

by Nick Greenwood

## Smarter Sustainable Design

Mouchel Business Services work in partnership with Lincolnshire County Council as well as providing business support and business improvement services to the county's other local authorities and private sector companies.



1. Horncastle Banovallum School  
– New Art & Technology Block Main Entrance.

Delivering a wide range of architectural services, Mouchel Lincoln plays a full and active part in the county's community and social-regeneration infrastructure.

Having a primary focus within the education sector, Mouchel Lincoln provides refurbishments, extensions and new build projects to schools throughout the county. The sizes of these projects vary from small, perhaps only a few thousand in value, right through to multi-million pound new primary and secondary schools.

Beginning work for Mouchel in January 2004, as a Part 1 Year Out student from De Montfort University in Leicester, I had always been interested in sustainable design and the advancements being made in areas such as passive ventilation. Upon joining the company I was trained to use ArchiCAD which I found to be an extremely powerful tool for illustrating design proposals in three dimensions right through to production of all construction documentation. It quickly became evident to me that local government was starting to strive for the inclusion of sustainable design concepts within their building projects, which obviously began to require further investigation at a professional level.

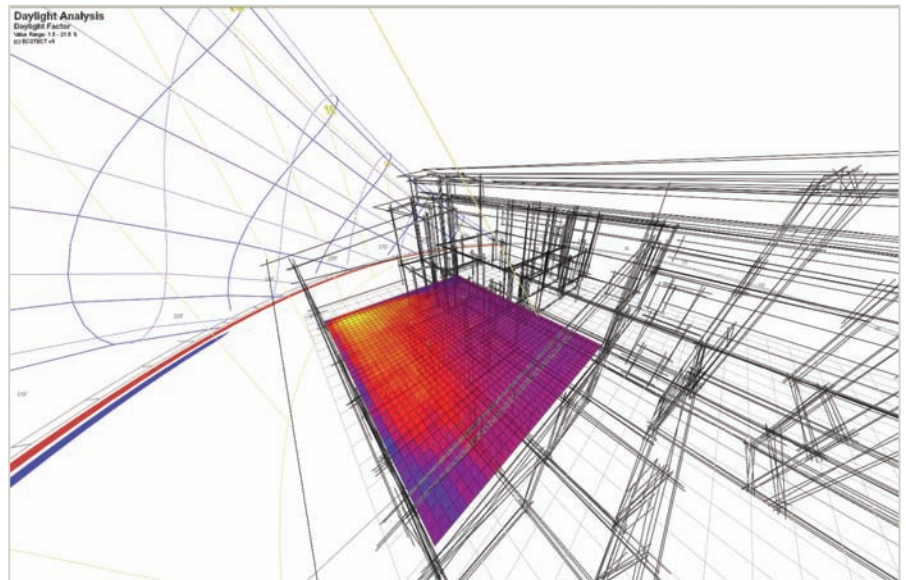
Initially through advertisements and seminars, this office became aware of the development being undertaken by Square One and Graphisoft to link the BIM design package – ArchiCAD – and the environmental analysis tool – ECOTECT. Having attended a seminar and seen first hand the possibilities of 'front end' environmental design without the need to employ expensive, external consultants this was too good an opportunity to pass up. Four members of the design group from various teams attended a single day's training from which they quickly developed a basic understanding of the software functions, with the intention that all design teams would have the ability to use the capabilities of ECOTECT.

Having acquired ECOTECT only recently the depth to which we have been able to investigate the potential of the program is at best limited, however, I do feel able to discuss the accessibility and productive nature of the software.

At this point we should take into consideration the issues of trying to achieve compliance to Part L (Conservation of Fuel and Power) Building Regulations. This aspect of ECOTECT opens the door for the Architect to arrive at an initial design that could pass the regulations based purely on fabric, orientation, shading etc. Early analysis, done in a matter of minutes, of a proposed design within ECOTECT highlights simple yet effective changes to the model within ArchiCAD that ensures optimum design of, for example, areas of glazing/roof lights. This is possible within ECOTECT even with a very limited understanding of the rest of the software, but can generate illustrations and graphs that clearly indicate the effectiveness of the apertures created; a great starting point when considering, for instance, the impact of artificial lighting on SBEM calculations for Part L.

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*Nick Greenwood – Mouchel Business Services*



2. Daylight Analysis.

When appraising ECOTECT, I believe that the connection between ArchiCAD and ECOTECT has become an integral part of our design process. By generating a simple BIM model within ArchiCAD, and using its zone tool to add zone information, this is then converted automatically into ECOTECT with the aid of an ArchiCAD add-on. The add-on converts the BIM model into a form that ECOTECT can interpret and then fires up ECOTECT which produces an editable form ready for analysis. The model within ECOTECT is simplified but still retains the formal aesthetic generated within ArchiCAD, and although modelling within ECOTECT is less detailed, simple changes can easily be made to zones and openings alike. As with all new software I was initially overwhelmed by the number of icons and tabs, however, don't be put off by this, because as soon as navigation of the menus and tabs is achieved results are quickly forthcoming.

