

SOFTWARE review

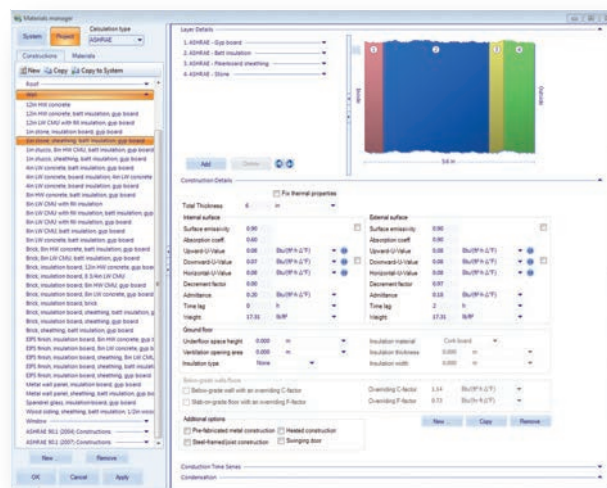
Better performing buildings

Bentley releases multidisciplinary tools for simulating and enhancing the performance of buildings, says David Chadwick

How's your building doing today? The concept of buildings performing, or behaving, as opposed to just 'looking and being there, is rapidly taking root. Before we put up a structure, besides wanting to know how much it is going to cost, we want to know how much energy it is going to use, both in erection, and from day to day. We want to know how much it is going to cost to run it, and how comfortable it is going to be for its occupants. We want to know if there are alternative materials we could use, more efficient heating systems, whether we can use natural resources to heat a building or its geometry to improve cooling during summer and retain heat during the winter.

The impetus comes from the drive towards more sustainable living. The jury may still be out on climate change and global warming in some quarters, but there are two salient facts that cannot be denied - we are running out of earth's natural resources, and the population of this small globe is increasing far too rapidly to be sustained by current investment in infrastructure and buildings.

That means we have to build smarter and more sustainably. Fortunately, we also have the means as well. The BIM has come at the right time (some might say it was too late twenty or so years ago!) providing a means of analysing a building's cost and performance before a single brick is laid, or lorry load of cement poured. It might have been developed as a collaboration tool to bring different technologies together on a project to save construction costs and improve construction efficiency, but the other side of the coin is that we are now provided



with an intelligent model that can be used for any type of analysis - environmental, energy consumption and emissions throughout a buildings lifecycle - including the cost and impact of demolition.

SPECS AND STANDARDS

Designing buildings for the future is not merely a project for the altruistic. Governments, having signed up to various International protocols, and fully understanding the cost to the planet if we don't adopt a sustainable agenda (I should have put those two the other way round, I suppose) have developed countrywide strategies that include the setting up of National Standards organisations, specifications for minimum levels of sustainability that must be reached by target dates, and certificates of performance that new and old buildings must reach and adhere to - BREEAM, CSTB in France, USGBC LEED, etc. The only method of ensuring that buildings have achieved, or are likely to achieve, the standards they aim for is to model the structure and analyse its performance.

Bentley Systems has been plugging Sustainability for a number of years now, and has a number of applications that cover various aspects of the issue. At the Be Inspired conference and awards ceremony in Amsterdam recently, they released details of their latest software initiative - the AECOsim Energy Simulator, and AECOsim Building Designer.

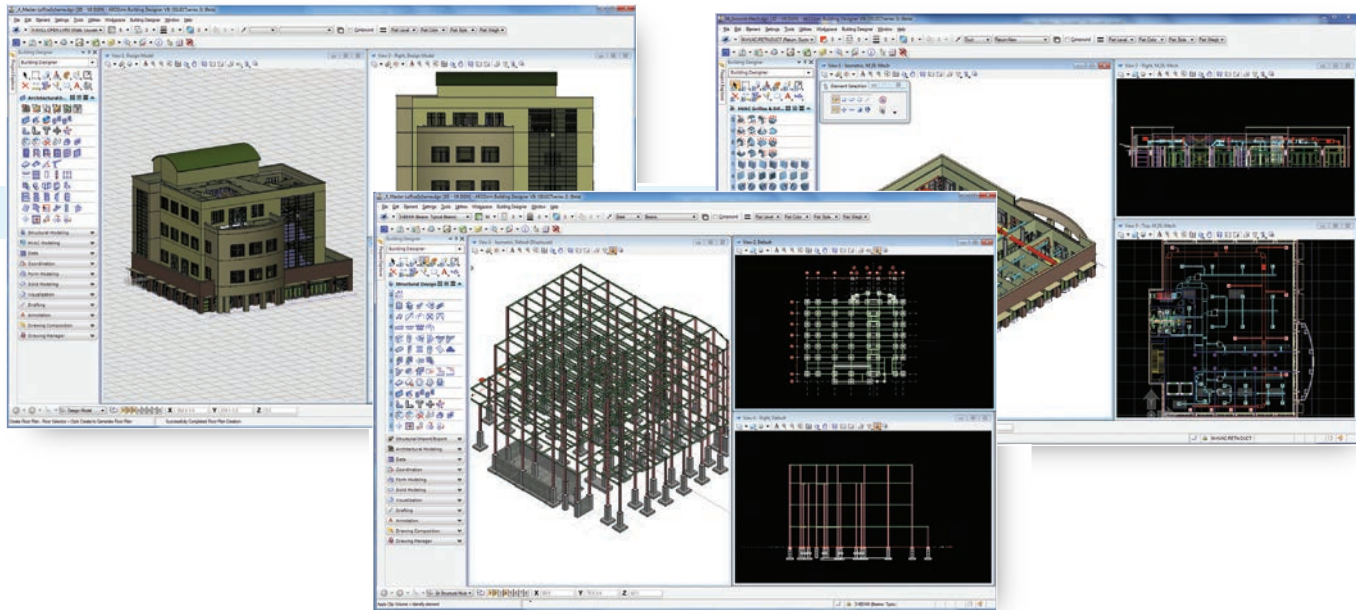
The AECOsim family provides interdisciplinary building design, analysis and simulation

