VELUX Energy and Indoor Climate Visualizer 3.0
User guide

April 2016

Contents

General use

Version

VELUX Energy and Indoor Climate Visualizer is available in two versions, a standard and a pro version. The standard version gives access to a range of pre-defined typical geometries, whereas the pro version gives you the possibility of changing the size of a generic building or to import geometry from various file formats. For more information about the two versions, see: http://eic.velux.com.

The version type can be found by selecting *About EIC Visualizer* from the *Help* menu. It will say 'Pro' or nothing.

Figure 1 *About* dialogue box

Starting a new case

A new case is created when you select *New* from the *File* menu. Several cases can be open at the same time. The open case windows are managed from the *Window* menu.

Save

You can save the current case by selecting *Save* from the *File* menu. You can also choose *Save as…* to save into a new file.

Open

Choose *Open* from the *File* menu to open an old case. Browse to the folder of your case and select the file. Finally click the *Open* button.

The most recent opened cases will be available in the *File* menu.

Help and support

Pressing F1 or choosing *Help* will open the User guide. The user guide will be opened automatically in the section corresponding to the tab, which is active when F1 is pressed.

The *About* dialogue box contains information about tool version and contact information about the VELUX EIC Visualizer team.

For further technical information, download the technical background document on the website.

Automatic check for updates

When the EIC Visualizer starts, it automatically checks if an updated version is available from the EIC Visualizer server via the internet. If an update is available, the user is asked if the update should be downloaded and installed.

The use of a firewall might conflict with the automatic update function. Please contact your local network responsible for further details.

Keyboard shortcuts

Ctrl + s:	Save current file
Ctrl + o:	Open a project
Ctrl + n:	New project
Ctrl + F4:	Close current project

Geometry

This tab is active when a case is opened. Here the geometry and location of the building are specified. All input data fields have default values. When you change a value, the 3D model is updated accordingly.

The colours are default and do not represent specific construction materials used. The 3D model shows a simple representation of window insertions. For roof windows, the calculations are based on installation principles and lining configurations as recommended by the VELUX Group.

Building geometry (standard)

Note: In the pro version, click *Simple Geometry* to change to the fixed geometries.

Geometry: Select one of the default house types:

1-storey single-family house with sloped ceiling

1-storey single-family house with flat ceiling

1½-storey single-family house

Roof space on apartment building

End wall configuration: Select whether the house is free-standing or part of a row of buildings. A house in a row will use less energy than a free-standing house, because no energy is lost through the walls that connects to the rest of the building.

If the building is defined as a row house or an attic, the neighbouring or underlying building will be presented by a transparent, grey shape.

Size: For each house, one of three default sizes can be selected. Internal measures are used, i.e. internal distances between walls.

You should choose the building geometry, which is closest to that of the actual building you are evaluating. An irregular, e.g. L-shaped building can be evaluated by selecting the rectangular EIC Visualizer model representation. The building size with an area closest to the specific design should be selected. Remember to take into consideration the location of the windows in the building (north/south/east/west). The simulator will produce results, which are well-suited for comparing one case with another, i.e. the addition of a window, even if there are

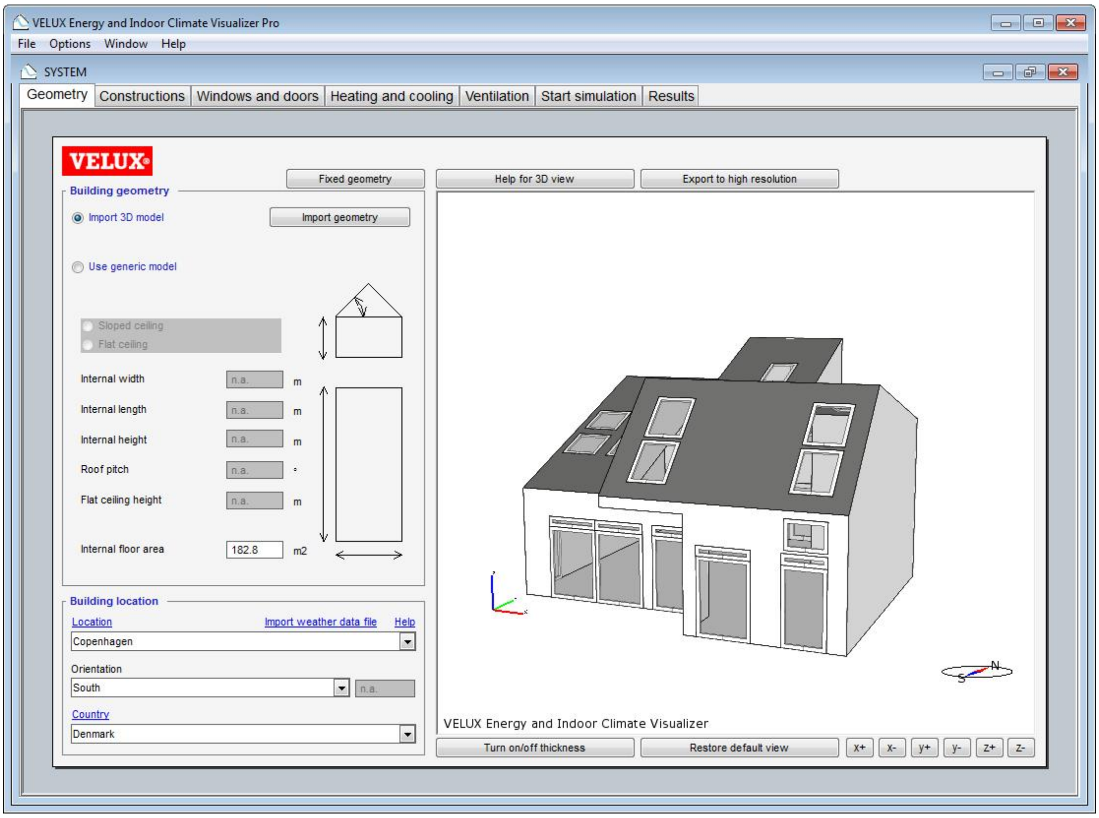


Figure 2 Geometry tab from standard version

differences between the geometry of the EIC Visualizer model and the actual building's geometry (as long as they have a comparable net area).

