

COMPANY

Atkins

LOCATION

Riyadh, Saudi Arabia

SOFTWARE

Autodesk® Revit®**Autodesk® Navisworks®**

Coordinated excellence

Atkins and FAST Consortium are using Autodesk BIM solutions to design and deliver three lines of the Riyadh Metro

With BIM and Autodesk software, we have integrated the discipline-specific design processes and are able to perform coordination reviews in collaboration with all project stakeholders. This enables us to produce designs with a high level of quality, accuracy and efficiency which meet, and often exceed, our Clients' expectations.

—**Ibrahim Atta-Apau**
Associate Director
Atkins



Image courtesy of Atkins.

The project

In 2013, the city of Riyadh began an ambitious transportation project—a new 176-kilometer rapid transit system to be delivered in just 5 years. When complete, the Riyadh metro will feature driverless trains on six different lines with 85 stations. Approximately half of the system will be underground. The Riyadh Metro is the world's largest public transportation system currently under development.

The FAST Consortium is one of three consortia contracted by Arriyadh Development Authority (ADA) to design and build the Riyadh Metro. The consortium is delivering three of the six lines, which includes 64 kilometres of track, 25 stations, two depots, and one park and ride car parks. The total capital cost of this portion of the project is approximately £8 billion. FAST is led by the Spanish construction group FCC and includes partners Samsung C&T, Alstom, Strukton and Freyssinet Saudi Arabia. Atkins (in a joint venture with Tyspa) is the consortium's lead designer. Atkins' multidisciplinary team includes specialists from four of its global design centres in Riyadh, Abu Dhabi, Bangalore, and Gurgaon. Each design centre is responsible for individual packages that are centrally checked, coordinated and delivered to Fast Consortium through a consolidated delivery team in Riyadh.

The challenge

"This is a very large and complex project, which we are delivering to a tight programme," explains Ibrahim Atta-Apau, an Associate Director with Atkins. "Atkins is responsible for coordinating over 10 design disciplines—from architecture and structures to utilities and rail systems. A project of this scope requires careful coordination on a constant basis."

"The production and coordination of CSDs (combined services drawings) on a project like this is particularly difficult," says Kartigayen Poutelaye, Atkins' BIM manager for the Riyadh Metro project. "In addition, the interfaces between the stations and tunnels are traditionally very difficult to match up using traditional drawing-based workflows."