software that covers all architectural, engineering and construction needs, and that can perform building performance simulations using rigorous design specifications, enabling the software to accurately predict the performance of a building.

AECOsim Energy Simulator has, at its core, the EnergyPlus simulation engine, an industry standard setter developed and maintained by the US Department of Energy, and can be used to create buildings that consume less energy and provide greater occupant comfort and safety - leading to what the press information states is "greater occupant productivity" - and control operational energy costs for its owners.

I like that productivity bit. I suppose you can either take it that students or workers will feel inclined to work harder in a more comfortable setting, or couples will interact more readily in a domestic building with the inevitable outcome!

Simulation can be carried out for 'lighting analysis', providing a number of optional lighting schemes to determine which is



most applicable in terms of energy consumption, occupant usability and safety, or for comparing different methods of heating and air-conditioning. Because the results of such analysis is retained with the model, the information acquired can also be used downstream for further, perhaps structural, analysis. All simulations are tested against existing standards, using the AECOsim Compliance Manager.

AECOsim Building Designer is used to find out energy costs per room, area, or building, producing a Performance Rating Report which can accumulate costs for given periods. After an energy simulation is run, the information is run through the AECO Energy Compliance Manager - a totally necessary step, as there are thousands of rules that buildings need to comply with.

AECOsim Building Designer is a multi-disciplinary tool, integrating architectural, structural, mechanical and electrical systems design and construction documentation, supporting large distributed projects, used for the design, simulation, analysis and documentation of buildings. It provides full information transference between I-models, ProjectWise, Bentley Navigator and many other of Bentley's Passport-enabled applications, providing full interference resolution and informative images and animations.

AECOsim Building Designer produces

high quality, fully co-ordinated building and project documentation for the whole of a building's life cycle.

Some interesting facts, by the way, courtesy of Bentley. Buildings consume about 40% of the energy we produce worldwide, and if we are able to reduce energy consumption by 50% - a conservative figure compared to some of the targets we have been set - that would be equivalent to taking every car and truck off the road!

AECOsim Energy Simulator and AECOsim Building Designer are not intended merely for use with Bentley products. In Bentley's spirit of Interoperability, and using the company's interoperability tools, the simulation software can interoperate with other BIM formats, including AutoCAD, Revit and others.

The software also integrates with GenerativeComponents. Designers can attach all of the constraints parameters to a section of the building to try out a number of different designs, producing an optimum solution that satisfies as many of the targets as possible. Generative design is ideal for such a task, enabling designers to create algorithms that apply different factors - determining, for instance, the shape, size, orientation of curtain walls or façade on a building - and then creating the geometry from the results. Bentley claims that this could be the beginning of

optioneering for buildings; an extremely iterative process, but one that can produce a range of buildings, based on the same original chassis, to suit different environments, locations, conditions and so on. (An ideal opportunity to investigate mass prefabrication to suit Third World habitation projects, perhaps).

HYPERMODELS

Incidentally, this is all part and parcel of Bentley's new hypermodel technology - the seamless welding together of 2D and 3D technology, which combines models and drawings in the same space, where the same platform is used to combine all disciplines and improve collaboration within multi-technology project teams, integrated and capable of driving any simulation, geometry, and the eventual production of fabrication or construction drawings in 2D.

Stephen Holmes of Foster & Partners explains it succinctly. "Hypermodel technology sees the maturing of Bentley's DynamicView technology. ...What has traditionally been a linear process from 3D design model to 2D production drawings has now come full circle. With complex building geometry, inlaying 2D production drawings into 3D models has always been labour intensive. Now, with hypermodels it can be done with two clicks of a mouse button."

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