



Abu Dhabi Investment Council facade developed using Digital Project



Belief System

By Nick Lerner

Having won the competition to develop the Abu Dhabi Investment Council (ADIC) building, Aedas Architects, London, is set to deliver one of the world's iconic structures using Gehry Technologies Digital Project (DP) supplied by UK VAR, Desktop Engineering.

This is an important building for an important purpose and Aedas, one of the largest and most prestigious practices with many global offices, has deployed Gehry Technologies Digital Project, based on CATIA technology, to perfect one of the most creative building façades yet devised.

In a region where many new buildings have recently been constructed, ADIC is an outstanding example of structure, culture and technology captured in twin 25 storey towers comprising 75,000 square meters.

More about Aedas Architects

As a global force in the built environment, Aedas offers a wealth of experience and expertise in Architecture, Interior and Urban Design, Landscape and Environment, Graphics and Signage, across a diverse range of market sectors and services areas. Currently the second largest architectural practice in the world, Aedas employs over 2,500 highly qualified architectural staff in 40 offices across six regions including the United Kingdom, Asia, Central and Eastern Europe, the Middle East, Central Asia and North and South Americas. www.aedas.com

Islamic architecture, renewable energy and inspiration from nature are the sources for this project. These three have been integrated into the design using algorithmic rules. The spirit of Islamic architecture has been revived in this development, which maintains a strong relationship to Middle Eastern heritage and local Abu Dhabi culture.

Clear Choices

Abdulmajid Karanouh Senior Designer, Intelligent Systems, at Aedas London, explained the principles that inform the design of the facade envelope. "A relatively clear glass curtain wall forms the first layer of the towers' skin. A secondary layer comprises an intelligent automated shading system that opens and closes via linear actuators operating in relation to the path of the sun. This innovative mechanism has a great heritage in the Middle East since it acts as a dynamic Mashrabiya – a wooden lattice shading screen popular in the region. The screen reduces solar heat gain and glare while avoiding the problems of reduced visibility associated with tinted glass."

The main design elements of the two buildings incorporate a significant degree of creative innovation that is rooted in Middle Eastern tradition. The geometric composition incorporates circles and

spheres representing unity and motion. These allow the design to generate infinite node arrangements. The main form comprises tangential linked arcs with a circular core, providing great zoning flexibility and orientation, while the structural system has been designed to provide for Abu Dhabi's seismic situation.

The structure also accommodates a specially designed honeycomb skeleton with elongated cells and diagrid members. Sky gardens every seven floors add impact, offer a taste of the outdoors and being open, add further complexity to the facade envelope.

No Soft Options

Abdulmajid spoke of the use of software on the project. "These buildings have been developed using a range of software tools to solve each aspect in the most appropriate and efficient way. We selected Digital Project, which is based on Dassault Systèmes CATIA technology, to develop the envelope because it is the only package able to efficiently handle this amount of data."

System provider and training partner, Desktop Engineering MD, Geoff Haines, commented, "Complex large scale AEC projects such as the Abu Dhabi Investment Council use DP. It is never stretched because it is devised to handle 3D digital models of the most advanced aerospace and automotive assemblies. In an AEC context, the software is able to show the highest level of detail, with all associated data, in geospatial context. Extending the use of 3D data using 3D model animation technology enables further understanding, development and progression

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of designs and the ability for all stakeholders to fully interact. This is achieved using DP kinematic technology or 3DIA Composer software."

Abdulmajid added, "We used the CATIA based parametric solver in DP to construct complex dynamic components with all their parts and consider them in relation to the rest of the structure and environment. The ability to iterate the facade and all its details relative to changes made to the main form is a very powerful feature of this software since it automates the need to re-draw every time a change is made. This frees us from the impossibility of continual re-designing and allows us to proceed rapidly. The powerful kinetic solver within DP is another useful tool that facilitates clear vision of the shading screen's operation. Parts of the Mashrabiya were parametrically constructed and linked to kinetic paths. These geometrically traced the intersection of spherical and circular movements of the main folding components. The conditional relationships the solver offers helped with clash and blockage detection and so establish sound kinetic proof of concept. The kinetic study also helps to communicate the design visually among the design team, client and specialist contractors."

Green Light

The DP model was used for solar analysis of the building to determine the behaviour of components both singly and collectively in relation to the shading offered throughout the year. By synchronizing the shading screen with the sun's movement, 90% of light is reduced across 30 - 40% of the building at any time. This not only optimally reduces glare but also significantly lowers the temperature of the interior and consequent demand on air-conditioning systems. The operation of the Mashrabiya will have its energy requirement more than offset by the 400 square meters of photovoltaics mounted on the structure.

Abdulmajid concluded, "We have been able to retain our design vision using DP and introduce and verify advanced features through its intuitive operation, powerful solver and advanced analysis tools that give the model extra dimensions beyond 3D. DP is a methodology that allows Aedas to test, explore, and optimise our designs and thereby take the process to a higher level" •

For more information:

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Abu Dhabi Investment Council features intelligent dynamic shading screens