Aesthetically, the sketchy nature of the ECOTECT imagery created is visually pleasing, giving the model a feel of fluidity and changeability which is important when analysing and displaying (possibly to clients) the ways in which designs can be altered, for example, to increase or reduce the amount of solar gain within a space. The use of the Visualisation Settings allows the designer to view a form in a three dimensional cut-away section whilst at the same time analysing the daylight factor of a selected zone. I have found that when developing and testing ideas for functional spaces this rapid generation of graphical displays that can be viewed in a variety of ways e.g. three dimensions, are invaluable in illustrating the physical changes that can be made to achieve spaces lit primarily by natural light.

Although ECOTECT has only been operative within the office for a few months it has already begun to influence our design approach towards effective natural day lighting and ventilation, and it has also begun to influence the aspirations of our clients.

Mouchel is a consulting and business services group that provides many of the design, managerial and engineering services that support modern society. We work with government agencies, local authorities, government-regulated industries and the private-sector to provide safe, reliable roads and railways, well-managed education and civic infrastructure, clean water, and cost-effective energy. We develop solutions to dispose of society's waste and to regenerate the most deprived urban communities; and we help developers and corporate clients to combine their objectives with those of the society around them.

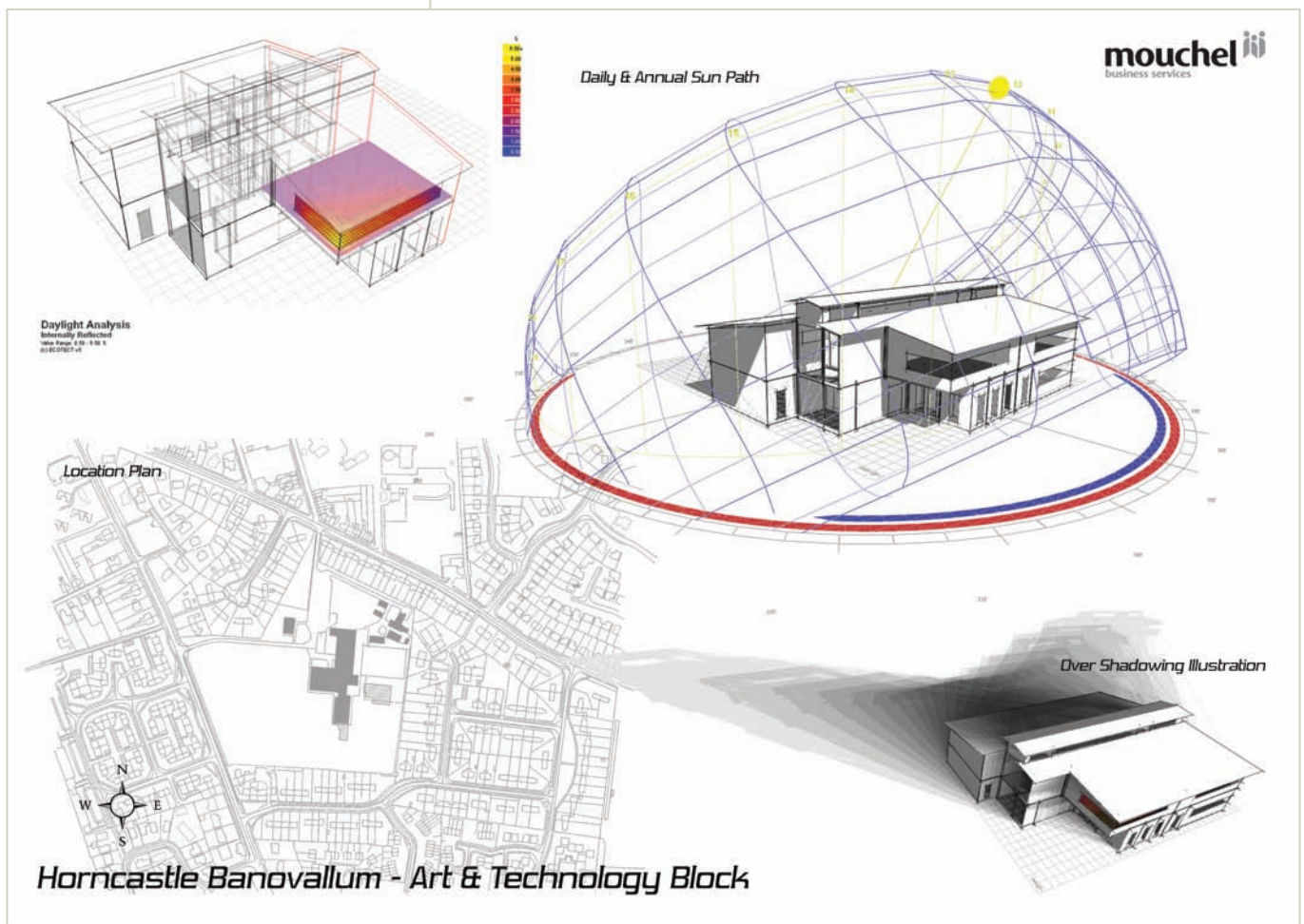
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Using ECOTECT to produce images that illustrate how rooms are affected during daylight hours and throughout the year give not only the client, but also the end user occupier, an insight into how spaces will look and feel, as well as providing justification for important design decisions such as building orientation. By being able to show the annual sun path in conjunction with a proposed design allows those with very little understanding of environmental design techniques to understand how, for instance, solar shading/brise soleil would function throughout the year. Again providing justification and visual appreciation for what is sometimes seen as expensive, external decoration.

