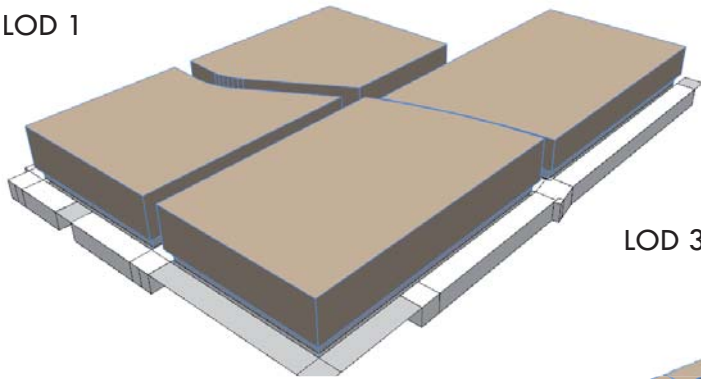
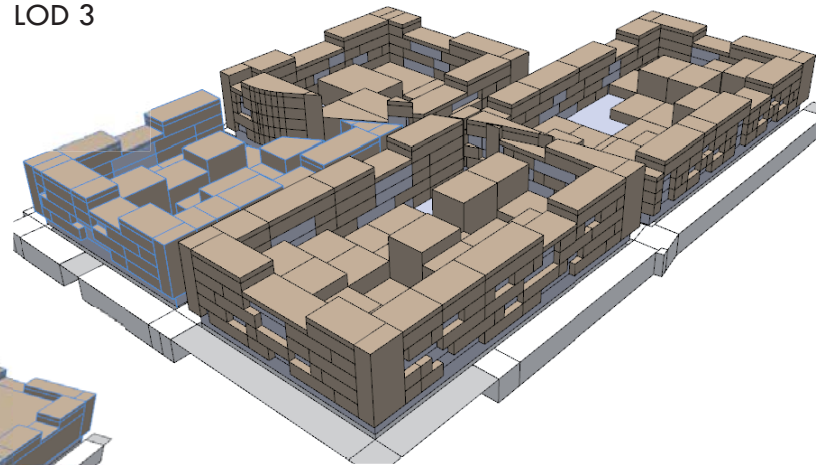


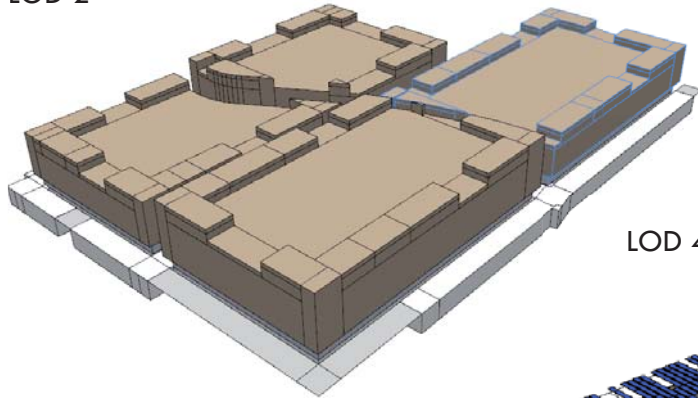
LOD 1



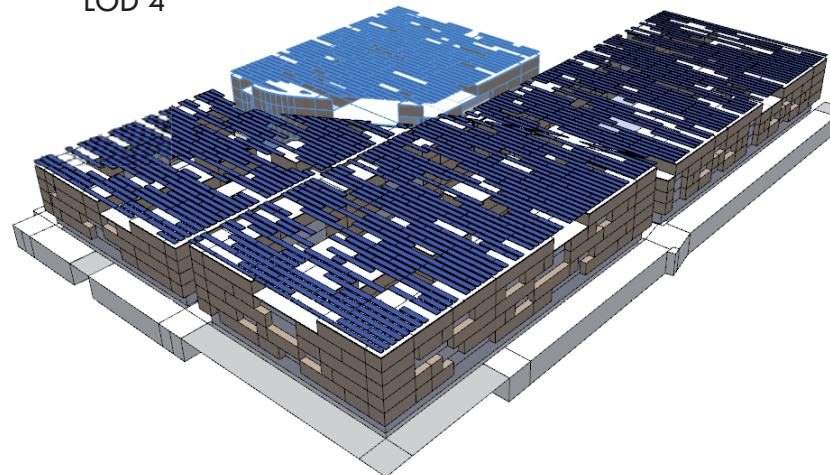
LOD 3



LOD 2

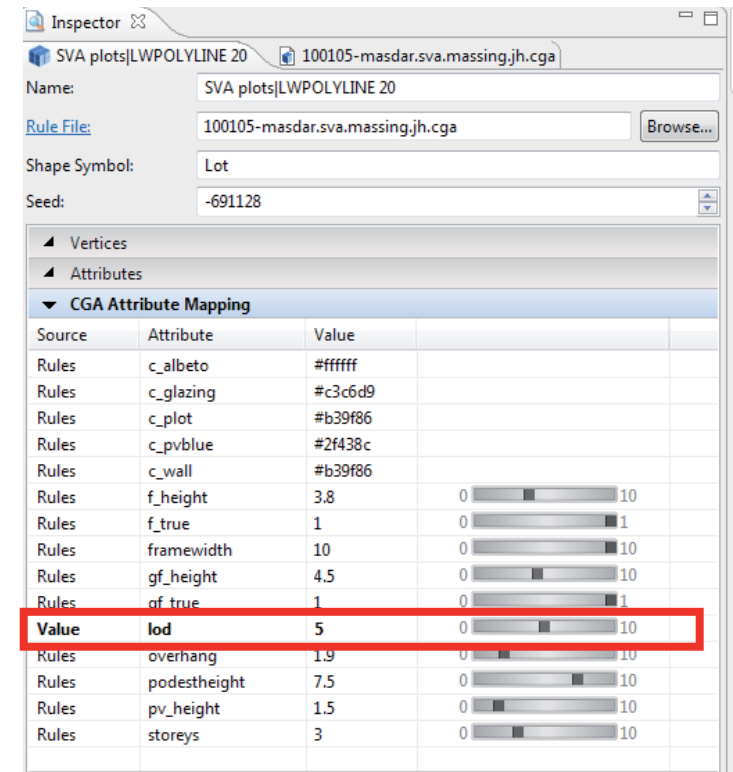


LOD 4

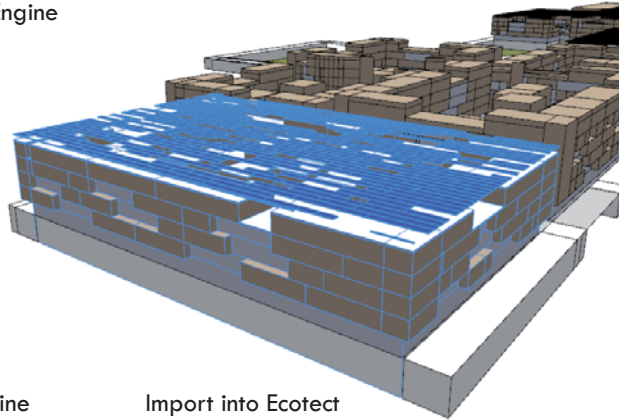


Adjust the level of details depending on the required complexity for the following analyses in Ecotect.

```
et (-2) comp(f) { inside: Basin, border: CourtyardPath color
comp(f) { inside: extrude (0.1) color ("#0066ff") report("1
extrude (0.2) color (Pathcolor) BasinBorder }
```



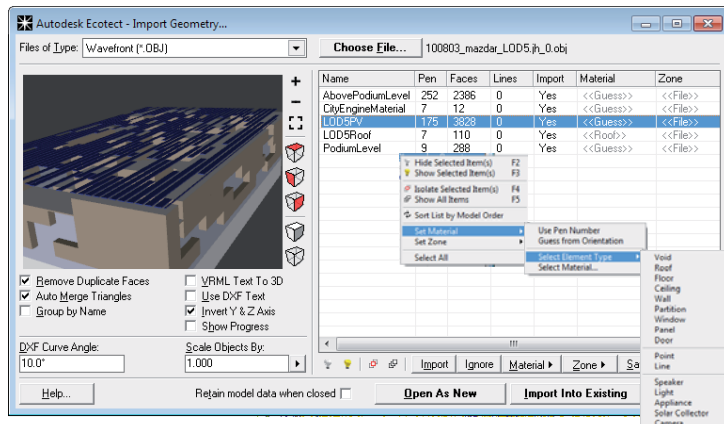
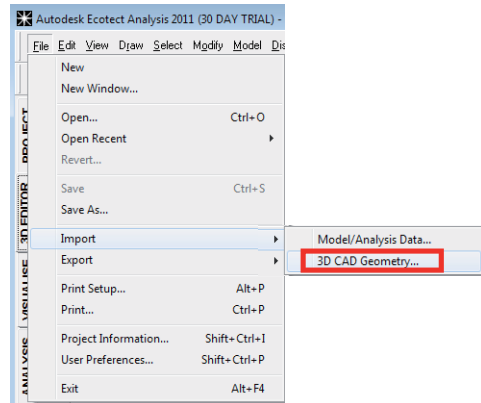
3D Geometry in CityEngine



Export from CityEngine



Import into Ecotect



MATERIALS-EXPORT FROM CITY ENGINE TO ECOTECT

In order to have the same material in City Engine and Ecotect, please proceed as follow:

In City Engine:

- make the differentiation between materials by using attributes in your .cga-code, as in the example below:

```
attr c_plot = "#b39f86"
attr c_glazing = "#c3c6d9"//979bb9"
attr c_albeto = "#ffffff"
attr c_wall = "#b39f86"
attr c_pvblue = "#2f438c"
```

PodiumLevel --> color(c_glazing) PodiumLevelVolume.

AbovePodiumLevel --> color(c_plot) Overhang

LOD5Roof --> split(y) {.3: comp(f) {bottom: Wall | side: Wall | top: color(c_albeto) RoofSurface.} | ~1: NIL }

LOD5PV --> case lod ==5 : t(0,f_height+scope.sy,0) s('1,,2,'1) split(x) {1.5: r(0,0,00) color(c_pvblue) LOD5PV_Z | .5: NIL}*

In Ecotect:

Select the geometry you want to export from City Engine.

Go to File/ Export, select the "wavefront" option.

- Start the **Ecotect™** application.
- Click on File menu, and then select Import » 3D CAD Geometry.
- In the dialog box that appears, click on **Choose File**.
- Browse to the location where you previously saved the **obj.file from City Engine**. Select the file and click **Open**.
- Highlight all the items that appear in the dialog box and then click Zone » **By Item Name**.
- Click the **Import Into Existing** button and the obj. model is imported into Ecotect™.