Note: For more information about the fixed geometry of the building you can go to Geometry in Appendix

Alternatively, you can visit http://eic.velux.com and see how to get the pro version of the program, where it is possible to change the size of the generic models and import building geometry from various file formats.

Building geometry (pro version)

Generic model

Change the size of the generic model with the input boxes. Always state internal measures as shown in Figure .

The ceiling can be either sloped or flat. If flat ceiling is chosen, the roof windows will be modelled with light shafts with the same construction as the roof.

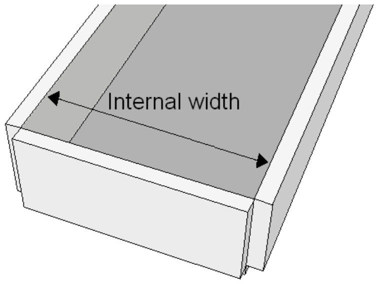


Figure 3 Measurements

The internal floor area is automatically calculated from the volume of the building. If a value is manually typed in, this value will override the calculated value.

Imported model

To import a model, select the *Import 3D model* radio button and click the *Import geometry* button. In the dialogue box, browse to your geometry file and click *open*.

The EIC Viz currently supports 3D Studio Max (3ds), AutoCAD 200X (dwg and dxf), Google SketchUp (skp), OBJ (obj) and VELUX Daylight Visualizer 2.5 exports (exp). See the

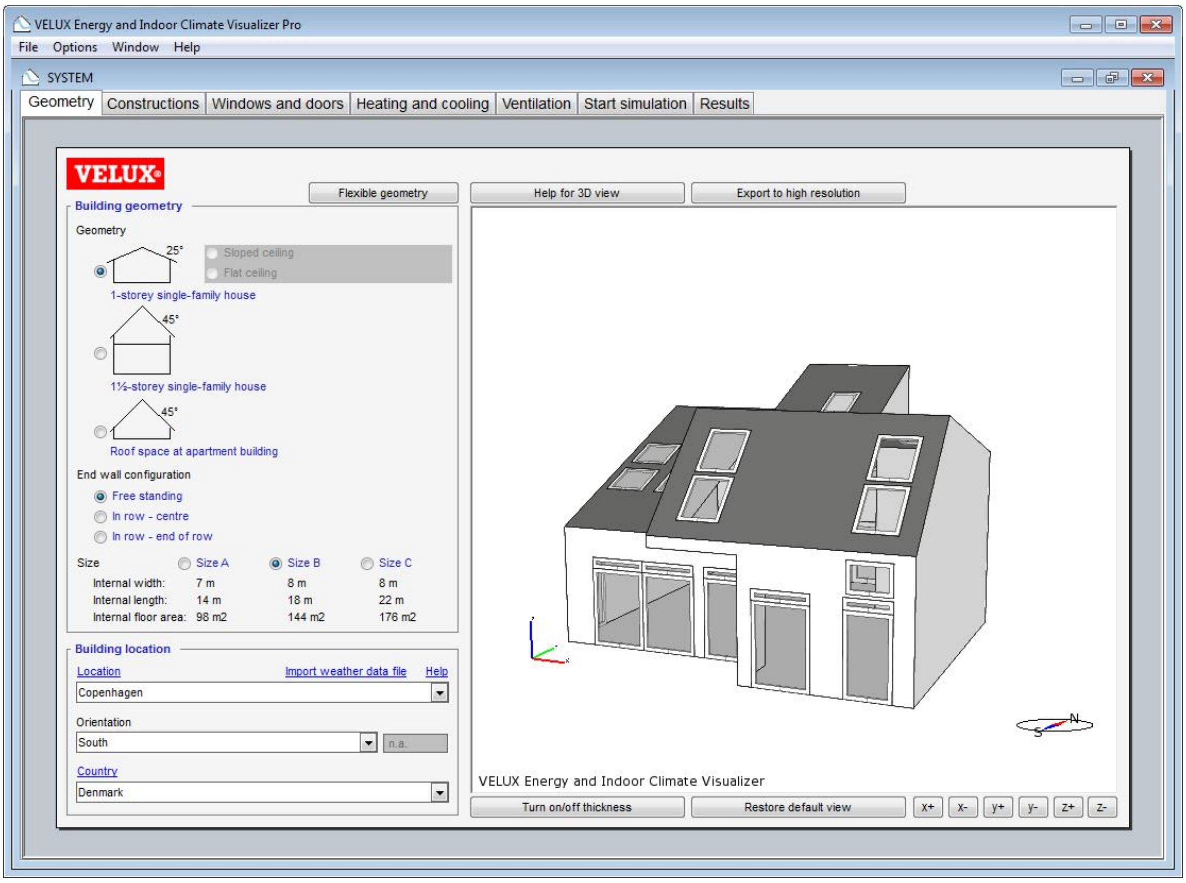


Figure 4 Geometry from the pro version

3D guidelines on http://eic.velux.com for more details on how to create 3D models.

Building location

Location: Choose the geographic location of the building. The list contains major cities from around the world and the most relevant city should be selected.

Orientation: Choose the orientation of the building. Major orientations can be selected from the list. The orientation is indicated by the compass in the 3D model.

If another orientation is needed, this can be made by choosing *Degrees from north* and typing the relevant orientation towards east.

Country: The country selection affects the currency used in the reports, energy price and the data sheet with pre-defined times for the program Energy Balance for controlling the sunscreening products.

The selection of country can be changed by pressing Country in the *Building location* box. This opens the Country dialogue box as seen in Figure 3. Data about currency and energy price for the selected country is specified here.

In this dialogue box, it is also possible to adjust the values in the program Energy Balance. It is possible to select the city that is geographically closest to the location of the building in order to optimise the effect of the program. The program Energy Balance is compatible with io-homecontrol® roller shutters and awning blinds. The program provides an optimised energy balance in the building by means of roller shutters and awning blinds. It will activate the sunscreening products in the daytime during summer and at night during the winter. This reduces the need for cooling in the summer time and the need for heating in the winter time. The Energy Balance program is particularly relevant in warm climates.

