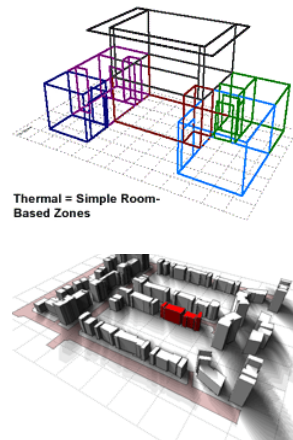


DIT | DSA | Computer Applications 4  
David O'Connell : 2008

## Overview

Ecotect is a multifunctional tool for measuring building performance and not a 3d modelling tool. The information which you receive back is dependent upon what you put in. This information takes the form of easily readable graphs and tables as well as actual images of the model created.



There are a number of principles which should be followed at all times.

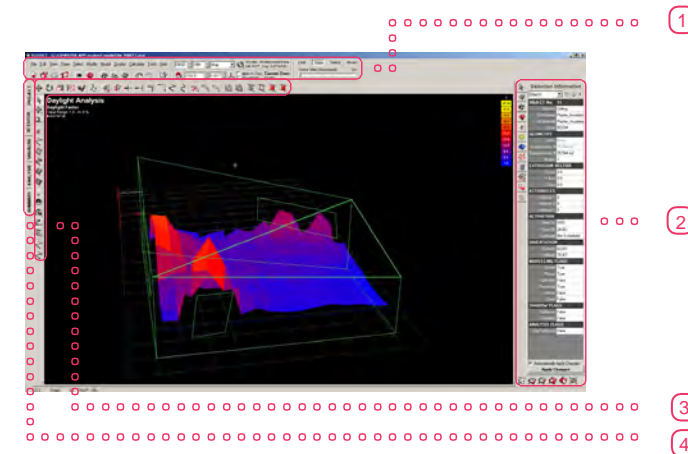
- Ecotect does not require the same level of detail as other modelling programmes and this is expressed in the modelling interface, models are usually made up of simple planar objects.
- Zoning - Ecotect uses a system of zones as a basis for its calculations defining an object as thermal or non thermal dictates how it influences calculations.
- Avoiding Abortive Work - Performance information is critical at the earliest stages if you are to avoid abortive work on inappropriate design solutions.
- Progressive data input - Although it is important to accumulate as much data as possible from the start Ecotect does allow you to perform specific tasks depending upon how much information is available. For just a simple plan layout you can model a simple building geometry and get create shadow analysis etc.
- You must always remember that Ecotect is an analysis tool and the output is generally information. The aesthetic value of the model is negligible.

\* As with all these programmes familiarisation with the interface is most important and a definition of exactly what you want to achieve.

## Workspace

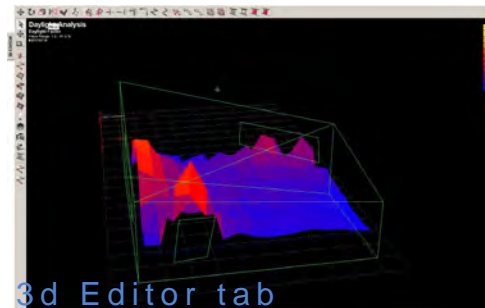
The workspace is similar in format to acad. But there are a few differences. Namely the use of tabs as a way of visualising calculations and data.

1. Standard menu bar. Contains parameters which are available in all tabs such as menu bars and location.
2. Settings bar - controls parameters of an model which effect calculations and visualisations.
3. Optional commands - dependent upon the Tab selected.
4. Tabs - Shows which tab is currently selected. A. Project, B. 3d Editor, C. visualise, D. Analysis, E. Summary.



## Layout pages

The information given through the Ecotect interface is categorized into 6 pages for ease of communication. Each of these pages contains page specific tools.



### Project page

This tab contains general information about the model including its file location. Position on the globe and the time for various calculations.

All of these variables are editable within this tab. Through direct input, drop down bars or click and drag interface

### 3D Editor page

contains the current and modelling tools.

Also contained within this tab are visualisations of calculations completed and scales and figures associated with the calculations.

