancing Infrastructure

Project Summary

Organization:
Robin Partington & Partners

Solution:
Buildings

Location:
London, United Kingdom

Project Objective:
- Deliver an iconic tower as the central focus of the GBP 500 million Merchant Square master plan.
- Implement an integrated modeling approach to accommodate the complex, non-uniform, curved building profile while optimizing productivity and resources.
- Design the various unique interior floor plans to complement the shell and core fabric of the dramatic structure.

Products used:
AECOsim Building Designer, Bentley Navigator, MicroStation®, GenerativeComponents®

Fast Facts
- GenerativeComponents enabled RPP to rationalize the geometric form and cladding for the dramatic façade.
- Bentley Navigator and i-models were indispensable coordinating the basement design as well as the landscaping, drainage, and ventilation strategy.
- AECOsim Building Designer enabled RPP to build an intelligent model of 1 Merchant Square with enough building data to run a 4D construction sequence.

ROI
- Bentley software facilitated an integrated BIM workflow minimizing requests for information and potential construction issues.
- GenerativeComponents saved project resources by enabling the team to produce numerous cladding iterations in a fraction of the time it would have taken using basic 3D modeling.
- Using the AECOsim Building Designer model enabled RPP to develop a trapezoidal unitized frame while maintaining rectilinear glass, which represented approximately 40 percent savings in terms of glass cost across the project.

Robin Partington & Partners Implements Federated BIM Workflow to Design Westminster Borough's Iconic Tower

AECOsim Building Designer and GenerativeComponents® Streamline Design Strategy for Complex, Curved Profile and Unique Interior Fitout

A New Hub in Paddington

The GPB 500 million Merchant Square development brings together four buildings and their unique setting as one coherent piece of urban infrastructure in the heart of Paddington, London, United Kingdom. In order to transform the area into a landmark destination, European Land and Property appointed Robin Partington & Partners (RPP) to design a master plan consisting of three phases of development. The first, which has reached completion and includes 3 Merchant Square and a portion of the basement, had to function independently for a number of years before the second phase of the project began. Phase two, the current phase of development, includes buildings 1 and 6 Merchant Square, and the completion of the basement, including the landscaping, drainage, and ventilation strategy. The final phase will see the completion of 2 Merchant Square.

While RPP faced numerous logistical challenges including the completed adjacent buildings, 4 and 5 Merchant Square, adjacent basement piling and structure, as well as the canal, designing 1 Merchant Square presented its own set of unique demands. RPP relied on the interoperability of Bentley's 3D design software to implement a federated BIM strategy and deliver the complex, curved tower.

Forming the 42-story, Mixed-use Tower

With a 93-key boutique hotel at its base, 209 apartments with private balconies above, and a spectacular two-story Skybar offering 360-degree views of the city of London, 1 Merchant Square will set a new standard for residential accommodation in Paddington. RPP wanted to develop the form of the building to fit within the master plan, yet be seen as a focal point and urban marker for the wider area. "We used AECOsim Building Designer to develop the form of the building and went through a series of iterations trying to develop the most elegant form whilst optimizing the client's brief in terms of area," explained James Ewen, Project Leader and Partner at Robin Partington & Partners.

RPP developed the sleek, curved building form with vertical structural fins clad in white porcelain, a midnight blue ceramic rainscreen cladding, and a distinctive crown-like peak. While the curved shape helps minimize the effects of wind, the geometry of the building necessitates trapezoidal cladding panels as opposed to the standard rectangular shape. The project team created the model in AECOsim Building Designer based on a 72-point-spaced coordinate system to help understand the building frame and analyze and accommodate the increasing trapezoidal panel shapes toward the extremities of the tower. Stated Ewen, the use of the model and careful detailing enabled RPP to "develop a trapezoidal unitized frame while maintaining rectilinear glass, which represented approximately 40 percent savings in terms of glass cost across the project."

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Computational Modeling Streamlines Design

Designing a building with varying cladding bay types presented RPP with the challenge of matching exterior finishes to the changing internal layout throughout the tower. With each bay type comprising a different arrangement relative to the internal layout, RPP realized that modeling all scenarios for the 150-meter structure would take a considerable amount of time.