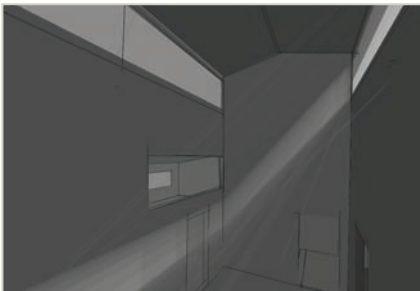
I have been able to use ECOTECT on two projects thus far, a seven classroom Art and Technology block extension and a new Special Educational Needs (SEN) Primary School. The two projects have provided an interesting lesson in the need to design for environmental efficiency at the outset. The Art & Technology block was already under construction when I was able to begin analysing it, in comparison to the very early design stage of the SEN Primary school. Investigation into the Art & Technology block revealed significant variations in the amount of natural light entering certain spaces, and this enabled retrospective action to be taken to remedy the situation. By comparison, the testing of initial ideas for the SEN 'classroom clusters' revealed ways in which varying the sizes of roof lights could dramatically alter the day light levels within the spaces. The intention for new SEN Primary school is that ECOTECT



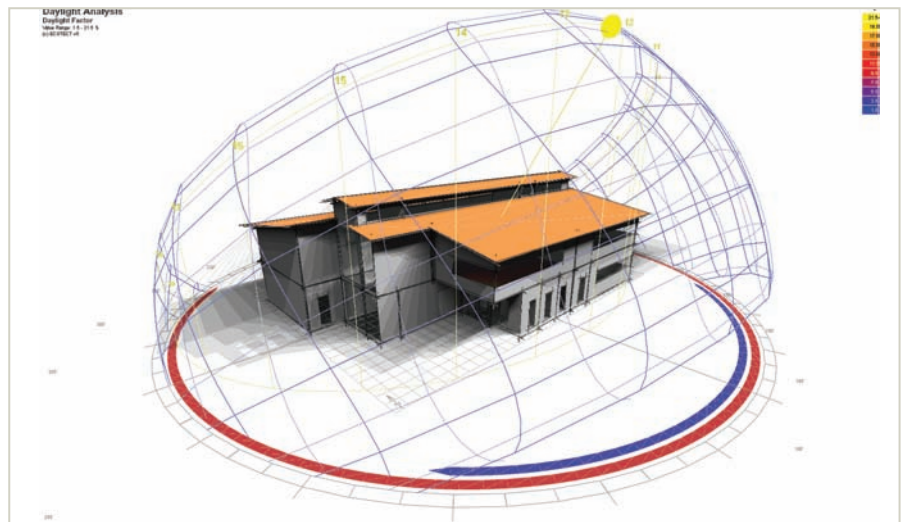
3. Daylight Analysis at Horncastle Banovallum.

*"From our early investigations into the huge scope that is ECOTECT, I am confident that when the time comes for detailed, numerical analysis of future projects it will again illustrate that it is more than up to the challenge and will prove itself time and again."*

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4. Internal Shadows.



5. Sun Path Shadows.

will play a major role in the way in which the building's orientation, form and aesthetic appearance are developed to achieve a very effective, environmentally sustainable design.

Whilst we have only just begun to use ECOTECT on live projects, the possibilities are clearly evident, and I'm sure for those that really want to achieve results at a very early design stage this is the software to do it. From our early investigations into the huge scope that is ECOTECT, I am confident that when the time comes for detailed, numerical analysis of future projects it will again illustrate that it is more than up to the challenge and will prove itself time and again.

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#### About Graphisoft

Graphisoft is the pioneer and leader in developing Virtual Building™ solutions. It is widely acknowledged as the world's #1 supplier of model-based software and services for the building industry. Our clients are at the forefront of the industry – delivering projects that are better designed, more predictable to construct and less expensive to operate.

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