### Visualise page

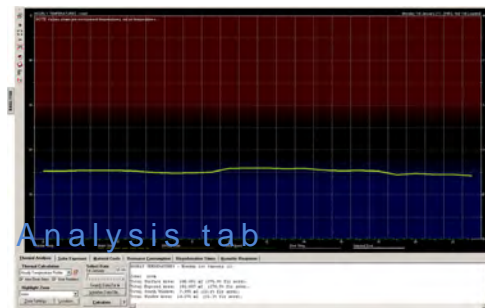
Shows the rendered OpenGL view of the model, complete with any of the analysis elements you choose to display

### Analysis page

Displays graphical analysis information such as solar radiation, internal temperatures or reverberation times.

### Summary page

Displays an embedded HTML browser that has a number of uses. It is used to display embedded help within the software as well as summary tables which can be displayed as either formatted text or HTML.



## User preferences

Once you have opened a new document there are a number of properties which need to be checked before you start modelling. These are available from the user preferences dialogue box under the file drop down bar, or from the standard menu bar.



### Modelling tab -

Contains editable options for colour, grid(size of squares which act as guides when modelling) size, Default zone height: default height of zones partitions and planes when drawn in the modelling page  
\*Default zone height can be used to effectively construct multi-story buildings without having to adjust the room height.

### Localisation Tab -

Contains unit options. All drawings are given Si Decimal as standard units

### Options Tab -

Contains:

- Application settings
- Modelling settings
- Display settings

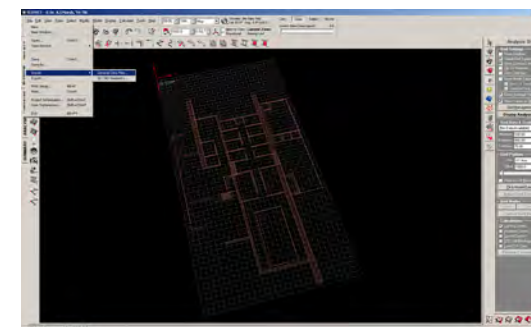
### Cursor Snap Tab -

Contain:

- Snap settings when modelling
- It also contains grid snap settings which can be adjusted to modify accuracy.

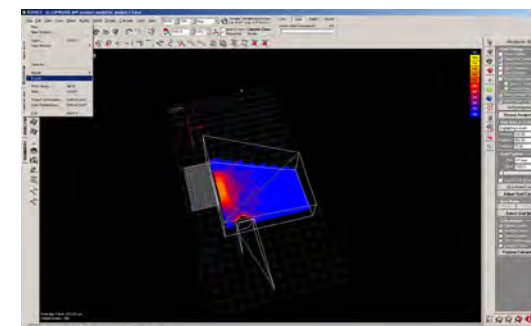
## Importing and Exporting

Upon opening a new document you will be required to enter the geometry from scratch. Ecotect can import both 3d models (not done due to the relative complexity of models compared to the requirements of ecotect) and drawings.



### File - import - General data file.

Ecotect will import dxf files from autocad, when you choose the file options such as scale and units must be checked to make sure the file is not imported at the wrong scale.  
\* note that the dxf file only serves as a template to trace your zones into a model. You must decide where zones occur prior to importing.



When calculations have been completed the graphic representations of this data can be exported in a number of ways.

1. From the file menu bitmap images can be saved to file using the export command.
2. In the bottom right hand corner of the screen a camera button is used to copy the images to a clipboard ready for use in your favourite layout programme.

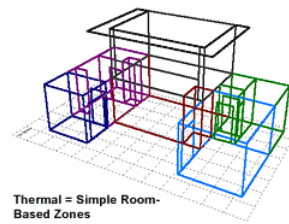
## Modelling interface

The modelling interface is similar to other cad programs with one particular difference it is not concerned with actual thickness in the modelling procedure.