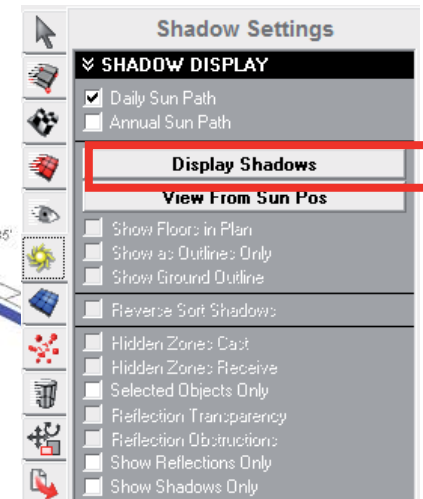
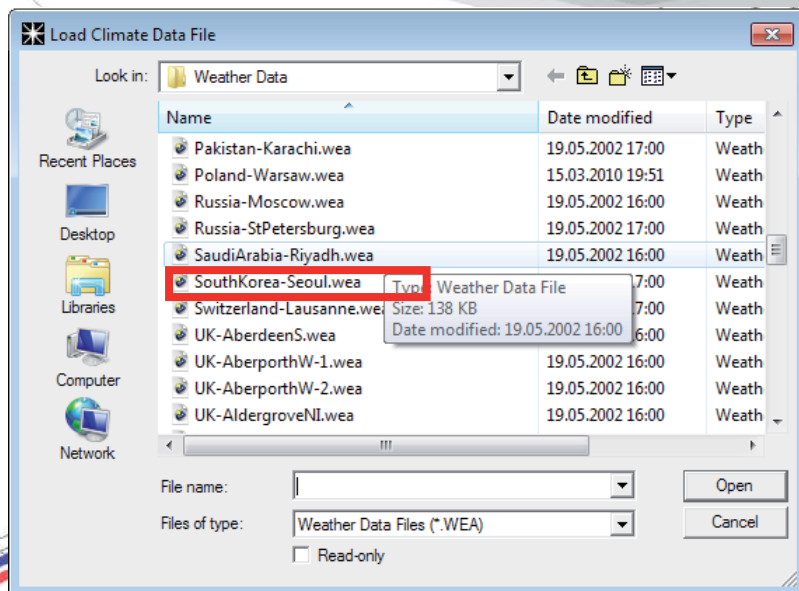
ECOTECT SIMULATIONS DISPLAYING SHADOWS

Step-by-step Instructions

- Before running any simulations in Ecotect - load a Climate Data File for the specific region
- To display shadows within Ecotect™ go to the Display menu and select Shadows. To turn them off again go back to the Display menu and select model. Similarly, you can use the shortcuts F10 to turn the shadows on and F9 to turn them off.
- You can also go to the Shadow Settings panel and click the Display Shadows button to toggle shadows on and off.

Working with 3D Sun-Path Diagrams

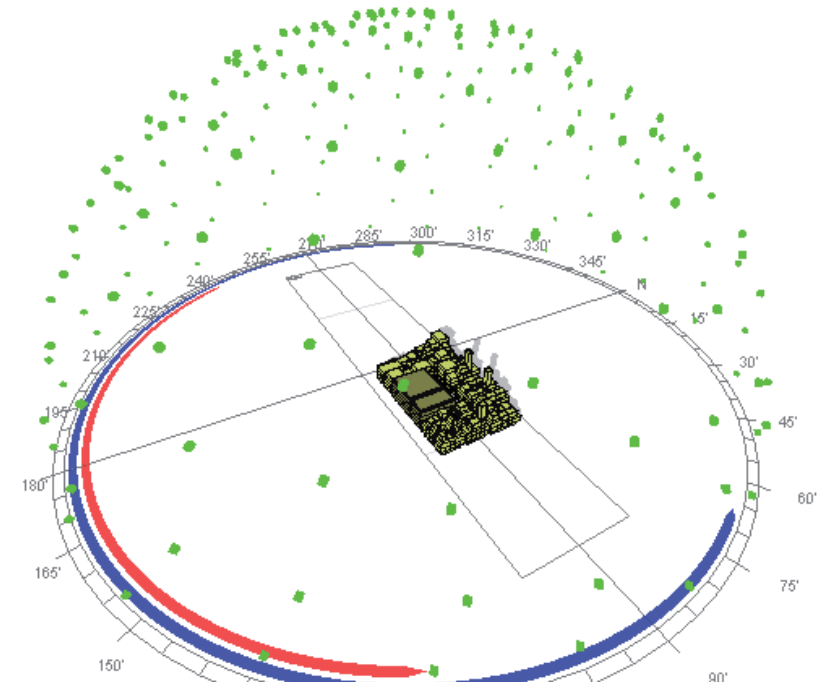
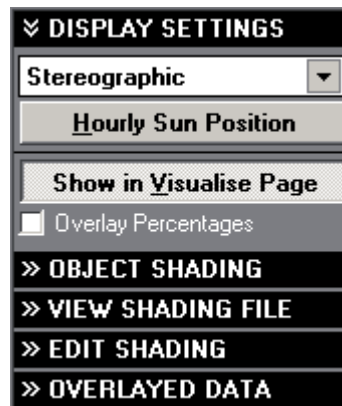
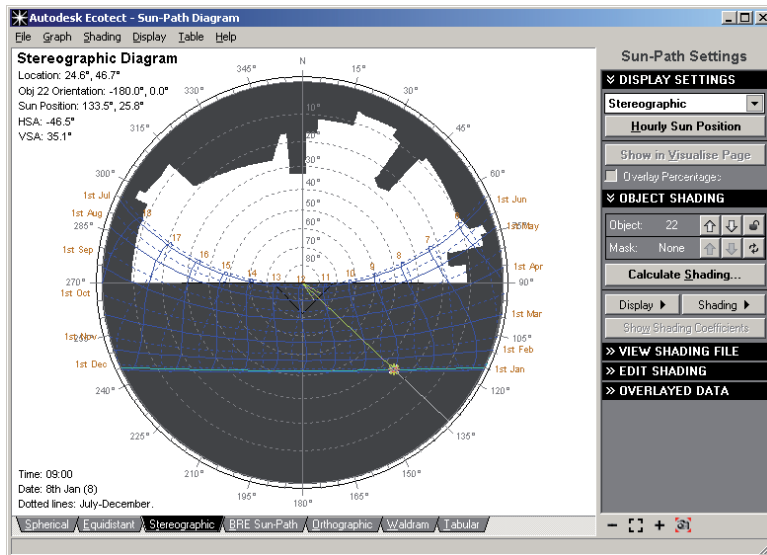
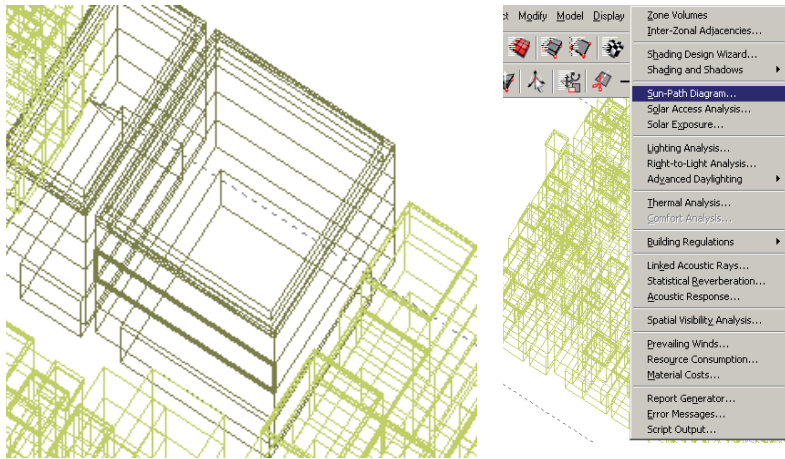
- Go to the Shadow Settings panel and select the Daily Sun Path and Annual Sun Path checkboxes
- Click on the Display Shadows button to display the shadows created by the model.
- To change the time of day, click on the sun and drag it around the daily sun path.
- For a more specific time and date you can enter the values in the Time of Day field in the main toolbar.
- Similarly you can display a more conventional 2D sun path diagram by clicking on the Calculate menu and selecting Sun Path Diagram. Changing the sun position on this diagram will automatically update the 3D window.



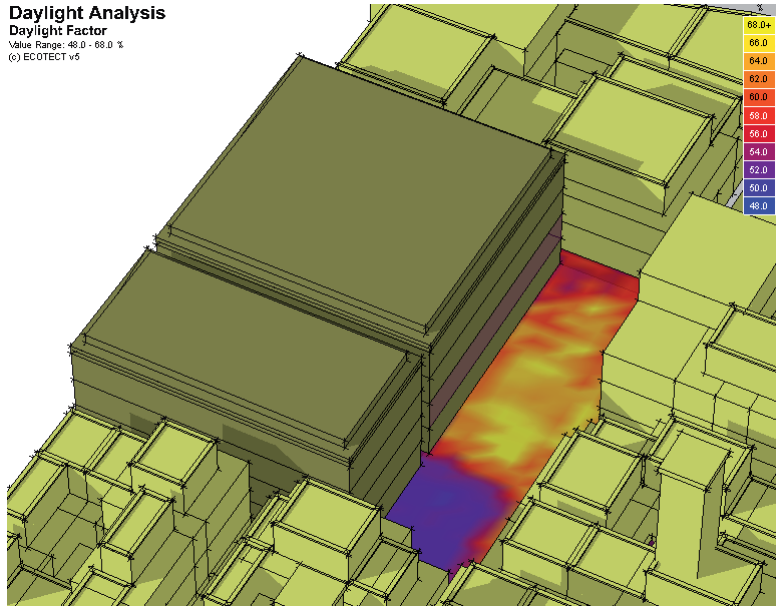
DAYLIGHTING ANALYSIS

Step-by-step Instructions

1. Select the object you want to analyze.
2. Select the **Calculate » Sun-Path Diagram...** menu command. The sun-path diagram window appears.
3. Expand the **Overlayed Data** section of the dialog box.
4. Select the **Daylight Factor** option. An array of green-coloured points is projected over the sun-path diagram; each point represent 0.5% of the available daylight factor.
5. Click the **Calculate Obstructed Pts.** Points that are obstructed by the building geometry or its surroundings will remain green.
6. Click the **Show in Visualise Page** button, and then close the dialog box. The daylight factor points are projected over the model.
7. You can clearly see the daylight factor points that are visible from any position. And calculating in this way the daylight factor.

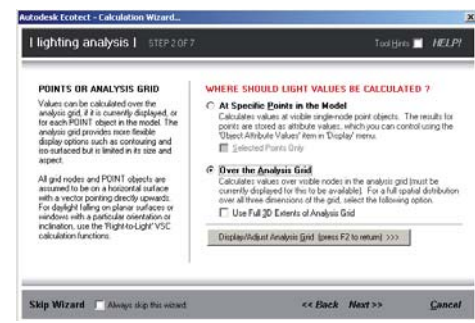
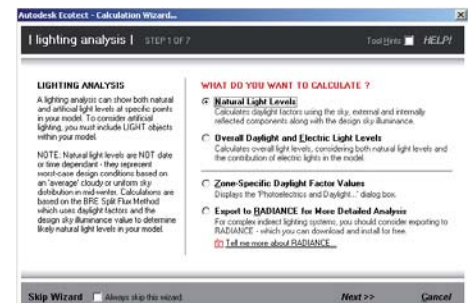
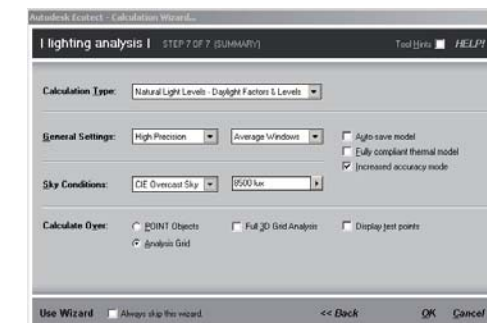
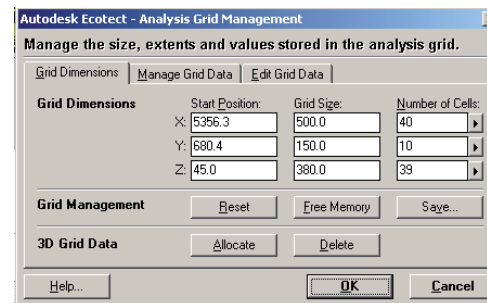
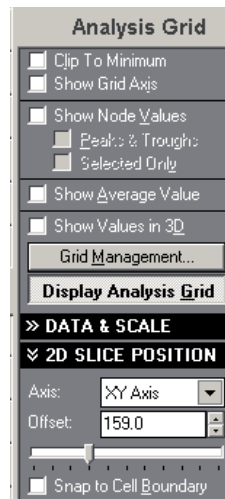
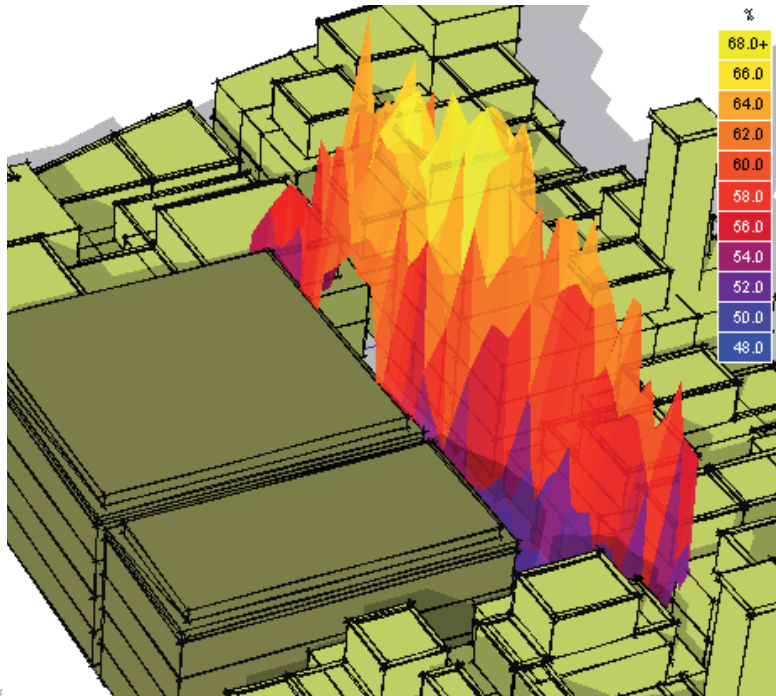