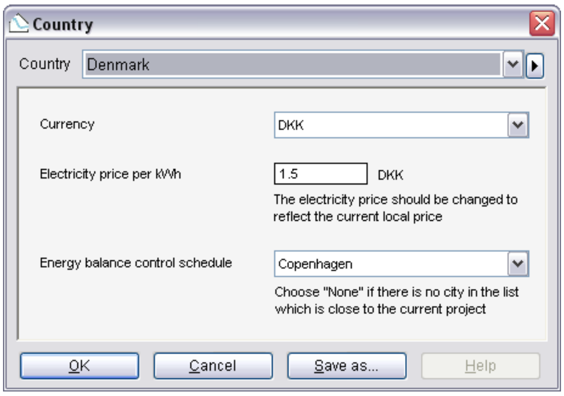


Figure 3 Country dialogue box

The program is defined for major cities, and the city closest to the actual location of the building should be selected. If no relevant city is available, select "None".

It is possible to enter a new country name, which will appear in the list of countries. This is done with the *Save as…* button. The country name will be saved with the current project, and will only be available within the current project.

Constructions

Here the different construction types of external walls, roof and floor are specified.

When you change a value, the 3D model is updated to reflect the thickness of the selected construction type if the feature *wall thickness* is turned on.

Building envelope

Any construction can be assigned to one of the four construction types. Click on the desired construction to select it and choose the relevant construction type from the radio buttons.

Note: The lowest horizontal construction will automatically be assigned as floor, vertical constructions as walls and sloped constructions as roof.

External wall construction: The wall construction of the house is selected from the items in the list.

Roof construction: The roof construction of the house is selected from the items in the list.

External floor construction: The external floor construction of the house is selected from the items in the list. This is the floor at the lower boundary of the house.

Adiabatic: The adiabatic construction type is used to represent a construction facing a heated room, for instance the walls dividing a row house. It is assumed that there will be no heat loss through an adiabatic construction.

Leakiness: The leakiness of the house is selected from the items in the list. Choose the construction period, which is most representative for the project.

Note: You can find more information about Leakiness under Constructions in Appendix

Editing walls, roofs and floors

It is possible to edit the definition of walls, roof and floor. This is done by clicking the blue, underlined titles. Clicking a link opens a dialogue box as shown in Figure 5. In most situations, the standard construction items will be sufficient.

The U-value and thickness of the construction are shown, as well as each individual layer of the construction. It is possible to change the thickness of each layer. When a value is changed, the U-value and thickness of the construction are updated accordingly.

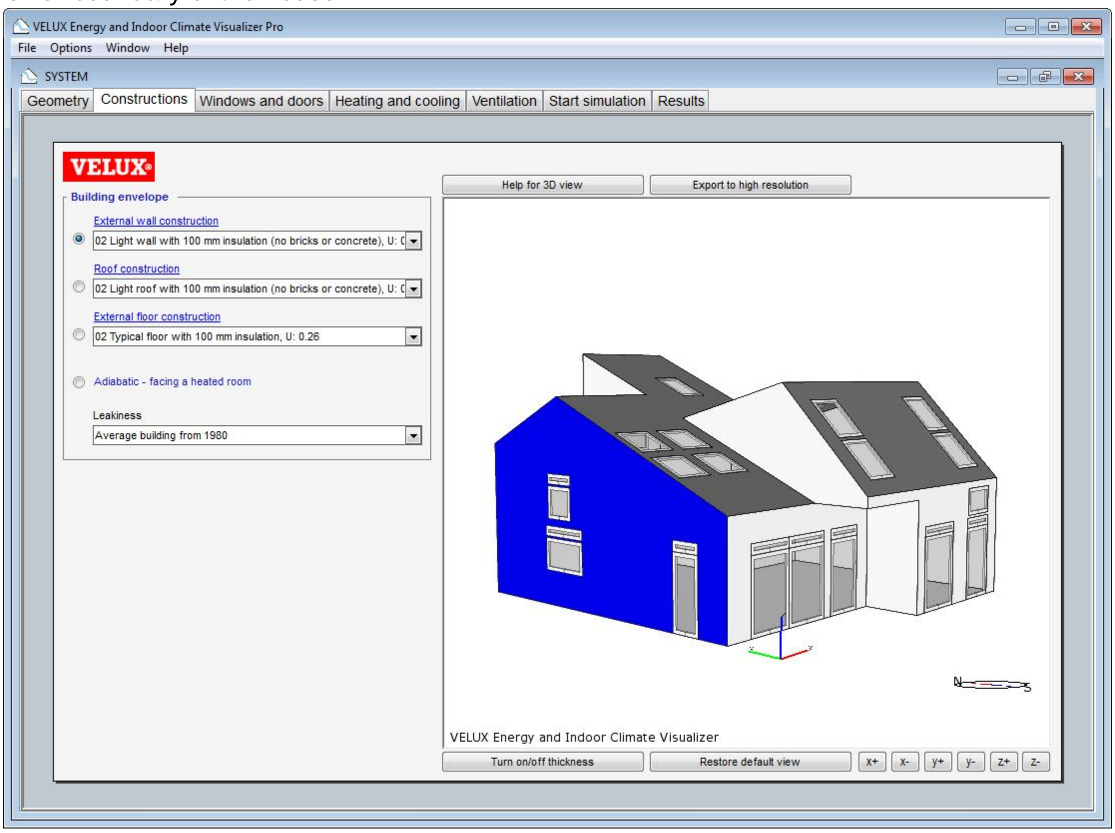


Figure 4 Constructions tab

It is also possible to change or add materials. Materials can be selected from the library of construction materials.