1. **Editing tools -**
  - Select - For selecting elements of a model or entities to add to the selection set hold down the shift key when selecting.
  - Transform - Contains tools for editing solids
  - Measure - To measure distances.
2. **Modelling tools -**
  - Points - mainly used for geometric testing purposes, such as the focus of a Sun-Path Diagram or as a lighting sensor point.
  - Line - to draw curved lines right click after selecting the first point for line type options.
  - Plane - Points are entered sequentially to form a plane.
  - Partition - are wall elements which have a default height which can be modified subsequently by changing the extrusion vector in the selection panel.
  - Zone - A closed volume which defines a space. See partition for editing options
  - Pitched roof - Allows the input of pitched roof objects editable the same as other objects.
3. **Objects -**
  - Allows for the input of objects which can have effects on thermal equations etc. Child objects such as windows can be inserted in planes by selecting the plane before selecting the window command.
4. **Add node delete node -**
  - Nodes can be added to existing line segments by selecting the line segment prior to using the command, or they can be given absolute values through the value input boxes.

## Zoning

The thermal analysis routines in ECOTECT require that you construct your model a certain way.  
**Building Zones**  
 Each building must comprise one or more fully enclosed thermal zones. The thermal zone is the basic unit in thermal calculations



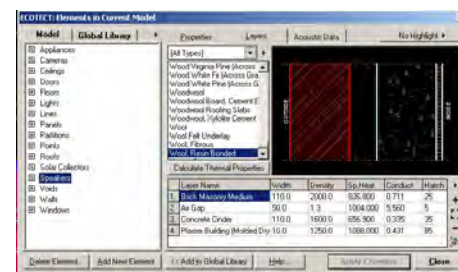
### Adjacent Zones

Adjacent thermal zones must have their intervening walls, ceilings or floors coplanar and overlapping. ECOTECT is thus able to automatically detect adjacency and determine the extent of heat flow between them.

### Geometric Detail Only When it is Needed

The key to a good thermal model therefore is simplicity, getting rid of all the thermally redundant geometry.

## Material Assignment



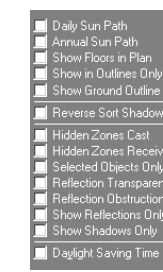
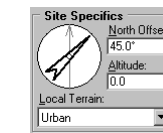
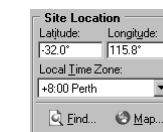
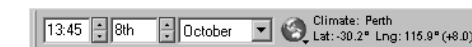
When created manually, ECOTECT attempts to automatically determine their element type based on their surface normal, roughly horizontal object near the ground will be created as a FLOOR.

To perform some of the calculations in Ecotect i.e. Thermal performance the program requires more data. The material dialogue box gives a wide range of options. You can designate materials to selected items from the list provided, or create ones from components listed in the layers tab.

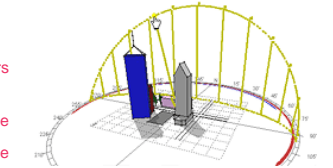
Once designated Ecotect gives you a number of images which explain the material you have created. These images can be exported using the camera tool or the export button.

## Shadows

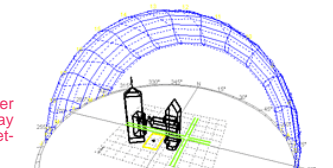
ECOTECT offers a wide range of shadow generation and display options.



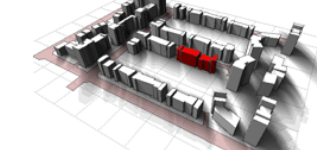
### Display 3D Sun-Path



### Display annual Sun-Path



### Show shadow range



In order to calculate the various shadow castings of a building. A number of parameters must be established i.e.

- Site time and date
- Latitude and timezone available in the report page.
- Orientation of the model which can be changed in the report page toolbar.

Shadow display options can be set using either the Shadow Options sub-menu in the Display menu or the items at the top of the Shadow Settings panel.

\*Show shadow range is another useful tool which gives you the complete shadow range for a period of time and their relative intensities.