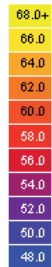
Daylight Analysis
Daylight Factor
Value Range: 48.0 - 68.0 %
(c) ECOTECT v6



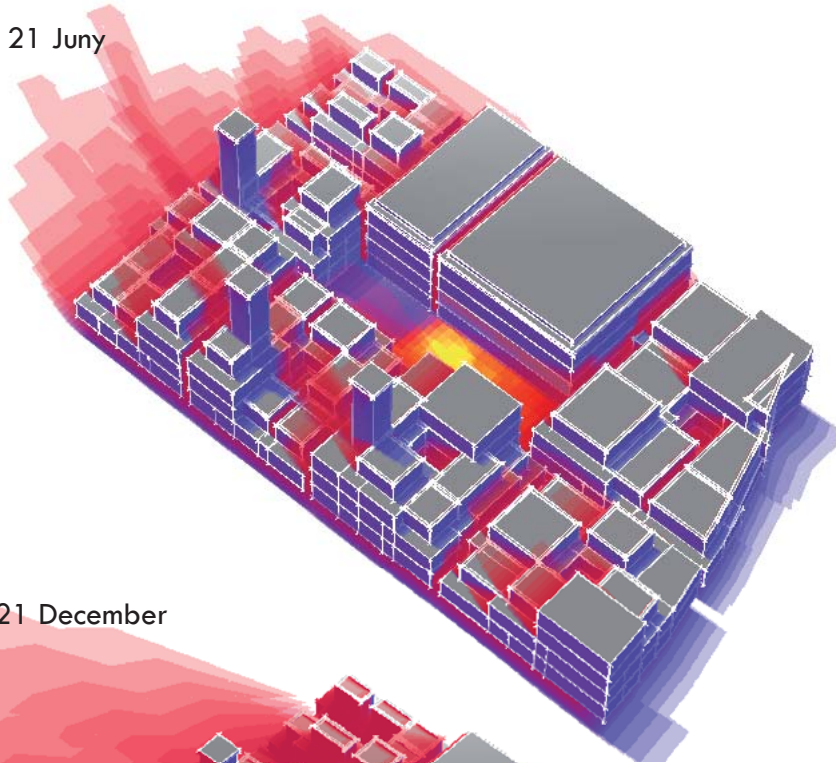
Step-by-step Instructions

1. Click the **Display Analysis Grid** button. The analysis grid appears in the **3D Editor** window.
2. Configure the analysis grid using the settings on the **Analysis Grid panel / Grid Manager**.
3. Go to the Calculate menu, and select **Lighting Analysis..** The Lighting Analysis wizard appears. Select **Natural Light Levels** option and click Next.
4. Select **Over the Analysis Grid** and click Next.
5. Set the **Ray-tracing precision** to **High** and click Next.
6. For Design Sky Illuminance, use the default values, and click Next.
7. For Room-based Settings, use the default values, and click Next.
8. Select Increased Accuracy Mode and click Next.
9. Confirm the settings are correct, then click Ok.
10. Ecotect™ calculates the daylight factor over the analysis grid and displays the corresponding results.
11. To display results in 3D, select the **Show Values in 3D** checkbox in the Analysis Grid Panel.
12. You can also view the analysis grid using the Visualize page.

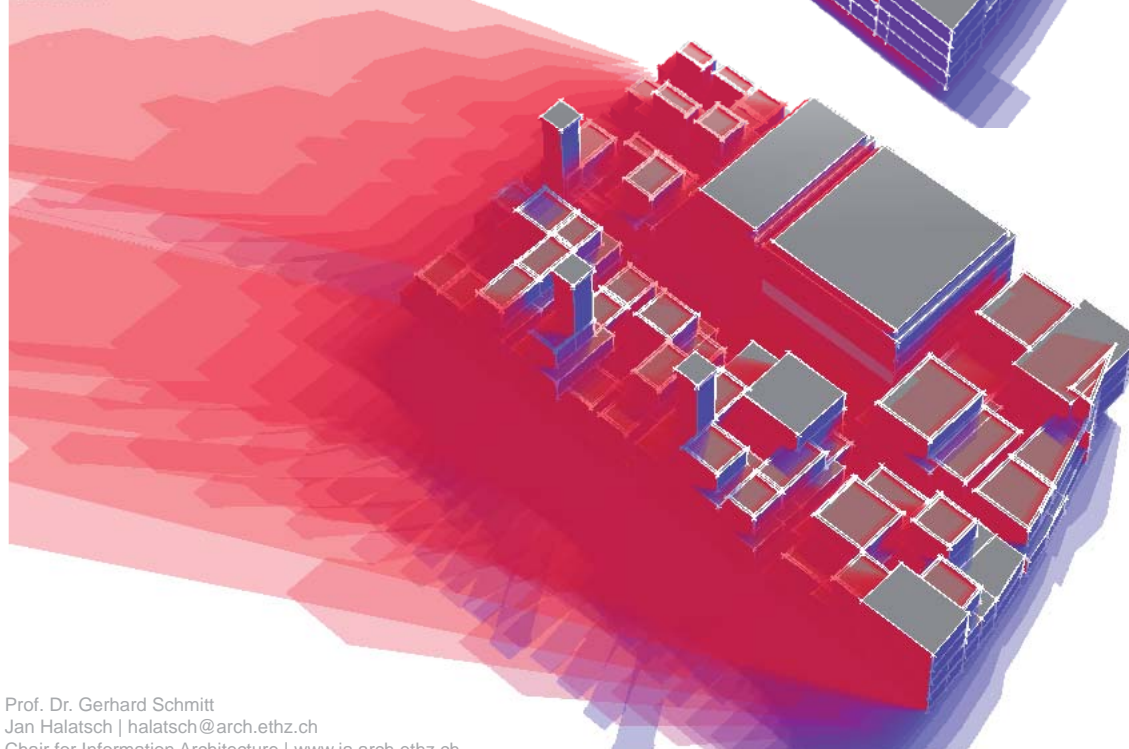




Sommer solstice 21 Juny

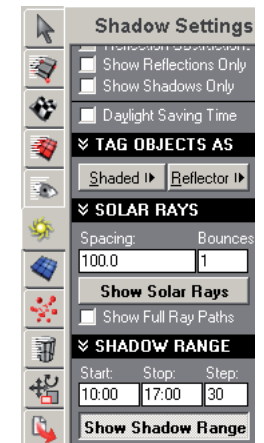
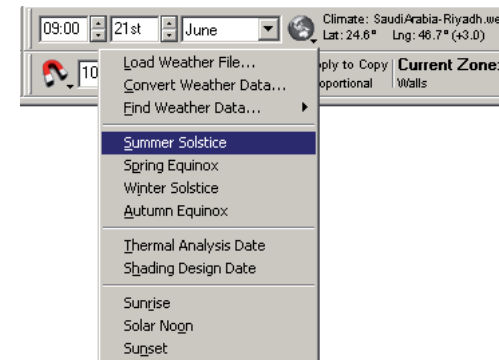


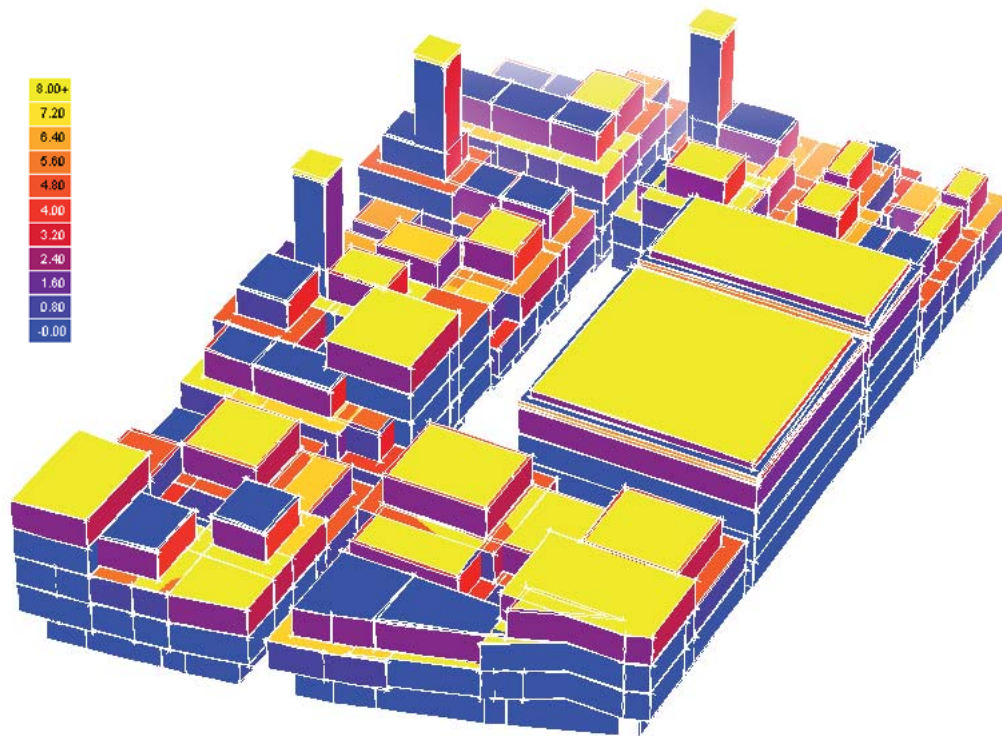
Winter solstice 21 December



DAYLIGHTING ANALYSIS SHADOW RANGES and BUTTERFLY DIAGRAM Step-by-step Instructions

- Click on the Set current time and/or location button and select winter solstice.
- Go to the **Shadow Settings** panel.
- Under the Shadow Range section, specify a start time of 10:00 and a stop time of 17:00. Leave the value in the step field as 30 for the time being.
- Click the **Show Shadow Range** button. This will display a full range of shadows for the specified date and times.
- The darker the shadow is the longer that area is in shadow.
- The Time Step value mentioned previously relates to how often Eco-tect™ produces a shadow diagram. Change this value to achieve a lighter or darker final diagram. For instance, a Time Step value of 15 creates a shadow diagram every 15 minutes and results in a darker final diagram than having a Time Step value of 60.