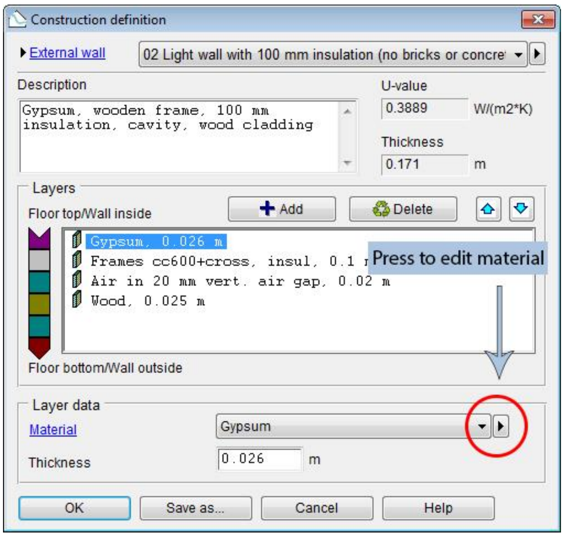


Figure 5 Dialogue box for editing walls, roofs or floors

The changed construction can be saved as a new construction type. The new construction will be saved in the current project, and will not be available for other projects.

Editing material properties

Material properties can be edited. This will only be necessary in rare cases. The Material dialogue box is accessed from the dialogue box for editing construction types.

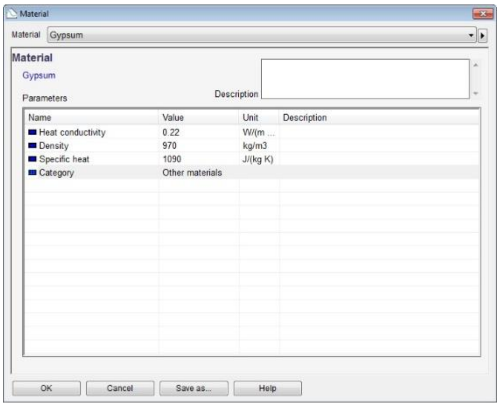


Figure 6 Dialogue box for editing construction materials

The heat conductivity, density and specific heat capacity of the material can be edited. The material can be assigned to a category.

Note: Under Constructions in Appendix you can find more information about advanced material properties settings

Windows and doors

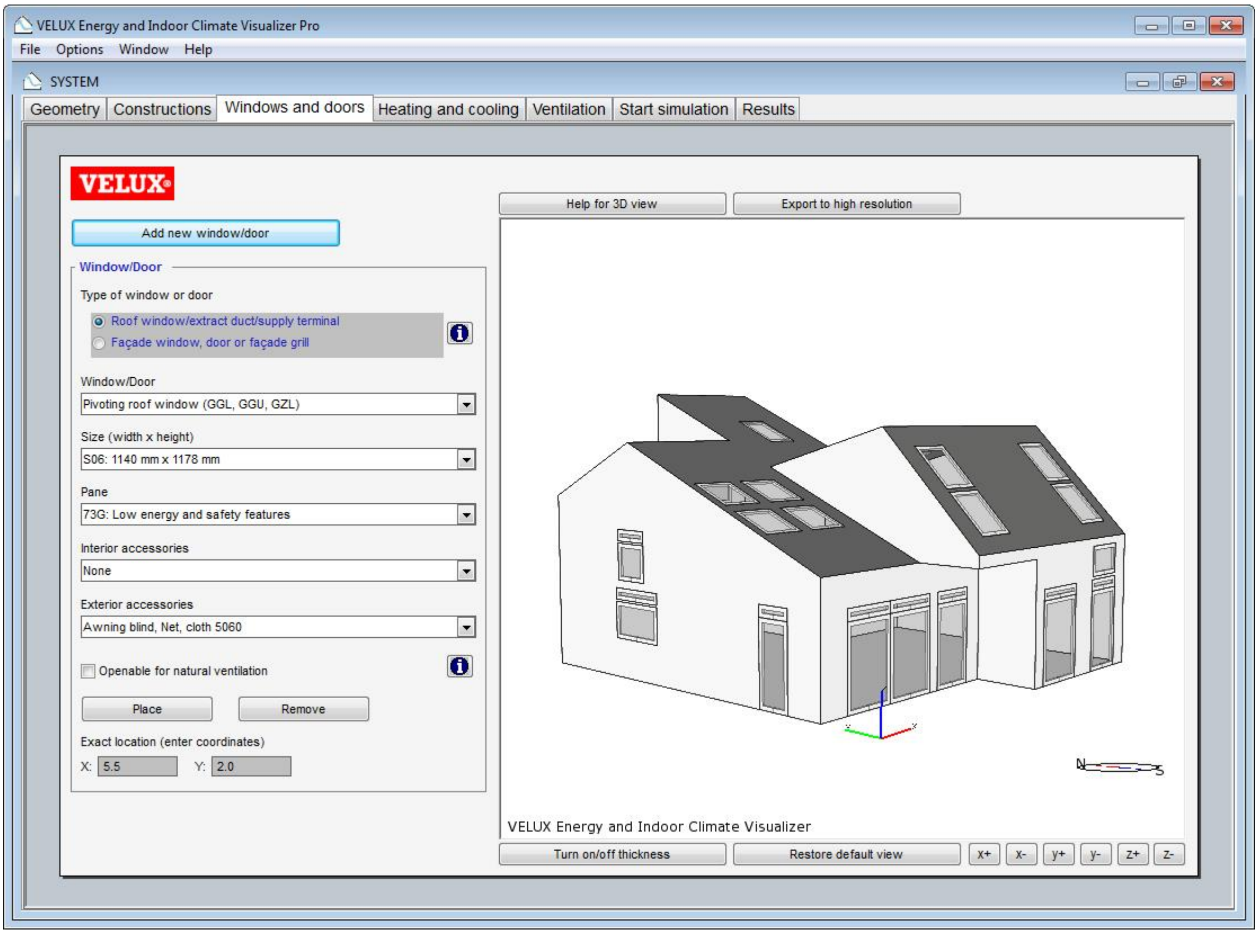


Figure 7 Windows and doors tab

At this tab, windows, doors and openings are added and edited. When you add or change a value, the 3D model is updated to reflect the change and show the window, door or opening.

To add a new window, door or opening, press the "Add new window/door" button. Then the settings of the element are selected. Finally, press the "Place" button. The new window, door or opening can then be placed in the model using the mouse. There is a visible 0.5 m x 0.5 m grid which the window snaps into.

The windows, doors and openings installed in the house can be duplicated using the 3D view. A window is selected by clicking on it. The selected window/door is shown in blue and the coordinate system of the wall is shown in green and red colours. To copy the window, press the button "Add new window/door" followed by pressing the "Place" button.