## Lighting simulation

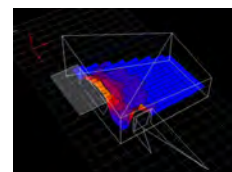
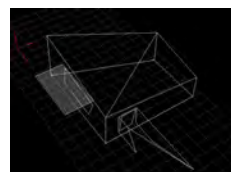
ECOTECT implements a range of methods which can be used to calculate natural light levels in buildings.

- The Average Daylight Factor
- Sky Point Overlays
- The BRE Split-Flux Method
- RADIANCE simulation



### The Average Daylight Factor

Once the model has defined as enclosed spaces you can perform this command. Command - calculate - lighting analysis, or from the analysis grid settings bar. In the lighting analysis dialogue box you will be asked to fill in a series of parameters which effect the graphic results given.



Prior to calculation

After calculation

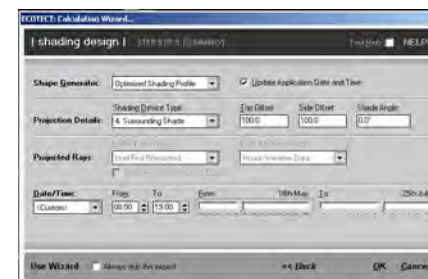
The visualisation of the data provides a clear explanatory image plus a scale with which to interpret the data. Also provided are figurative representations of the data in the bottom and top left hand corners of the page..

## Shading Design

The design of shading devices is an important part of many buildings.

### There are a number of methods of designing shades in ecotect

1. View From Sun, 2. Interactive Shading Design, 3. Cutting Solar Profiles, 4. Optimised Shading Devices (i will explain this in detail), 5. Project Shading Rays

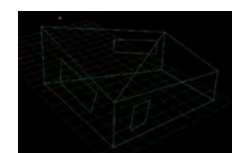


### Optimised Shading Device

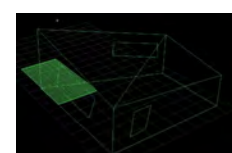
Before you create a shading device you must select the opening to shade.

ECOTECT can design a shading device for you. It will use the solar profiles described above to generate the exact shape required to shade any given rectangular window given a start and stop time and a cut-off date.

It must be remembered that this method although quick does not work with complex geometries. Perhaps the best method is a combination of a number of methods.



Prior to calculation



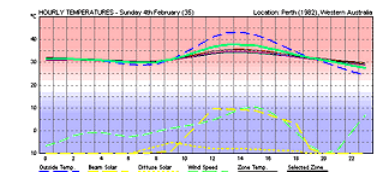
After calculation

Some of the items not explained above might be worth exploring such as the view from sun (This function displays the model in an orthographic projection, as the Sun would 'see' it) and project shading rays (determine where shading is required, and also what intensity of solar radiation needs to be protected from) when working with more complex models.

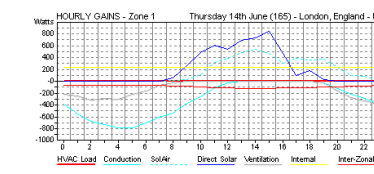
## Thermal Performance

ECOTECT offers a wide range of thermal performance analysis features. These can be accessed via the Thermal Analysis tab in the Analysis page, invoked directly by the Thermal Performance... item in the Calculate menu.

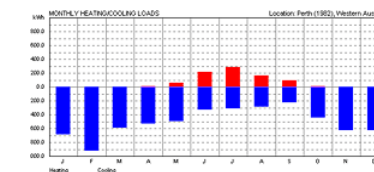
\*All principles discussed in the zoning page previously must be adhered to prior to performing any calculations



1. **Hourly temperature graphs -**  
 Display the internal temperatures of all visible thermal zones in the model over a 24-hour period. The outside air temperature and wind speed, as well as beam and diffuse solar radiation, is displayed as dashed lines within the graph.



2. **Hourly heat gain graphs -**  
 Display the magnitude of all the different heat flow paths acting on visible thermal zones in the model over a 24-hour period.



1. **Monthly space load graphs -**  
 Display total heating and cooling loads for each zone. If no thermal zone is selected, the graph shows the total of all thermal zones, otherwise it displays the loads only for the selected zone.