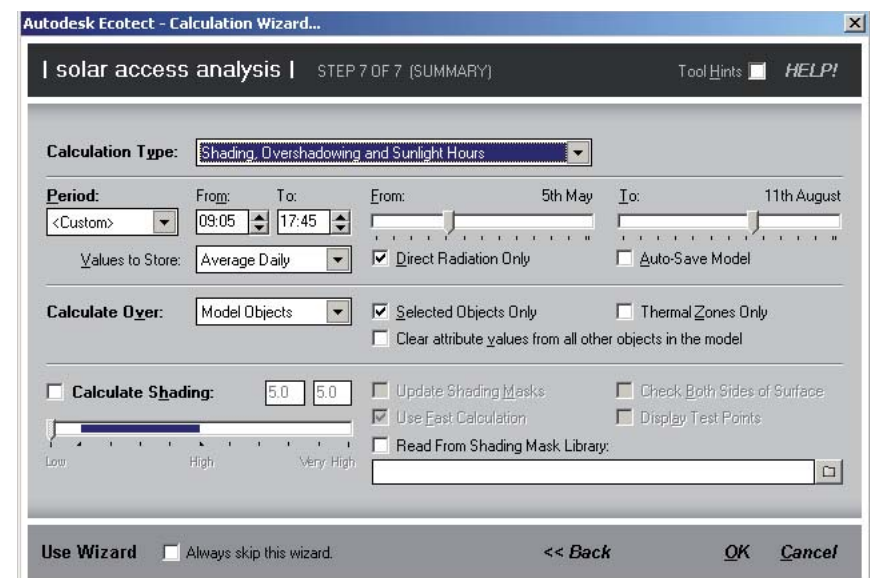
SOLAR ACCESS ANALYSIS

Step-by-step Instructions

Instead of using the analysis grid, you can visually map and store the incident solar radiation that falls upon a surface. To do this, the surface first needs to be sub-divided into smaller units - Ecotect then calculates the incident solar radiation for each of this sub-divisions.

- Go to the Zone **Management panel**. Right-click on the Facade zone, and select Make Current. You can also do this by double-clicking the zone name. (Or select the elements you want to test)
- Right-click again on the Facade zone. From the context menu, select **Isolate Selected Zone**. This makes it easier to edit the facade elements of the model.
- Go to the Calculate menu, and select the **Solar Access Analysis** command. In the wizard, select the Shading, Overshadowing option. Click Next.

Note: The higher the quality settings, the longer it will take to generate the Radiance image!



INSOLATION ANALYSIS TOTAL SUNLIGHT HOURS

Using Ecotect™ you can visualize the amount of incident solar radiation that falls upon a surface or plane in an Ecotect™ model

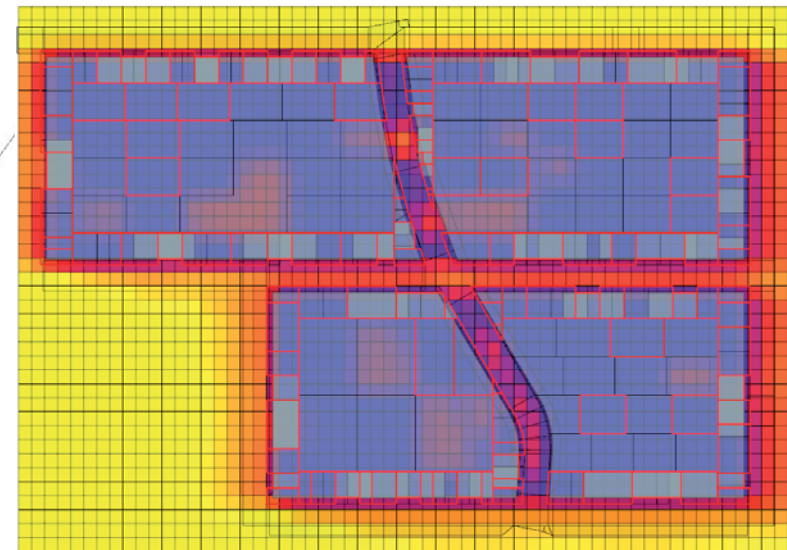
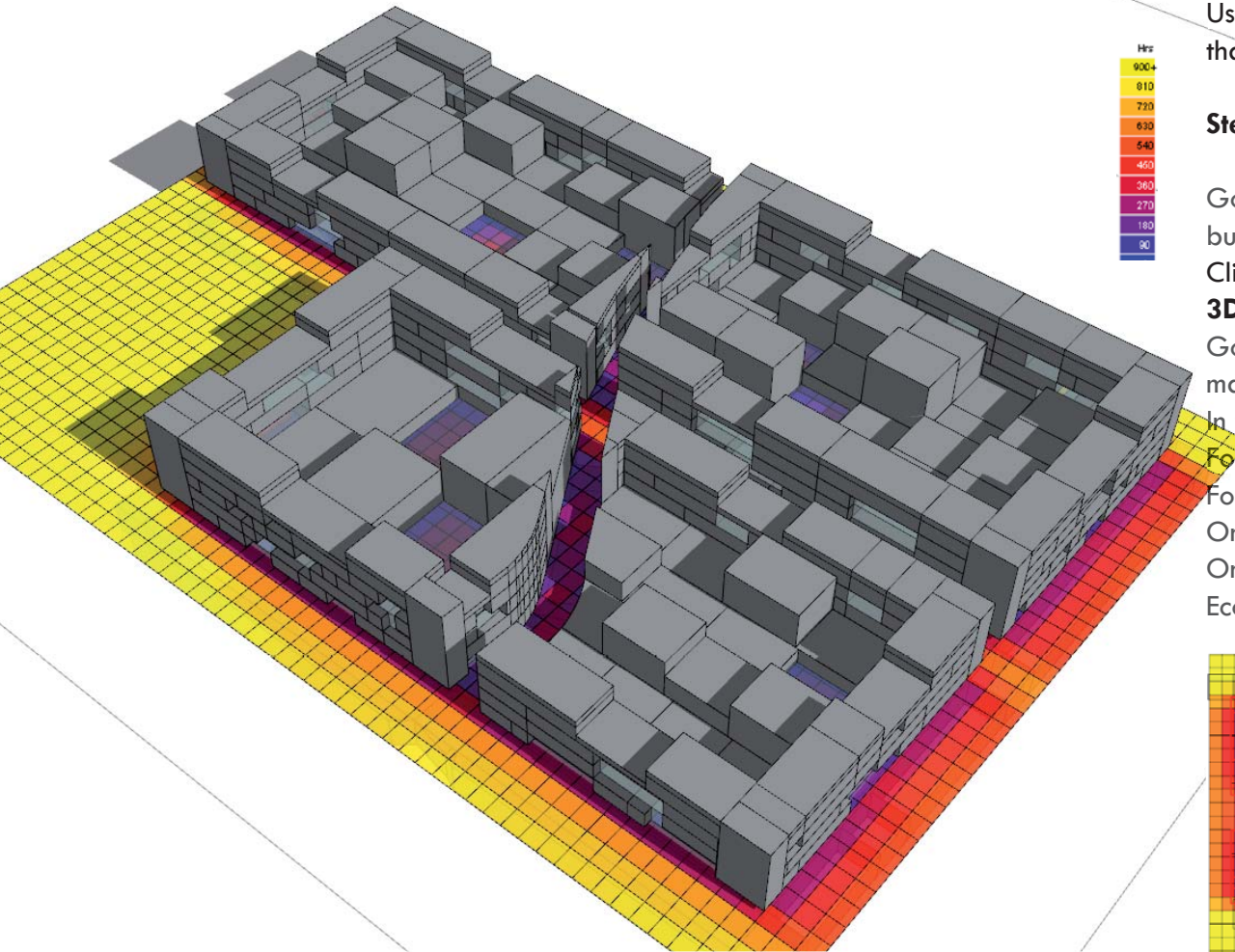
Step-by-step Instructions

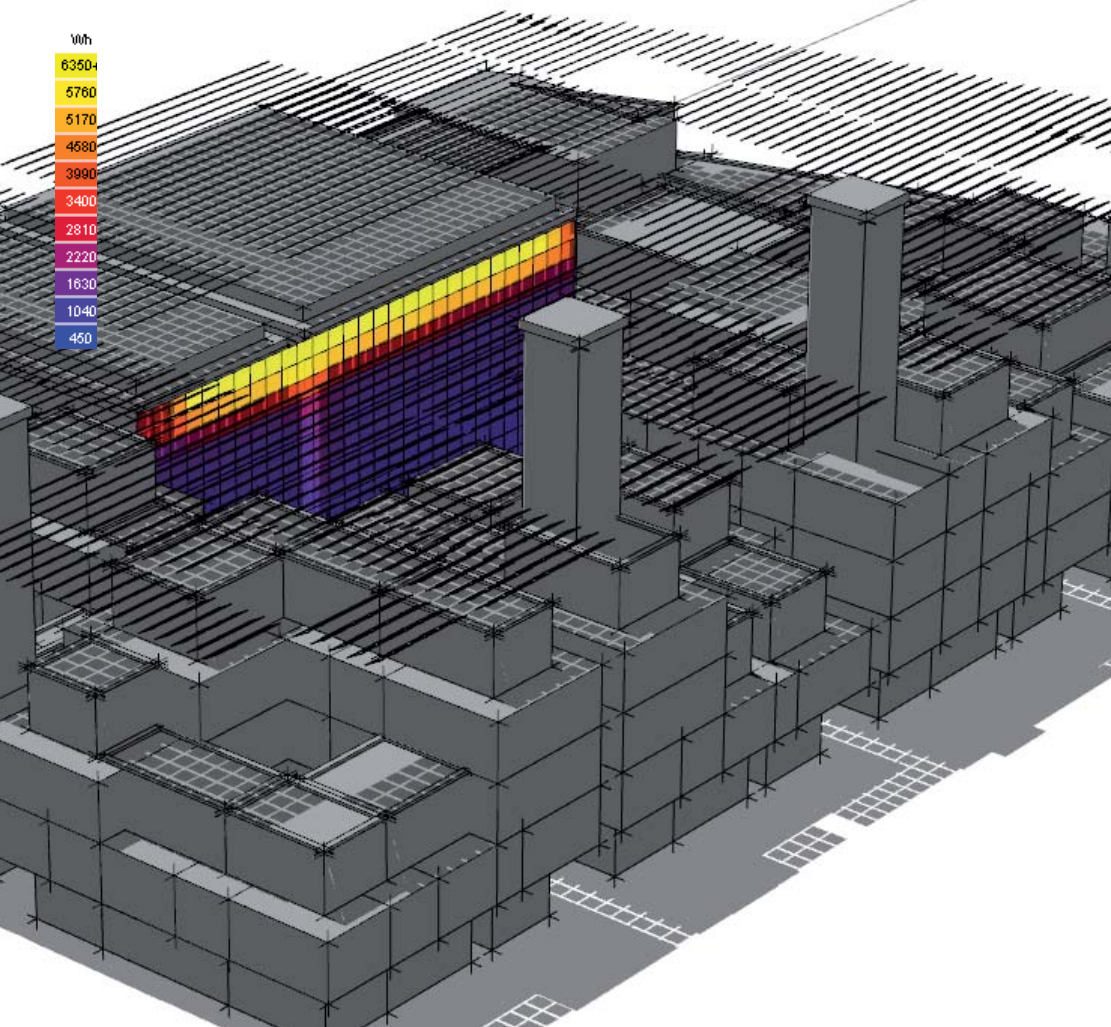
Go to the 3D EDITOR page and then select the perimeter block of the building.

Click the **Display Analysis Grid** button. The analysis grid appears in the **3D Editor** window.

Go to the **Calculate** menu and select the **Solar Access Analysis** command.

In the wizard, select Incident Solar Radiation option. Click Next
For the calculation period, select For Current Day. Click Next
For Period-based Values, select Average Daily Values and click Next
On the next wizard screen, select the Analysis Grid option. Click Next.
On the Summary page, confirm the selected settings and then click Ok.
Ecotect calculates the insolation levels over the analysis grid.