When a window is selected, the properties of the window are shown in the fields to the left of the 3D view. It is possible to change the properties at any time.

It is not possible to select more than one window at the time.

Window/door

Type of window or door: You can select a roof window/extract duct or a façade window, door or façade grill.

Window/Door: The type of window, door or opening is selected.

Façade windows can be openable or fixed. Façade windows can have a ventilation flap (or grill) built into the frame.

It is possible to define your own window type. Choose "Custom window/roof window" from the drop-down menu under Window/door. Window/door becomes clickable, which will open a dialogue box where the properties can be edited.

Custom façade window/roof window

The following values should be entered: U-value of the frame (Uf), the widths of the frames and the linear transmission loss (Psi) between window and roof. For roof windows the maximum opening area and effective height can also be edited. See the technical background document for more details on how this is done.

Note: In the Appendix, under Windows and doors you can find more detailed information about custom settings

Size: The size of window, door or opening is selected or typed in.

Pane: The type of pane for the window or door is selected.

It is possible to define the type of pane by choosing "Custom pane" in the drop-down menu under Pane. Pane becomes clickable, which will open a dialogue box where the properties can be edited.

The following values should be entered: g-value, tv, te, psi and U-value of the glazing. The U-value is needed for three slopes: 0°, 45° and 90°. Values in between are interpolated from these. If accessories are to be used, Fc, Ft, dUg of the products are needed. See more details on this in the technical background document.

Note: For more information about abovementioned parameters go to Windows and doors in Appendix

Accessories: If the window is installed with sunscreening products, select the products from the list.

Openable for natural ventilation: By selecting this option, it is defined which windows will be used for natural ventilation.

All selected windows will be controlled with the same control options; it is not possible to select different control options for different windows.

Place: When the "Place" button is pressed, the mouse can be used to decide where the window should be placed on the roof or façade.

Remove: The "Remove" button is used to delete the selected window/door.

Exact location: The exact coordinates of the selected window are shown in the boxes. The location can be changed by changing the coordinates if the window cannot be dragged with the mouse to the desired location. The coordinates are relative to the surface where the window is installed.

Include natural ventilation extract duct or façade grill

It is possible to add natural ventilation extract ducts or façade grills. These can be selected from the Window/door drop-down menu and can be placed and edited in the same way as windows and doors. The duct or grill will be open constantly. The airflow through ducts will depend on the diameter and height above roof ridge. The airflow through a façade grill depends on its width and height. Also on the leakiness of the house and the distribution and control of windows for natural ventilation have an influence.

Natural ventilation extract ducts and façade grills are common in bathrooms and kitchens.

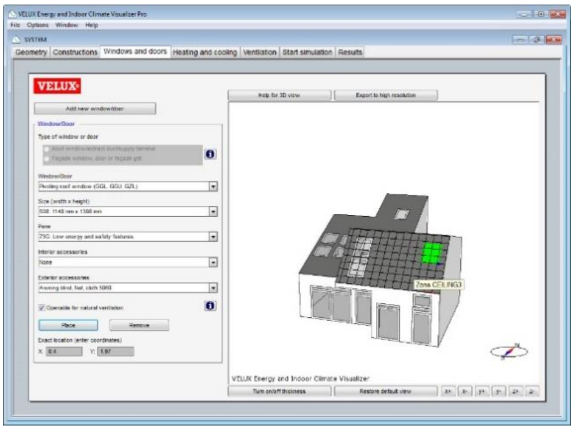
Extract duct

Diameter: The diameter of the duct.

Height above roof ridge: The distance from the roof ridge to the top of the duct. The lower end of the duct starts at the underside of the ceiling. The length of the duct is from the underside of the ceiling to the top of the duct.

Façade grill

Width and height: The dimensions of the free opening area of the grill. This area is less than the actual hole in the wall and is the total area minus the area of the physical grill.



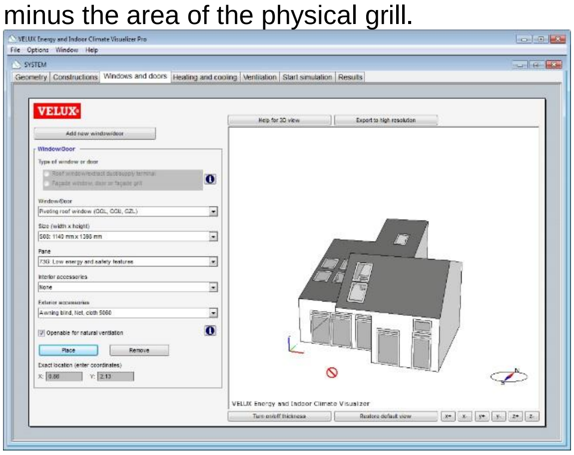


Figure 8 A green rectangle indicates a location where the window can be placed. The red "no-drop" cursor indicates a window location, which is not valid.

Heating and cooling

At this tab, the controls for heating, cooling and sunscreening are selected as well as the schedule for the occupants of the house.

People

Number of people: The number of people occupying the house is selected.

Schedule: State when the occupants will be in the house by choosing the schedule, which best describes their occupancy of the house. The schedule can be edited by pressing Schedule.

In the *Schedule* dialogue box, the blue line represents the occupancy of the house. 1.0 means that all occupants are in the house. If nobody is in the house, the graph should be 0.0. It can be 0.5 if half of the occupants in the house are at home.

The blue line is edited directly in the diagram by clicking and dragging parts of the line. The schedules for weekdays and weekends can be different depending on the check box selections.

Note: Under Heating and Cooling in the Appendix you can find information about advanced Schedule settings

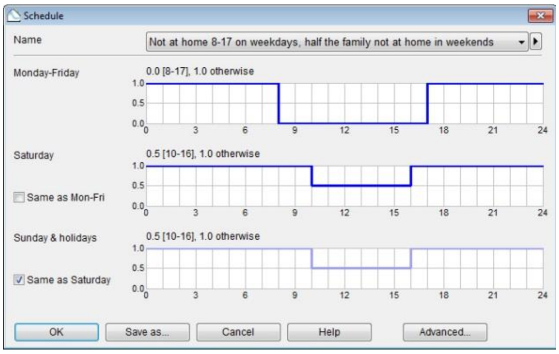


Figure 9 Dialogue box for editing occupancy schedule

Heating and cooling system

Heating set point: The set point for the heating system. The heating system will attempt to maintain the specified indoor air temperature.