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GenerativeComponents provided an efficient method to model the varying cladding system without building a detailed design model for each scenario. Using Bentley's 3D design software, RPP built a computational model of one panel type and applied it across a bay, and then repeated that process for the different panel types and corresponding bays throughout the building with different arrangements. RPP were able to create numerous cladding iterations with GenerativeComponents in a fraction of the time it would have taken using basic 3D modeling.

To help prevent a workflow bottleneck within the design team, RPP colorized the model, assigning different colors to each of the panel types in AECOsim Building Designer, and then linking the panels to a universal Excel spreadsheet to serve as the control for the panel arrangement. The interoperability of Bentley software enabled RPP to link the Excel spreadsheet to the GenerativeComponents model to assign additional parameters and then output the model to AECOsim Building Designer. Simplifying the design process allowed the team to assign the colors directly from the spreadsheet (eliminating the need for detailed knowledge of GenerativeComponents), streamlining the workflow, and minimizing risk with a single source of data.

The ability to filter the varying cladding panel types using this integrated process also accelerated and enhanced the production of cladding scope drawings for tender. "There are effectively 12 drawing sheets setting out the cladding scope with five drawings on each sheet, giving us 60 drawings just from one model. This is a massive efficiency for us. It's all single sourced, and is all driven by this Excel, GenerativeComponents, AECOsim Building Designer link," explained RPP architect Matthew Scammels.

Large Quantities of Design Data

RPP leveraged Bentley's BIM software solutions to resolve the internal modeling challenges faced from the varied floor plans and different apartment types. "We want to get a lot from our data. We are not happy just modeling geometry," stated Scammels. Given the extensive amount of modeling data coupled with complex variables, RPP needed a system to manage the extreme quantity and potentially oversized computer files.

By creating basic geometric models for each apartment type and applying iterative modeling processes using GenerativeComponents, RPP streamlined its design strategy for the 209 apartments, identifying and creating just 40 model types and rotating up and around the building, replicating and matching each model type to its respective apartment type.

RPP continued the iterative BIM workflow to create a schedule of over 2000 doors. However, while the doors could be reused and repeated, they still needed to retain a uniqueness. By assigning each door an identification number and using the AECOsim Building Designer model to create spatial zones for each level and apartment with numerical values attached, RPP implemented a system where every door inherited the properties of the zone in which it was placed,

making each door unique and eliminating the need to model the doors for each apartment on every level, saving significant time. Using search criteria in AECOsim Building Designer, RPP could then search for and identify the doors within the model for each apartment on every floor to produce its door schedule.

Using the AECOsim Building Designer model, RPP were able to filter its design data to generate production drawings. "Everything we modeled in AECOsim used datagroup properties and information—this allowed us to get a significant return for this time invested" explained Scammels. Having the building wall types already modeled, RPP again assigned a colorized system to automatically produce its building wall type scoping drawings. The automation and extensive BIM coordination optimized data, enhanced the workflow, and facilitated accurate communication of design intent to the client and construction team.

Optimizing Coordination and Clash Detection

Working in a federated environment, different disciplines relied on varying software platforms for modeling and analysis with large quantities of data attached. RPP used Bentley Navigator to coordinate the entire basement model with structural, mechanical, electrical, and plumbing (MEP) installations and architecture models all referenced together. The interoperability of Bentley Navigator allowed RPP to take almost any incoming file format and create i-models that enabled on-the-fly design reviews as part of regular coordination meetings with the wider project team. "Using i-models really helped…they're quite light and you can quickly interrogate them for the relevant information," stated Scammels.

The ability to isolate information from the i-models in Bentley Navigator and create search criteria accelerated the clash detection process. Rather than running a clash detection on the entire building, which would produce thousands of results, using the search criteria to isolate architectural walls against cable trays in the model would generate approximately 50 or 60 results for a much faster and more precise analysis ultimately minimizing construction issues.

Federated Modeling Drives Success

Facing geometry, cladding, and interior layout complexities designing 1 Merchant Square above ground, combined with the below ground basement energy center requiring a phased operation, RPP implemented a federated BIM strategy using Bentley's integrated 3D design software to streamline the workflow and optimize ROI. The interoperability of Bentley applications enabled RPP to make the design data work as hard as possible using a single source of information throughout the entire modeling process.

AECOsim Building Designer, GenerativeComponents, and Bentley Navigator empowered RPP to deliver an innovative, iconic building design with an integrated approach that optimized productivity and saved resources.