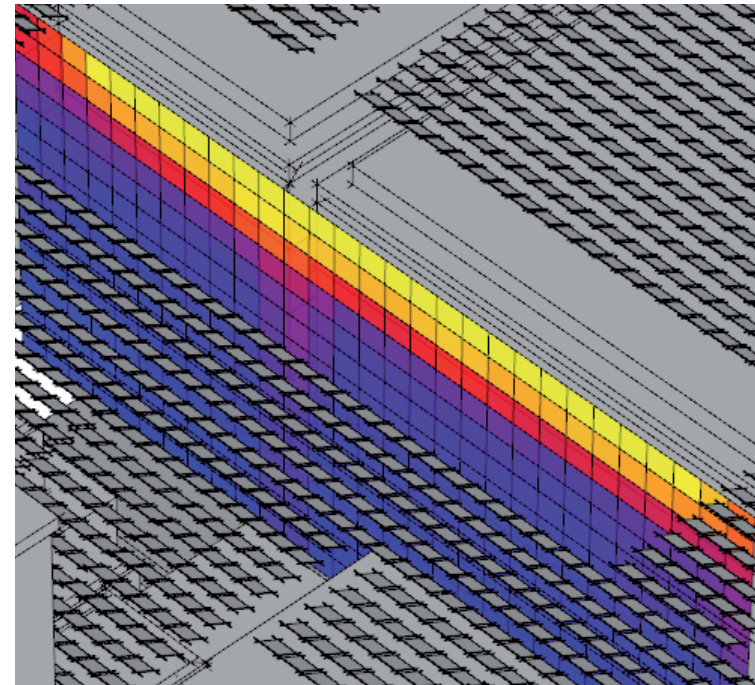
INSOLATION ANALYSIS TOTAL RADIATION

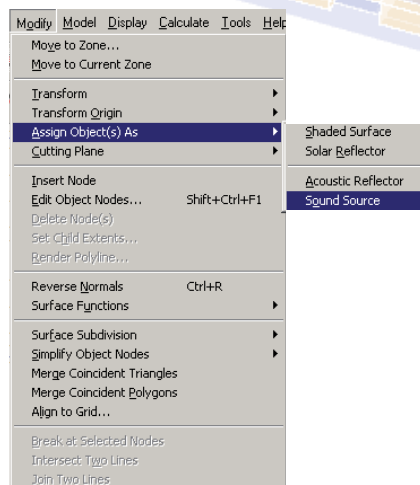
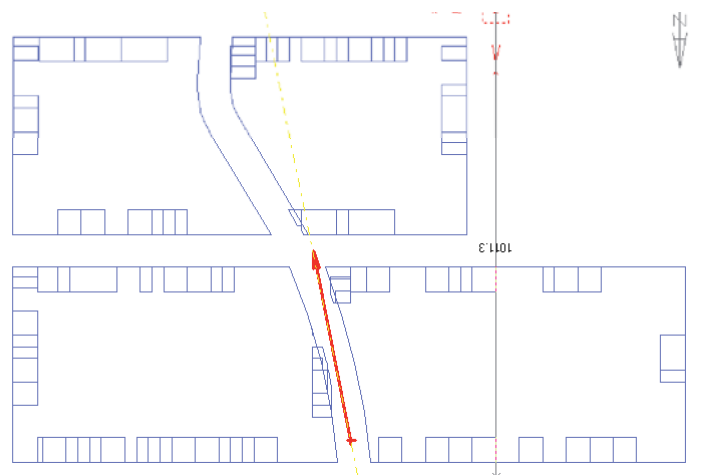
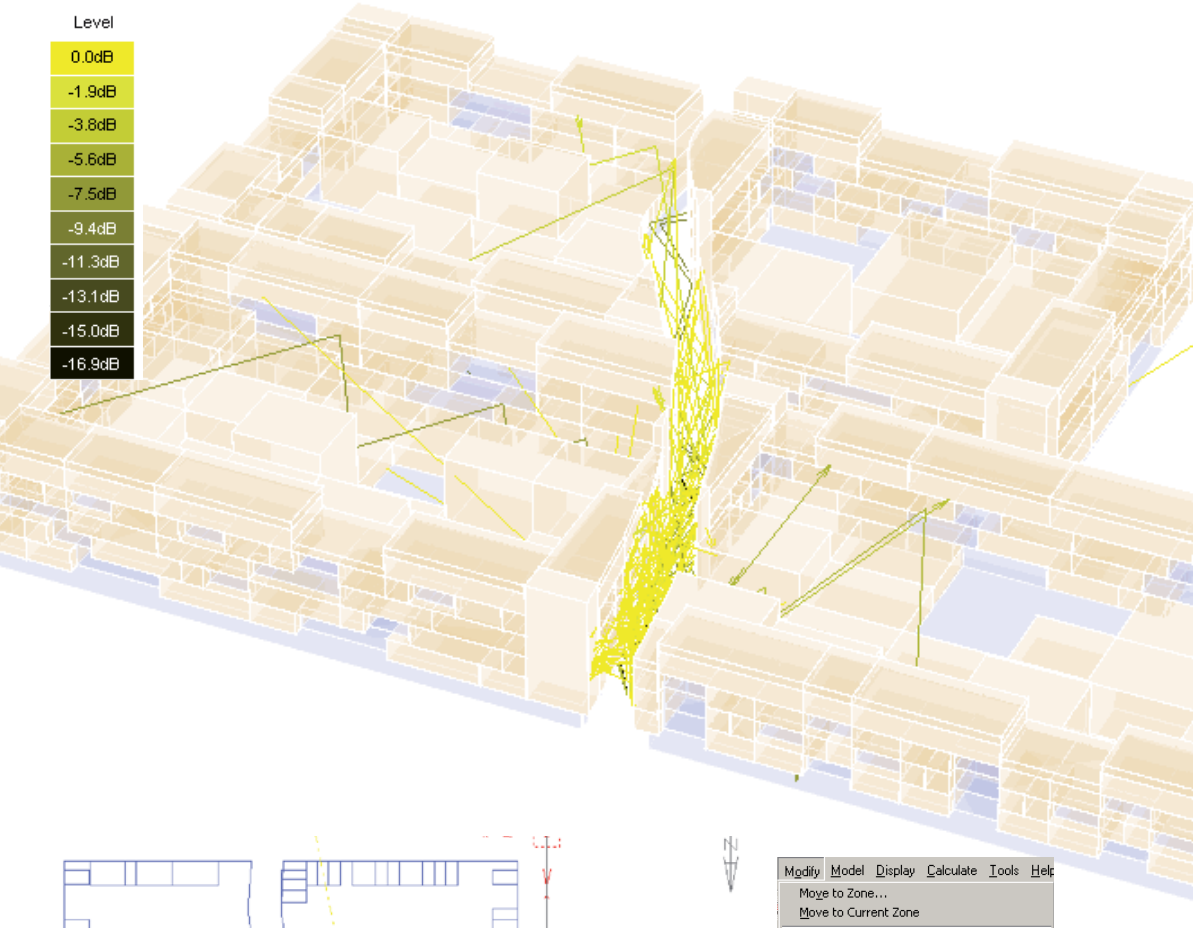
Using Ecotect™ you can calculate the visibility of selected objects from specific locations in the model. This type of analysis can be used to determine how much of a proposed development is visible from another building facade.

Step-by-step Instructions

Ecotect™ calculates the visibility of the selected objects from the building facade. Results are **displayed** as square metres of visible area over the analysis grid.

Use the options under the Analysis Grid panel to manipulate the display of the analysis grid. For example, to display contours over the analysis grid, select the Show Contour Lines checkbox.





ACOUSTIC ANALYSIS SPRAYING ACOUSTIC RAYS OR PARTICLES

Step-by-step Instructions

1. Select the Calculate » Linked Acoustic Rays... item in the main menu to display the Linked Acoustic Rays dialog.
2. Make sure the Reflections value is set to 2 and that the Only Test Objects Tagged as Acoustic Reflectors item is checked, then click the OK button.

To interact with the rays:

Use your mouse to select the source vector.

Move your mouse over the top of it then, when the cursor changes to a small black arrow, click the left mouse button.

Now nudge the source towards the front of the stage by pressing the X key. You can also use Shift+X to move it backwards.

To interactively move model geometry:

Use your mouse to select the reflector surface.

Move your mouse over any line that belongs to it and then, when the cursor changes to a small black arrow, click the left mouse button.

Now nudge the reflector downwards by using the **Shift+Z** key.

You can also use just Z to move it back upwards. You can also adjust the angle of the reflector, again using the Z and **Shift+Z** keys.

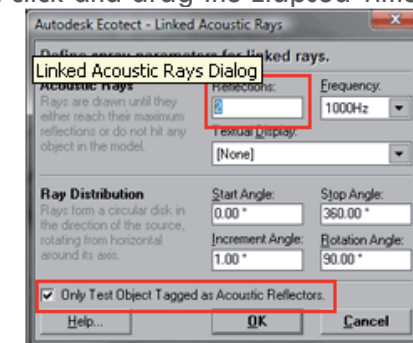
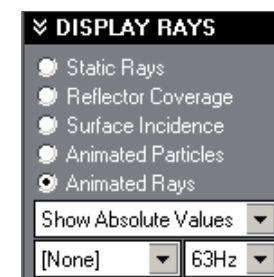
Spraying Acoustic Particles

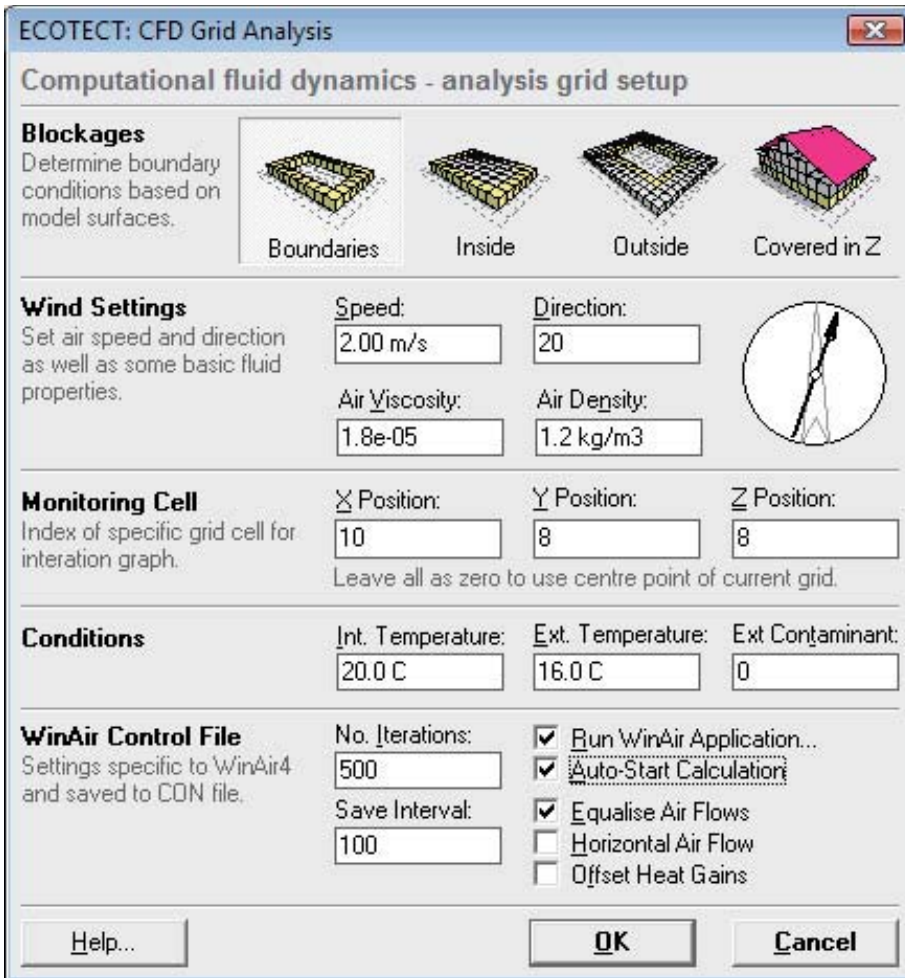
Select the Play (>) button in the ANIMATE RAYS section of the Rays & Particles panel.