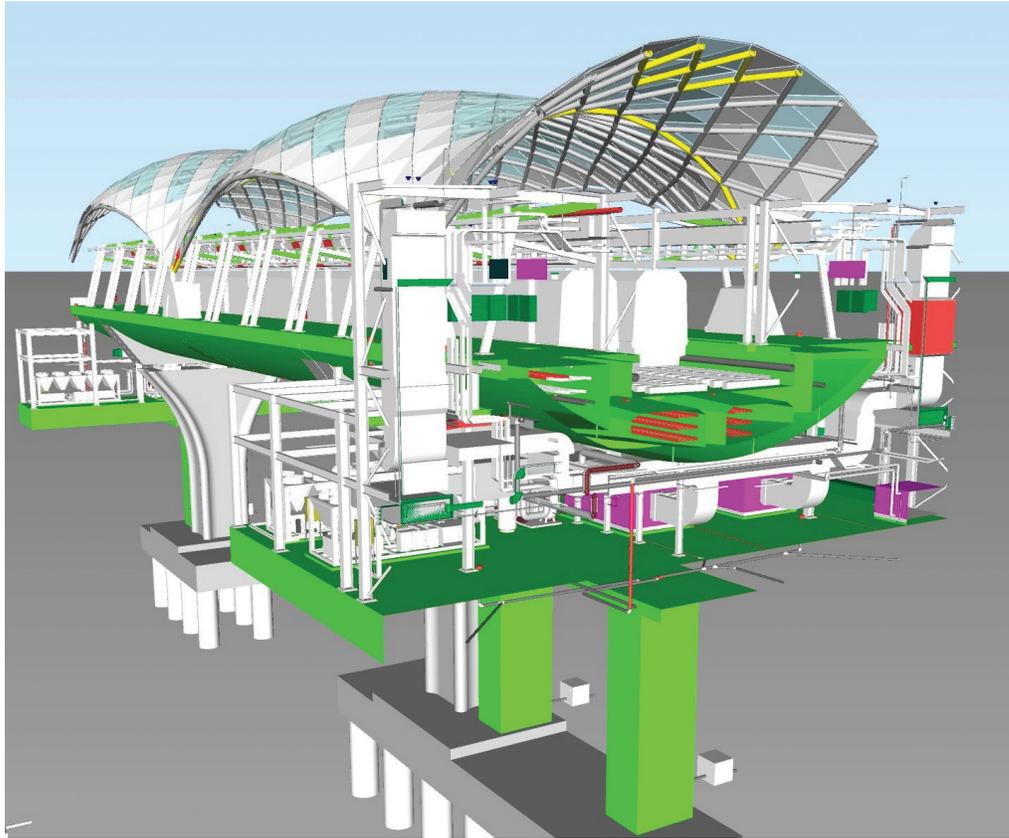


Image courtesy of Atkins.

The solution

To facilitate multidiscipline project coordination between disparate design teams, the FAST Consortium decided to use Building Information Modelling (BIM) processes and a common BIM software platform for project design and delivery. Atkins are experienced users of Autodesk BIM software including Autodesk Revit software for architectural, structural, and MEP design, and Autodesk Navisworks for project coordination; and have successfully utilised these tools on a number of their Middle-East Projects. Based on Atkins' proficiency with these Autodesk BIM solutions, FAST were encouraged to use these BIM software solutions for the Riyadh Metro project.

Model-based project coordination

Throughout the design process, the individual design teams within the Design Joint Venture share their design models for project coordination by uploading them to a 'Common Data Environment' or CDE, which is a centralized project document and data management repository. On a routine basis, Atkins federates these design models

in Navisworks for multi-discipline clash detection and formal project review meetings (using a live BIM environment) with representatives from all the consortium companies.

Although many of the design teams used BIM software from the beginning of this project, it was not client-mandated. But as Atkins started to hold its project review meetings, the value of BIM quickly became apparent to the whole team. "The success of BIM and model-based design for project coordination encouraged other disciplines such as rail systems and utilities to engage and work in a 3D model-based design environment," says Atta-Apau. "This in turn, has improved overall project coordination and design accuracy.

One area where 3D modelling was particularly important was for the coordination of the piping running through tunnels between stations and the underground metro tunnels as shown on CSD drawings. "Using 2D drawings to coordinate these interfaces would have been extremely difficult," says Poutelaye. "So although we don't normally develop 3D models for tunnels like these, we did so on this project. This helped save a considerable amount of time."

Intelligent design models

FAST's use of BIM and the Revit design platform results in intelligent behaviourally-correct 3D models in which design elements are parametrically related to each other, and the software keeps all of the design elements, as well as the documentation, coordinated.

For example, when one aspect of the design is changed, all the related parts of the design, as well as affected drawings, are automatically updated to reflect that change. "There are thousands of drawings on a project of this size and design changes are happening constantly," says Poutelaye. "Given the aggressive project schedule, I don't believe it would be possible to complete this project on time without using BIM and the Revit and Navisworks solutions."

The intelligent design models can also be used for design analyses and calculations to help guide and inform the design process. For example, the project's mechanical engineers are using the Revit software's built-in pressure drop calculations to compute pressure losses in ductwork. Using traditional design processes, Atkins engineers would have used Excel spreadsheets to calculate and document pressure losses. On this project, they utilize their design models, saving the time, expense, and potential errors associated with manual data re-entry.

The result

The package of Riyadh Metro being delivered by FAST is on schedule and budget. "With BIM and Autodesk software, we have integrated the discipline-specific design processes and are able to perform coordination reviews across the individual disciplines and entities," says Piotr Konopka, Civil Works Systems Assurance Manager for the FAST Consortium. "This is helping us to deliver higher quality, more accurate and more integrated designs with improved efficiency." For more information, visit www.autodesk.com/BIM

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BIM Manager, Riyadh Metro
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