Note: The systems will use the indoor air temperature as set point. The results will show the operative temperature which can be a bit different. For further explanation, see the DEIC Book.

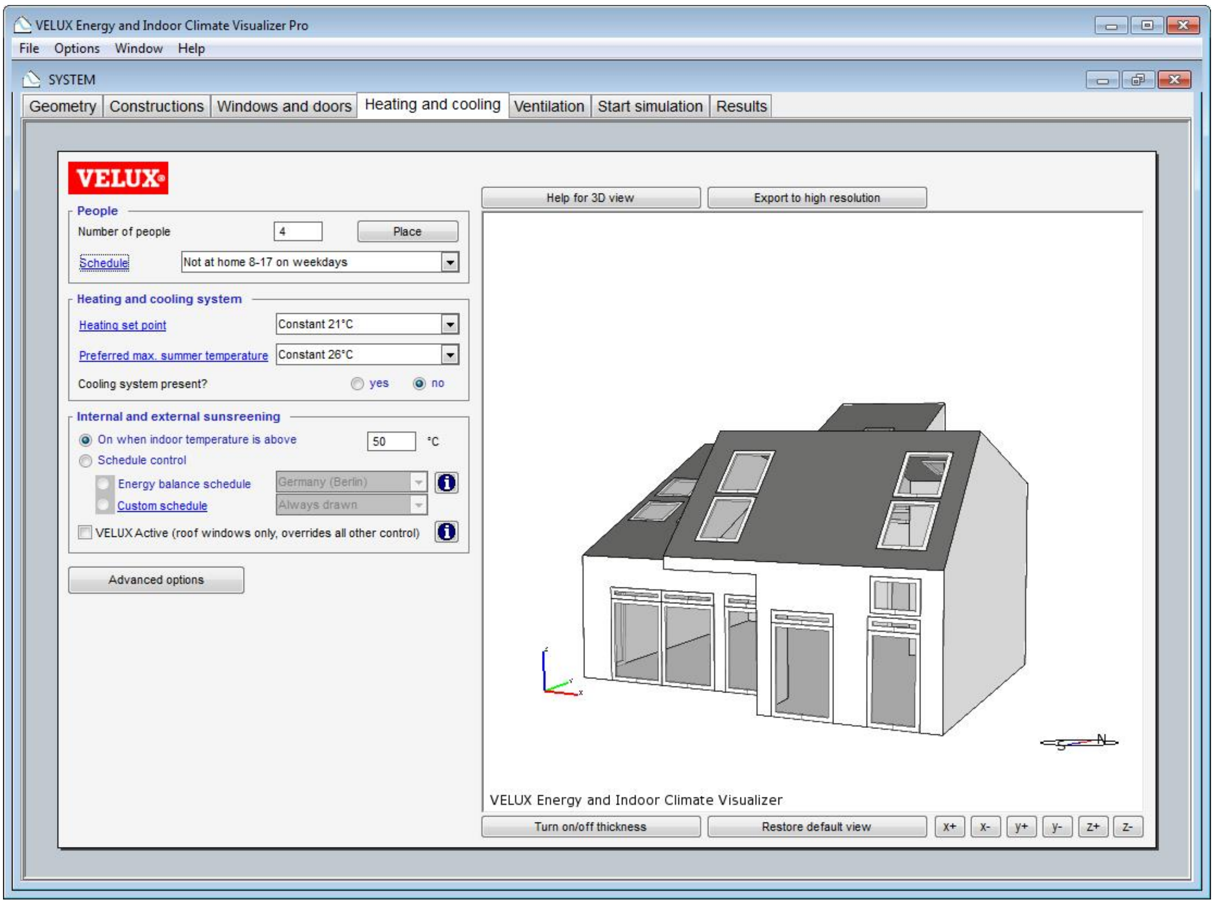


Figure 12 Heating and cooling tab

Preferred max. summer temperature: This input has two purposes and must always be specified:

If a cooling system is present in the house, this temperature is the set point for the cooling system. The cooling system will then attempt to maintain the specified indoor air temperature.

The temperature is also used for the night cooling control of natural ventilation.

Cooling system present: If "yes" is selected, a cooling system (air conditioner) is installed in the house.

Internal and external sunscreening

On when indoor temperature is above ___ °C: If this control is activated, the sunscreening products are activated when the indoor air temperature is above the set point and deactivated when the indoor air temperature is below the set point.

Automatic roof window control: These features only apply to roof windows and will override the temperature control if active.

VELUX ACTIVE climate control (sensor based): If this control is activated, the sunscsreening products are controlled by sensors on the window.

The VELUX ACTIVE climate control feature is available for all external and internal io-homecontrol® sunscreening products.

The automatic operation is based on an algorithm that optimises the use of sunscreening products throughout the year. The algorithm is based on input from two wireless exterior sensors that measure the outdoor air temperature and the solar radiation on the roof windows.

VELUX Energy Balance (time controlled):

The Energy Balance program is available with all io-homecontrol® roller shutters and awning blinds. It automatically controls the exterior sunscreening products to help optimise the energy balance of the building. It will activate the sunscreening products in the daytime during summer and at night in the winter. This reduces the need for cooling in the summer and the need for heating in the winter. The Energy Balance program is particularly relevant in warm climates. The time schedule is controlled by the country selection and can be changed in the *Country* dialogue box.

Advanced options

By pressing this button, you can choose various options for electrical equipment, heating and cooling.