You can quit the animation by either clicking the same button again or using the Escape key.

When it is static, you can also use the Mouse Wheel to interactively move backwards and forwards in time - try it.

Alternatively, you can click and drag the Elapsed Time track bar in the ANIMATE RAYS section.





CFD ANALYSES USING WINAIR4

Step-by-step Instructions

1. Download **WinAir** (<http://proxyarch.com/uploads/WinAir.zip>)
2. Install WinAir to: **c:\WinAir\winAIR4.exe.**

- Fit our analysis grid to this object
- Adjust Grid Extents

Use manipulator buttons to situate the grid on the ground and make sure it is large enough in the Z dimension to allow for air to circulate over. You also need to provide a good amount of space beyond your objects for air to circulate past.

- Grid Management

Change 'Number of Cells' to something reasonable - a higher cell number in each direction will give you better results, but cause the calculations to take longer. In general, you can multiple the three values to get a total cell count. Anything higher than 50,000 or so will be prohibitively high for calc times.

- Go to the Calculations Menu at bottom right (analysis grid panel)

toggle CFD cell blockages, perform calculations... perimeters

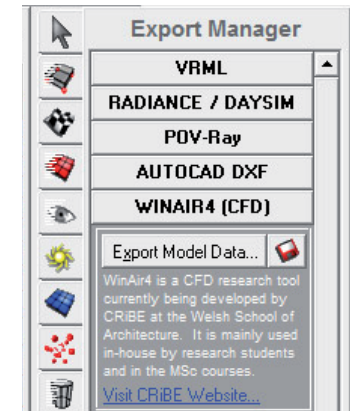
- Change panels, from the **analysis grid** panel to the **export manager** panel.

Select Winair4

Select Export Model data

Match your settings to the image on the right

- o Make sure to input a wind speed and direction
- o Make sure to toggle on 'Run Winair Applications...'
- and 'Auto-start calculation'
- o **THIS IS CRUCIAL** Before running, make sure winair is installed in c:\WinAir - also, make sure you have **set your computer clock to 2006**, so that you will not get the trial expiration error in winair!
- o Run!



CFD ANALYSES USING WINAIR4

Step-by-step Instructions

- Winair should appear, and you should see a graph plotting similar to the image below. When the graph levels out, it will return you to ecotect.

- To visualize results:

Under the analysis grid panel (Rightmost window)...

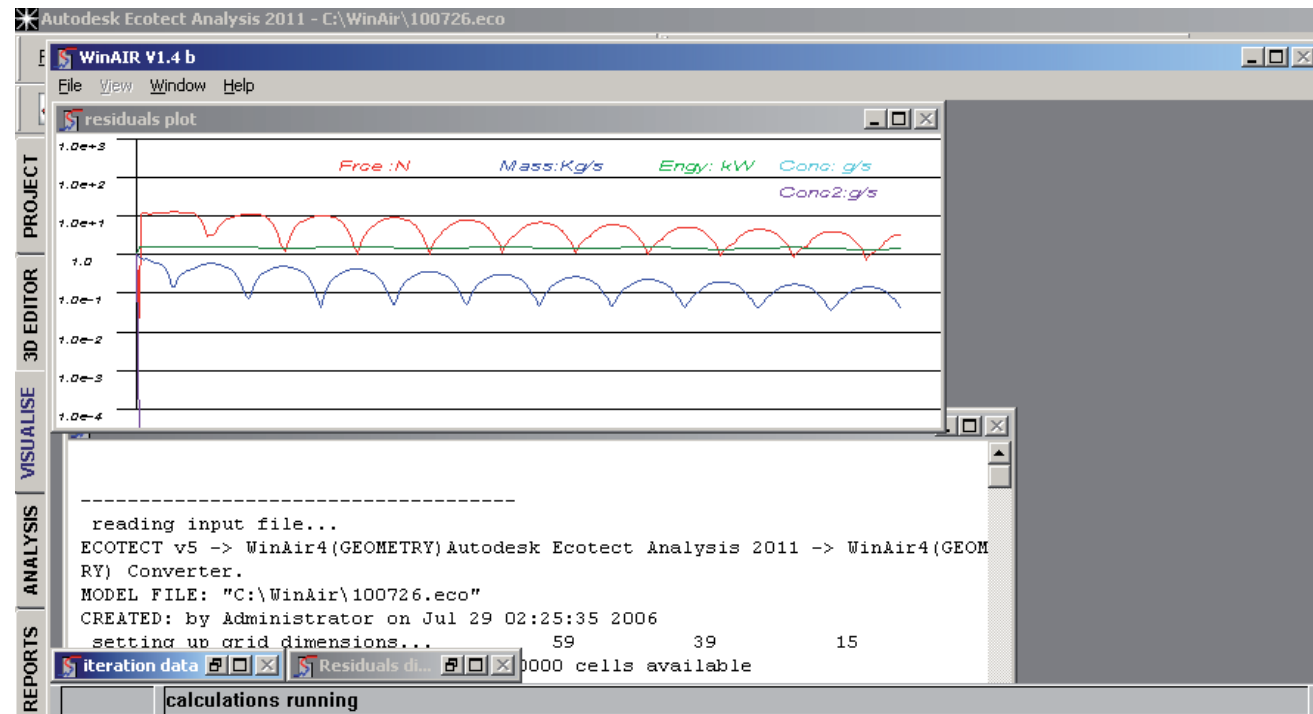
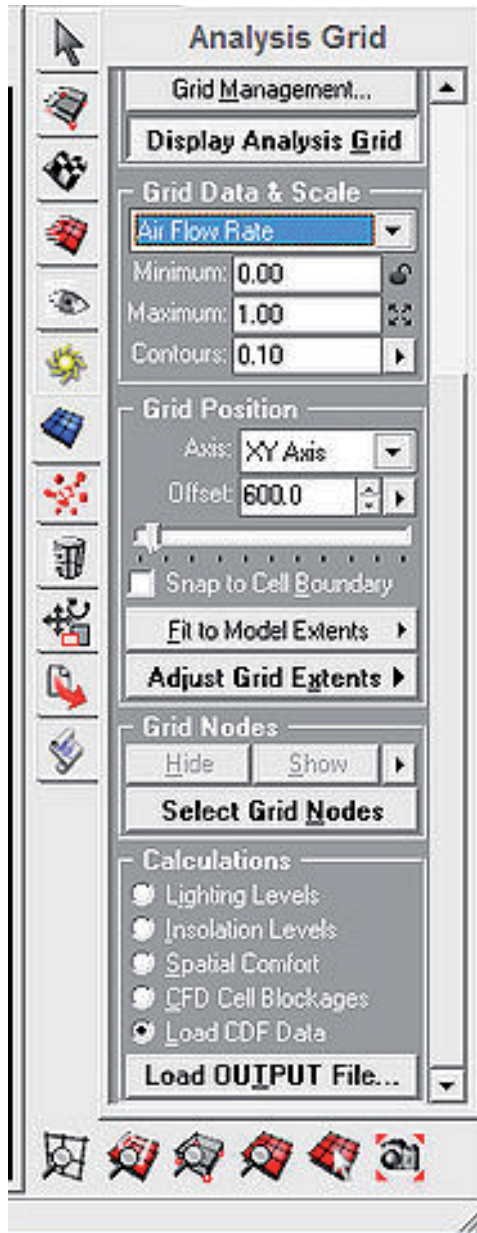
Under Calculations

Load CFD data

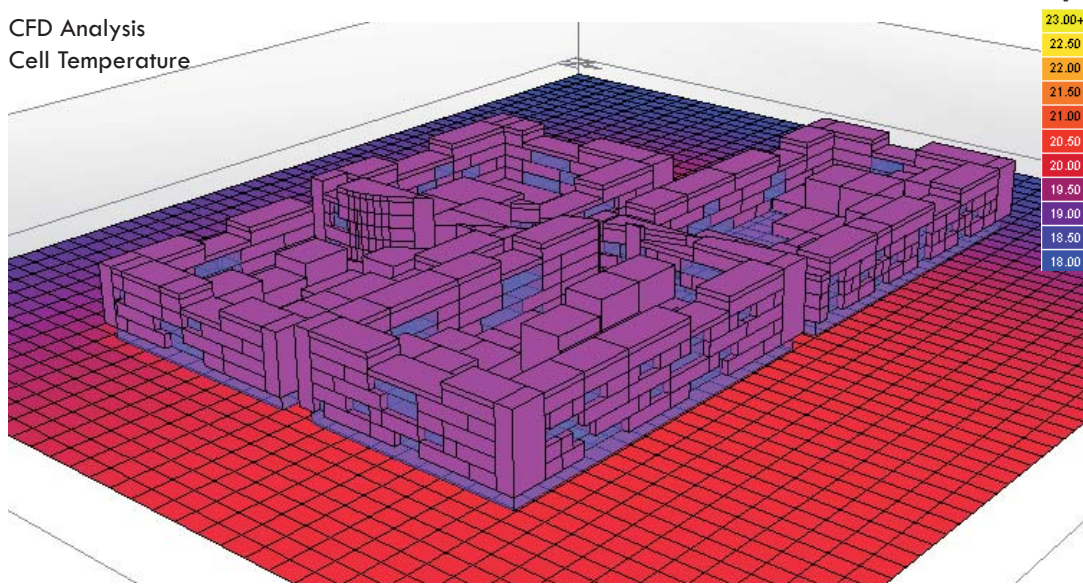
load output files - the file we want to load is **OUTPUT** in the winair director

It will default to showing you cell temperature. We are more interesting in Air Flow rate. Go to Grid Data & Scale and select this metric.

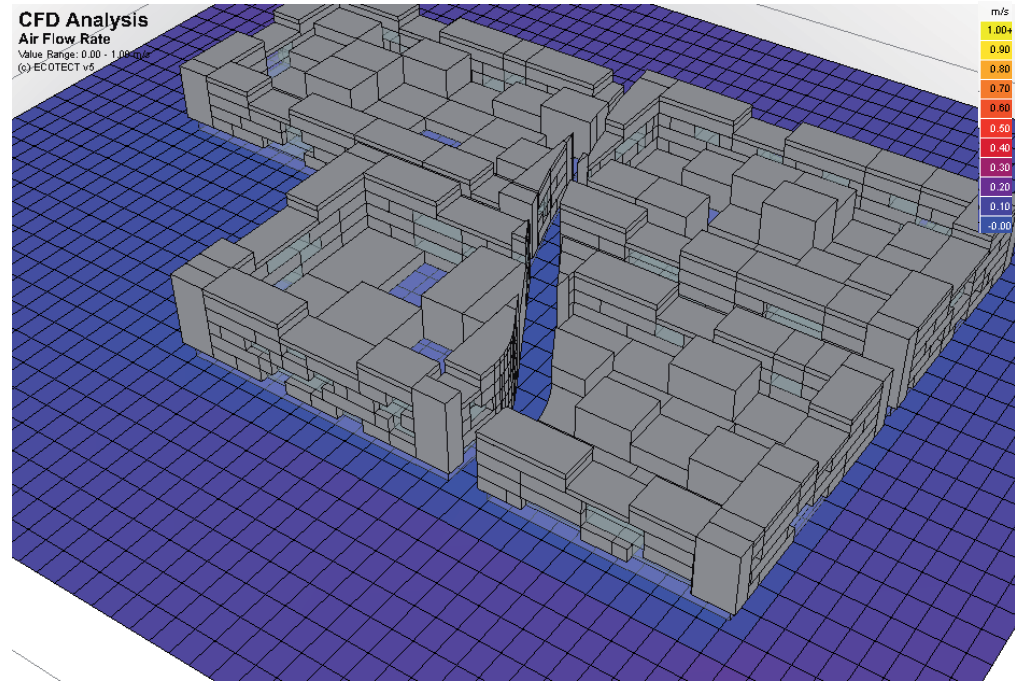
Adjust Grid Offset to see depth of simulation



