

Bentley[®]
Advancing Infrastructure

Project Summary

Organization

Arab Engineering Bureau

Solution

Structural Engineering

Location

Lusail City, Doha, Qatar

Project Objectives

- To optimize costs and reduce resource hours for safe and efficient design, coordination, and construction of the Alfardan Office Tower.
- To determine optimal structural schemes in accordance with European design codes to accommodate topography and complex design.
- To ensure interoperability to streamline workflows among multiple engineering disciplines.

Products Used

ProjectWise[®], STAAD.Pro[®]

Fast Facts

- AEB used STAAD.Pro to design all steel elements of Alfardan Office Tower.
- The USD 260 million project presented a complex design scheme within a coastal environment.
- Bentley's flexible, interoperable structural design and analysis application coordinated design among the multiple engineering disciplines using different CAD platforms.

ROI

- STAAD.Pro facilitated 3D BIM workflows to save between 20% and 30% in resource hours, lowering project costs.
- AEB reduced steel quantities and performed clash detection to identify and resolve errors prior to construction.
- STAAD's automated analysis features and a variety of international design codes saved significant time and ensured structural integrity.



Arab Engineering Bureau Uses 3D BIM Processes to Design Alfardan Office Tower

STAAD.Pro Helps Save Nearly 30% in Resource Hours on High-rise Building Project

Implement a Collaborative 3D Solution

Located within the commercial area of the Marina District in Lusail City, Doha, Qatar, the Alfardan Office Tower is a mixed-use high-rise building that occupies 12,541 square meters. The building features three basements, a ground floor, a mezzanine, 27 upper levels, a penthouse, and a main roof level. The tower comprises offices, restaurants, parking facilities, storage space, and an automobile showroom. Architecturally, the design embraces the dynamics of Lusail City, integrating local heritage through a contemporary interpretation of traditional patterns. Structurally, the ground floor is designed as a four-story cantilevered podium that is intended to be a luxury car showroom. Rising 32 stories from the ground floor, the building transitions into a symmetrical, curved, yet sharp-edged, skyscraper wrapped in a glass façade.

Arab Engineering Bureau (AEB) provided design services for the USD 260 million project and sought a cost-efficient, collaborative 3D digital solution to optimize design, construction, and multidiscipline coordination. During the initial design stages, the team faced structural challenges accommodating the coastal topography and associated environmental conditions. AEB also found it difficult to find the optimal design that would support the podium's cantilever slabs, which gradually increased in size on each floor. To ensure structural integrity of the iconic luxury building, AEB's engineers needed comprehensive design and analysis technology to address foundation challenges and enhance the structural system of the complex design.

User-friendly Interface Reduces Design Time

"Initially, to proceed with a 3D building information modeling (BIM) solution, we decided on STAAD.Pro for structural design, given the complexity of the design and the structure, and the location issues," said Navaid Moshin, BIM manager at AEB. Proceeding with a BIM-aligned solution, the team used STAAD.Pro to design and analyze all steel structural elements. Working in STAAD's 3D environment enabled the incorporation of structural grids, converting wire mesh to 3D models for presentation. The user-friendly interface allowed

for effortless modeling to reduce design time. Since the firm already had established an open, connected data environment (CDE) based on ProjectWise, they also could easily and efficiently manage the STAAD.Pro models.

Originally, AEB engineers had suggested using reinforced concrete and steel for the foundation and framework of the tower. With the implementation of STAAD.Pro, AEB determined that the initial steel quantities previously calculated using manual methods were overestimated.



The team used STAAD.Pro to design and analyze all steel structural elements of this complex design.

In addition to simplifying the modeling tasks, STAAD.Pro facilitated comprehensive, automated analyses, eliminating error-prone, time-consuming manual calculations. Using the software to perform seismic, nonseismic, wind, and vehicle load simulations helped generate an accurate structural design that accommodated coastal environmental conditions and determined optimal steel support for the cantilevered podium. The team designed an exterior structural support

“STAAD.Pro is remarkably flexible and very easy to learn and understand. Its graphical interface is incredible. STAAD.Pro has efficiently saved 20% to 30% of our resource hours.”

*– Navaid Moshin,
BIM Manager,
Arab Engineering Bureau*

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made of light steel that was positioned under the podium, but left space for the showroom vehicles. Automating previously manual design tasks and analyses saved 15% to 20% in design resource hours to lower costs, while eliminating errors to produce structurally safe designs.

Lastly, the 3D STAAD® models were shared with stakeholders to provide a visual representation and better understanding of the structural design intent. These models are typically large, data-laden files that can be difficult to transfer and download. AEB used the model compression feature in STAAD.Pro to transfer a distinct input file that recipients could import onto their desktop or mobile device to access the model. “This was a big advantage for us to share the model quickly and get the results,” Moshin said. The lightweight files simplified and accelerated model sharing to optimize time and costs.

Interoperability Drives Digital BIM Workflows

With multiple engineering disciplines working on Revit and various CAD platforms, AEB needed to simplify and streamline design coordination and ensure that all designs complied with European structural design codes. AEB easily exported the STAAD models into a CAD format using a plug-in. As a result, MEP, architecture, and interior designers could work simultaneously on the models. This capability significantly reduced modeling and remodeling time from days to minutes and optimized production. The interoperability of STAAD.Pro provided a flexible 3D digital environment driving a BIM workflow process for seamless integration of the models into a comprehensive, federated model. In addition, AEB identified and resolved issues in the coordinated model prior to construction through the clash detection feature in STAAD.Pro.

Furthermore, with more than 90 international design codes, STAAD.Pro facilitated a highly customizable design that complied with European standards. This feature enhanced the flexibility of the software, enabling AEB to determine a comprehensive, innovative, and safe design solution that saved time associated with traditional methods used to determine regulatory compliance. Using STAAD.Pro to initiate a 3D digitally coordinated design process, AEB achieved its cost optimization goal, lowering costs by saving up to 30 percent in resource hours from design through production and construction.

Investing in Lifecycle BIM

Since using STAAD.Pro for structural design of the Alfardan Office Tower was a success, AEB will utilize the application to design other high-rise towers. The ability to integrate STAAD with other BIM software complements AEB’s commitment to driving lifecycle BIM implementation. AEB has been working for several years with Bentley to support BIM initiatives. With more than two-thirds of its staff being BIM compliant, the company has used numerous Bentley products for modeling, design, and analysis to deliver successful BIM projects.

From conceptual design through detailed design, fabrication, and construction, the CDE and Bentley’s integrated engineering solutions streamlined workflows to quickly produce accurate 3D models that can be confidently handed over to the construction team, compared to traditional methods of manually designing and issuing printed drawings to the site. The commitment to and investment in Bentley’s 3D digital technology drives the coordinated approach and sustainable solutions necessary for AEB to achieve full lifecycle BIM processes.