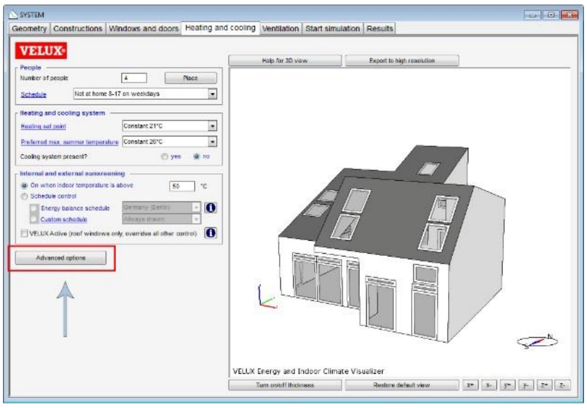


Figure 13 Pressing the Advanced options buttons opens more options

Electrical equipment

Internal gains (electrical appliances): The internal gains are the electricity used by appliances, which are not part of the energy calculation. These are kitchen appliances, electronics, etc. The internal gains are not included in the energy demand of the building, but they are considered a "free gain", which will reduce the heating demand of the building. Increasing the internal gains will reduce the heating demand of the building.

It is difficult to make a precise estimate of the internal gains, but a value between 2 and 5 W/m² will often be reasonable depending on the number of occupants.

Schedule: The schedule for the gains can be edited if they are not the same during the day. They are edited as described in the paragraph People.

Heating system

Energy source: The energy source for the heating system is selected here. These options are used to calculate the results of energy costs. The energy source can be edited by pressing Energy source.

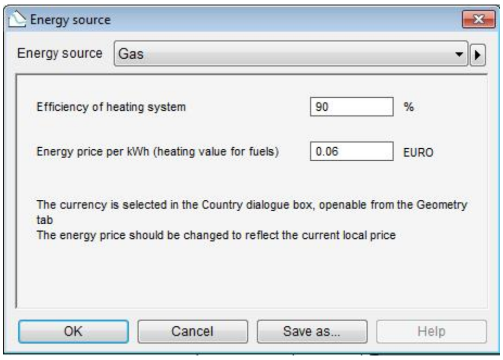


Figure 14 Energy source dialogue box

Efficiency of heating system: The efficiency of the heating system has an influence on the amount of fuel used. An electrical heating system is approximately 100% effective. The efficiency of an oil-burning boiler is lower, e.g. 70%.

Energy price per kWh (heating value of fuels): The energy price should be per kWh.

Cooling system

COP, coefficient of performance: The COP of the cooling system should be inserted. A typical unit could have a value of 2.0 to 4.0. The higher COP value the better performance.

Electrical Lighting

Type of electrical lighting: the type of electrical lighting is selected here. You have the choice between Typical, Incandescent and Fluorescent light source with the setpoint of 25, 50 or 100 lux. By clicking on "type of electrical lighting" you can adjust values of specific artificial lighting system's parameters.

Note: You can find more information about Electrical lighting system setting in the Appendix.

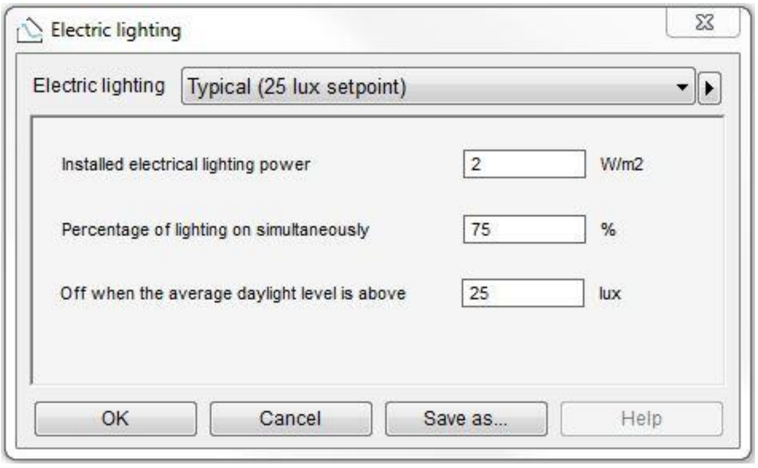


Figure 15 Electric lighting settings

Ventilation

In this tab, the controls for ventilation are selected. The windows, which have been marked as "openable for natural ventilation" on the Windows and doors tab, will be used with the controls below.

Control of overheating

These controls can be used to control overheating via opening the windows.

Open windows when the indoor temperature is above ___ °C: Façade and roof windows are opened when the temperature is higher than the desired indoor temperature. The specified temperature will be used as a set point so that the windows will start opening 1-2°C before the set point is reached.

This function will only be activated when the occupants are present in the house, and if the outdoor temperature is less than 2°C above the desired indoor temperature. This prevents the building from being heated further if the outdoor temperature is higher than the indoor temperature, thus preventing further overheating.

Use windows for night cooling: All openable roof windows open between 22:00 and 7:00 if the indoor temperature at 22:00 is above the average of the heating set point and the preferred maximum summer temperature, and if the outdoor temperature is below the desired indoor temperature. This function is relevant in warm climates to cool the building during the night and use the thermal mass as a buffer.

Control of air quality

Demand controlled ventilation based on CO_2 level

This is a CO_2 based demand control of the indoor air quality. The ventilation system will be used to maintain the comfort category chosen in the set point dropdown, see Table 1 for