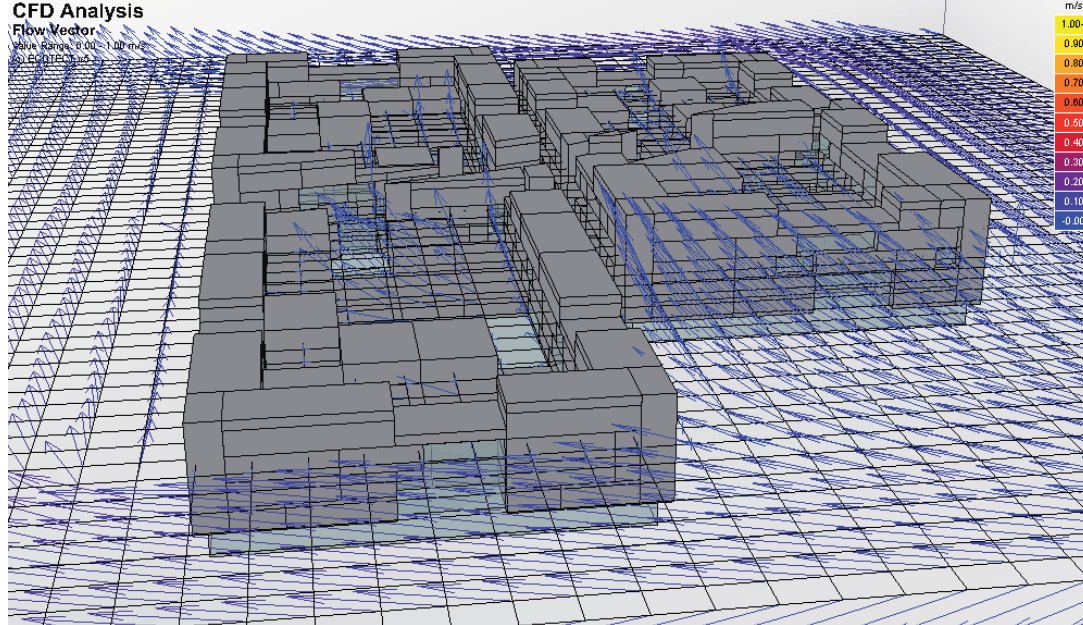
CFD Analysis
Cell Temperature



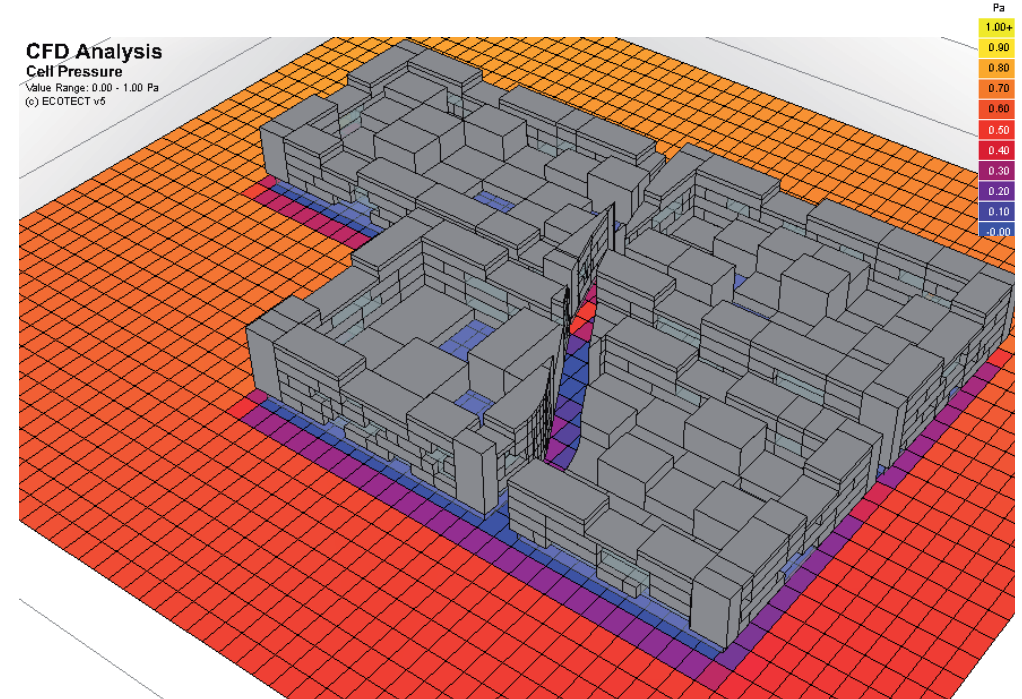
CFD Analysis
Air Flow Rate



CFD Analysis
Flow Vector



CFD Analysis
Cell Pressure



DESIGN BUILDER 3-D SFD WIND FLOW SIMULATION

Computational Fluid Dynamics (CFD) analysis is used to answer design questions such as:

- * What sort of temperature distribution could I expect in an atrium under clear sky summer conditions?
- * Will the arrangement of supply diffusers provide adequate air movement?
- * Is the location of the radiators going to provide good comfort conditions?
- * Will natural ventilation provide occupants with adequate comfort in the summer?
- * What effect will the shape of the building have on local wind velocity?
- * Are there any regions of stale air inside the building?

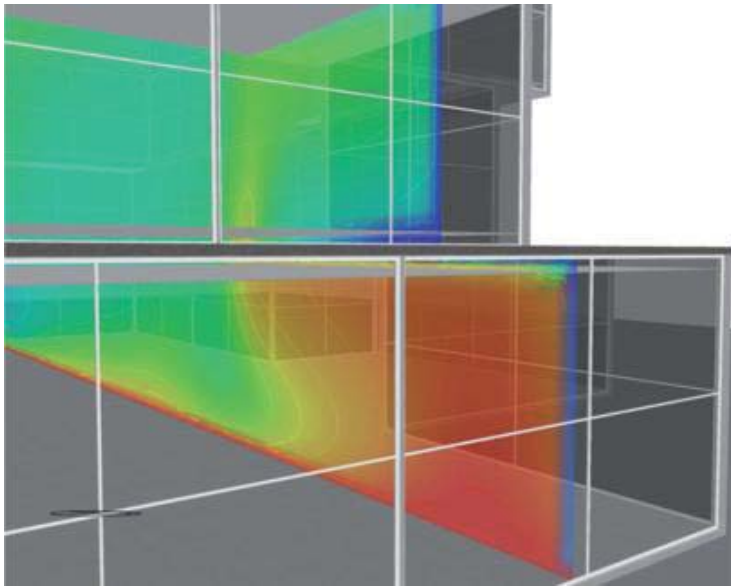
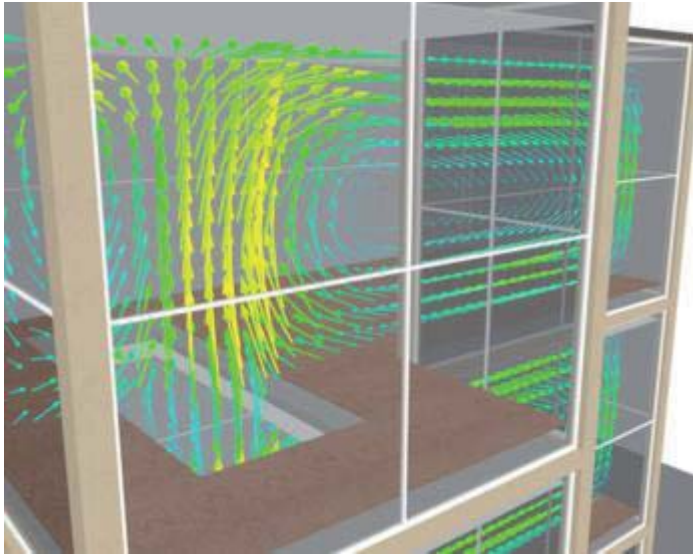
DesignBuilder 3-D CFD

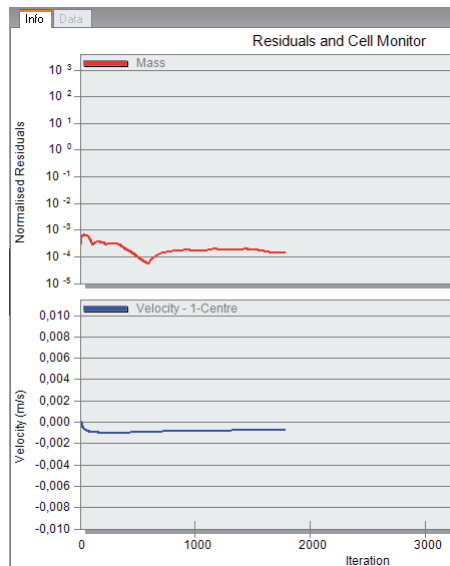
DesignBuilder CFD has been especially designed to provide data on airflow and temperature distribution in and around buildings using the same methods as the general purpose pure CFD packages but at a fraction of the cost and without the need for specialist knowledge.

Using conventional CFD packages for building airflow analysis can be a time consuming task requiring very careful attention to setting up the correct geometry and boundary conditions. Using CFD in DesignBuilder simplifies this process hugely by automatically providing the geometry and boundary conditions. Temperatures, heat flows and flow rates previously calculated by EnergyPlus can be seamlessly used to provide boundary conditions simply by specifying the time/date of the CFD analysis.

Some of the key DesignBuilder CFD features:

- * 3-D CFD grids are generated automatically from model geometry and boundary conditions to promote optimal solution convergence.
- * The CFD engine has been developed around the SIMPLER algorithm, which belongs to one of the most widely used families of CFD solution methods. Turbulence can be modelled using the widely researched and documented k-e model and there are plans to introduce additional models for specific applications.
- * The interface incorporates tools to enable a wide range of boundary conditions such as supply diffusers, extracts, temperature patches, etc. to be assigned to room surfaces. A component library is also provided to enable radiators, fan-coil units, furniture, occupants, etc. to be located anywhere within the model and automatically incorporated within the analysis.
- * Boundary conditions can be automatically assigned from a previous EnergyPlus simulation.
- * 3-D CFD results are displayed using the DesignBuilder OpenGL graphics engine providing impressive, easy-to-interpret images and movies of velocity vectors, temperature contours, iso-surfaces, particle streams, etc.

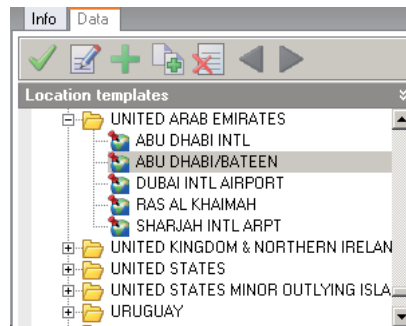




Weather Data Converter

Use this dialogue to convert weather data to and from a range of file formats. Supported formats are:

- EnergyPlus data files (.epw)
- EnergyPlus 'comma separated values' files (.csv)
- TMY2 data files (.tmy2 or .tmy)
- TMY data files (.tmy)
- IWEC data files (.iwec or .iwc)
- Samson data files (.samson or .dat)
- WYEC2 data files (.wyec2 or .wy2)
- DOE-2 formatted data files (.fmt or .txt)
- ESP-r formatted data files (.esp-r or .clm)
- BLAST ASCII formatted data files (.blast or .asc)
- Ecotect WEA weather file (.wea)



Edit Site Layout

Use this screen to create new buildings and change the layout of existing buildings on the site.

- [Add building to the site](#)
- [Import 2-D drawing file](#)
- [Import 3-D CAD model](#)

Location

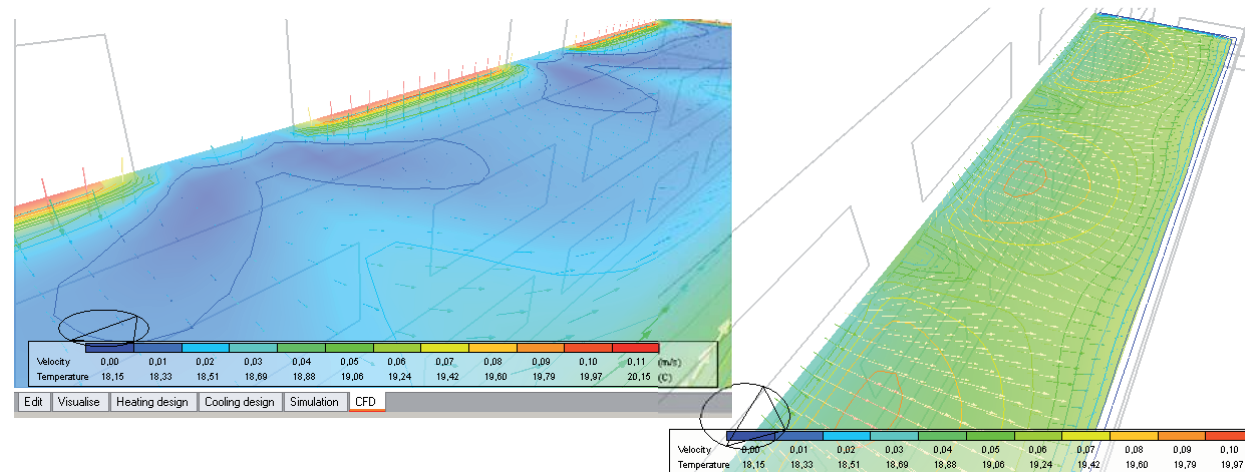
You can edit the location and associated weather data for the site by clicking on the Location tab

- [Load location from template](#)

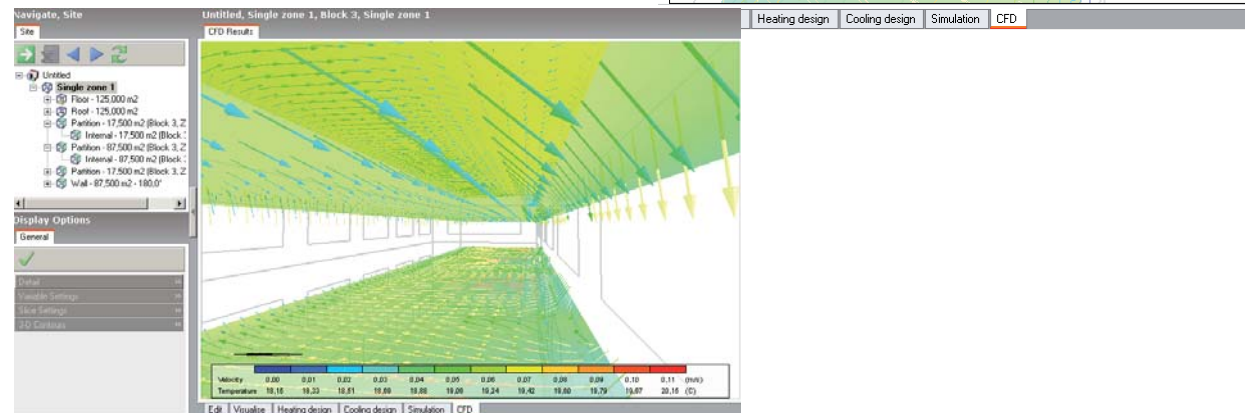
DESIGN BUILDR 3-D SFD AIR FLOW SIMULATION

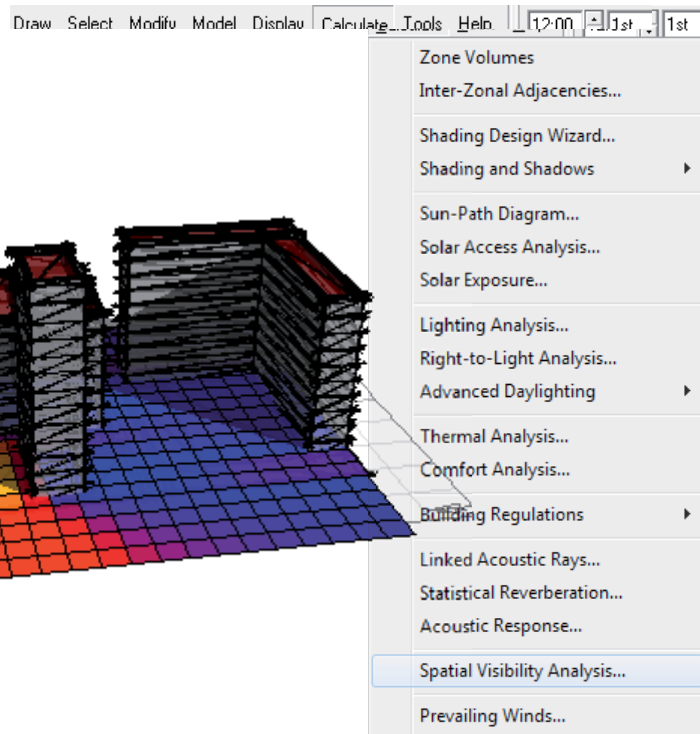
Important:

Import Format: CAD 3D, weather data can be imported from a number of programs, e.g. from ECOTECT Software



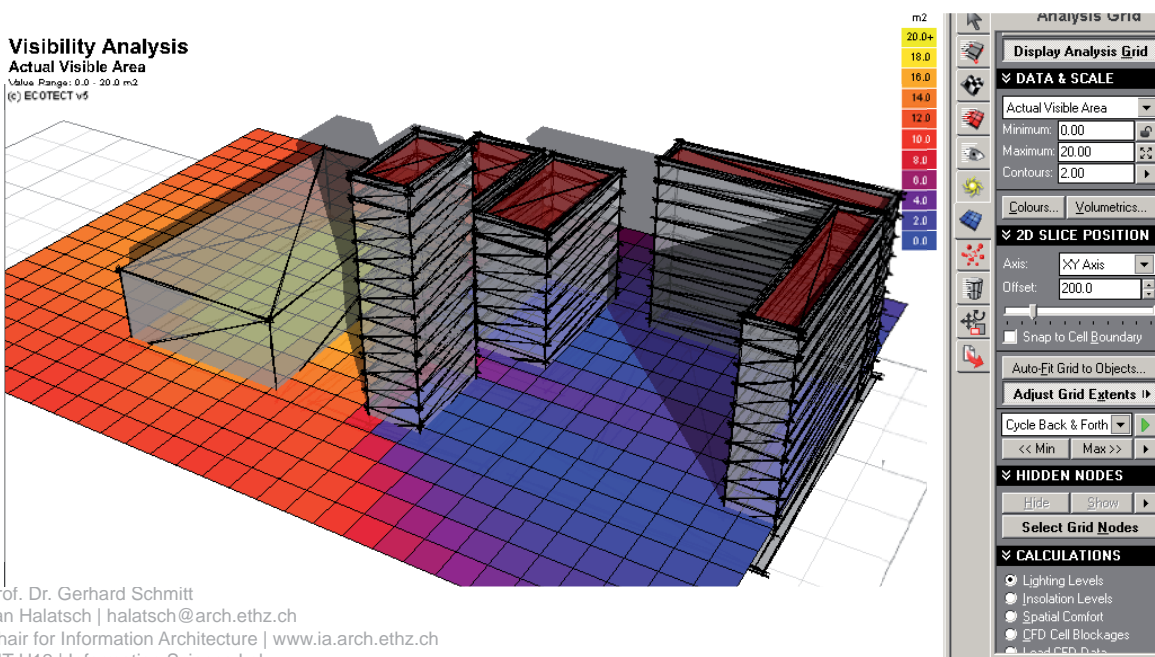
DesignBuilder Data				
Recent Files Component Libraries Template Libraries				
Name	Folder	Size (KB)	Last Modified	Extension
DesignBuilder templates				
Courtyard with VAV Example	C:\Documents and Settings\All Users\Application Data\DesignBuilder\Templates	868	09.04.2010 14:11:38	DesignBuilder templates
Dehumidification example	C:\Documents and Settings\All Users...	1049	15.06.2009 14:02:26	DesignBuilder templates
House Example 1	C:\Documents and Settings\All Users...	929	19.02.2009 15:59:10	DesignBuilder templates
CFD Internal Analysis Exa...	C:\Documents and Settings\All Users...	1113	17.02.2009 14:20:20	DesignBuilder templates
Parametric Simulation Exa...	C:\Documents and Settings\All Users...	1028	29.01.2009 02:17:40	DesignBuilder templates
Simple HVAC night cooling	C:\Documents and Settings\All Users...	1654	12.01.2009 04:44:26	DesignBuilder templates
Atrium example base	C:\Documents and Settings\All Users...	1446	12.01.2009 04:25:20	DesignBuilder templates
VAV with night cooling	C:\Documents and Settings\All Users...	1503	08.12.2008 17:18:14	DesignBuilder templates
Mixed Mode Example	C:\Documents and Settings\All Users...	1835	24.11.2008 00:48:14	DesignBuilder templates
CFD External Analysis Exa...	C:\Documents and Settings\All Users...	1011	24.11.2008 00:36:48	DesignBuilder templates
Zone Multiplier Example	C:\Documents and Settings\All Users...	1733	01.11.2008 14:41:22	DesignBuilder templates
Green roof example	C:\Documents and Settings\All Users...	1024	19.10.2008 11:34:52	DesignBuilder templates
Model Geometry Example	C:\Documents and Settings\All Users...	872	03.03.2008 16:23:56	DesignBuilder templates
Single Zone Example	C:\Documents and Settings\All Users...	676	04.12.2007 13:21:58	DesignBuilder templates
Underfloor Heating Example	C:\Documents and Settings\All Users...	664	04.12.2007 13:19:32	DesignBuilder templates
Mech Vent with Preheat	C:\Documents and Settings\All Users...	667	04.12.2007 13:18:24	DesignBuilder templates
Atrium Example with Calc...	C:\Documents and Settings\All Users...	639	04.12.2007 13:16:20	DesignBuilder templates
Trombe Wall Example	C:\Documents and Settings\All Users...	794	04.12.2007 13:11:38	DesignBuilder templates
Zone vs System Plenums ...	C:\Documents and Settings\All Users...	808	04.12.2007 13:10:26	DesignBuilder templates





Visibility Analysis
Percent Exposed Objs
Value Range: 0.0 - 100.0 %
(c) ECOTECT v5

Visibility Analysis
Actual Visible Area
Value Range: 0.0 - 20.0 m2
(c) ECOTECT v5



VISIBILITY ANALYSIS

Using Ecotect™ you can calculate the visibility of selected objects from specific locations in the model. This type of analysis can be used to determine how much of a proposed development is visible from another building facade.

Step-by-step Instructions

Go to the Analysis Grid panel. Under the Grid Settings section, click the **Display Analysis Grid** button. The analysis grid is displayed in the model. The visibility of the proposed development will be calculated over the analysis grid for the facade of this building.

Go to the Select » By Zone... menu command. A dialog box appears listing all the zones in the current model. Select the ExampleSite zone. Click Ok. Or select manually a surface/object you want to analyse, by selecting it in the 3DEditor panel.

Go to the **Calculate** menu and select **Spatial Visibility Analysis**. In the wizard, select **Visibility of Selected Objects**, and then click Next.

The wizard screen confirms that you have selected objects to use with the Spatial Visibility Analysis. Click **Next**.

To configure how partial visibility of objects will be calculated, click the Suggest a Reasonable Sample Size button. Ecotect™ then automatically sets the Sampling Grid Size. Click **Next**.

Confirm your selected settings on the Summary Page, and then click **OK** to proceed.

Ecotect™ calculates the visibility of the selected objects from the building facade. Results are displayed as square metres of visible area over the analysis grid.

Use the options under the Analysis Grid panel to manipulate the display of the analysis grid. For example, to display contours over the analysis grid, select the Show Contour Lines checkbox.