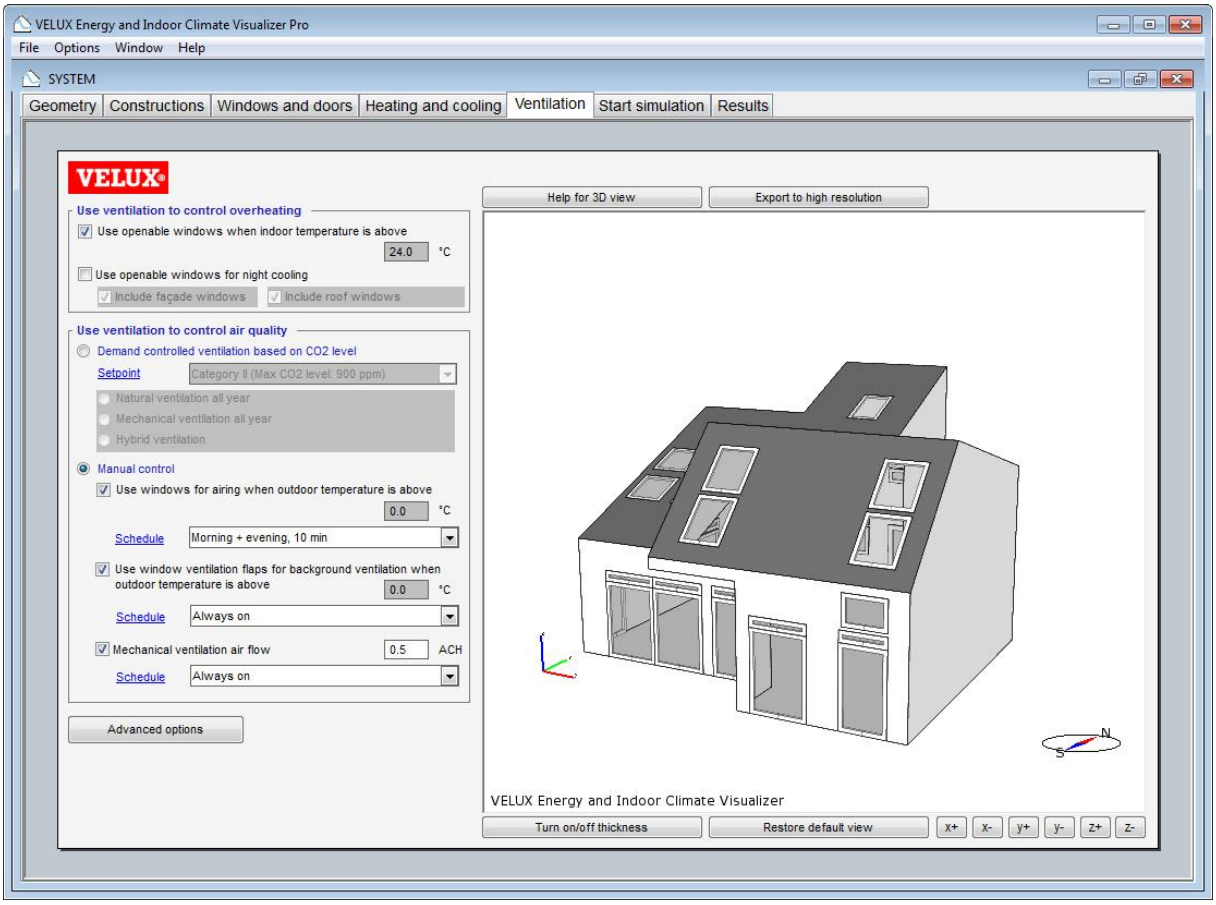


Figure 16 Light and ventilation tab

details on the used levels. Custom levels can be used. Select *Custom* in the drop-down menu and click the link *Set point* to edit the values.

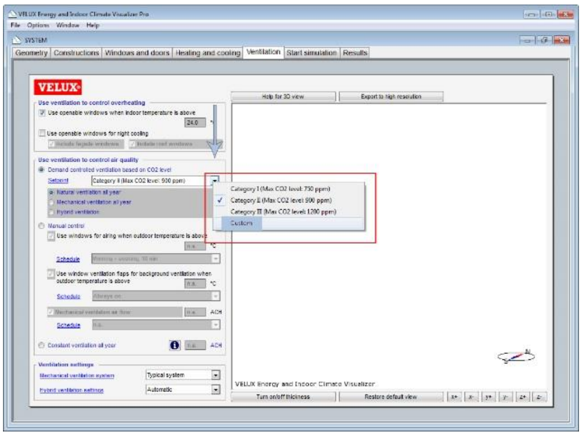


Figure 17 Max CO2 level specification

Table 1 CO_2 levels by indoor air quality categories

CO_2-level [ppm]	Maximum	Minimum
Category I	750	500
Category II	900	650
Category III	1200	800

If a mechanical ventilation system is active, the air change rate will be adjusted to maintain the maximum level. If natural ventilation is active, the windows will open fully when the maximum level is reached and close again when the concentration drops and the minimum level is reached.

The ventilation system is controlled with the radio buttons: *Natural ventilation all year*, *Mechanical ventilation all year* or *Hybrid ventilation*. The hybrid solution settings is changed under the advanced settings, see below.

Manual control

Three different controls can be used for manual airing the building.

Use windows for airing when outdoor temperature is above ___ °C

All windows are opened in the selected intervals of the schedule. Roof windows are opened approx. 21 cm (corresponding to the max. opening of an electrically operated INTEGRA® roof window). Façade windows with a window height above 1.5 m will open 10% and façade windows with a window height below 1.5 m will open 20%. The house will only be aired when occupants are present in the house. This function can be used to refresh the air in the house and is recommended in cold climates to reduce humidity problems.

The temperature set point can be used if ventilation is considered undesirable on very cold days.

Use window ventilation flaps for background ventilation when outdoor temperature is above ___ °C

With this function, the ventilation flaps of all windows with ventilation flaps (not only those marked as "openable") are kept open all year to supply background ventilation. It is recommended to use this feature to provide a healthy indoor environment. The temperature set point can be used if background ventilation is considered undesirable on very cold days.

Mechanical ventilation

If this option is ticked off, mechanical ventilation is considered active according to the schedule.

Details about the mechanical ventilation system are found in the *advanced options* section.

Advanced options

By pressing this button, you can choose various options for the ventilation systems.

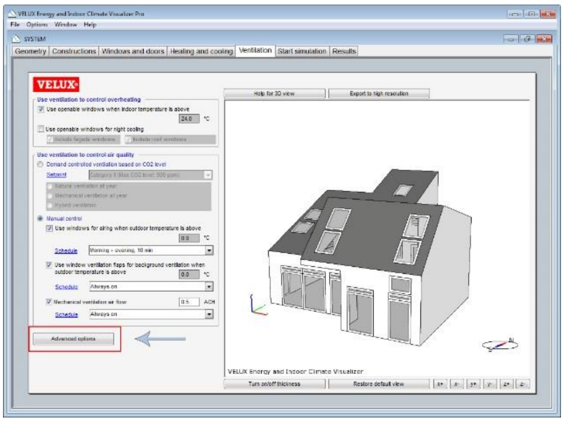


Figure 18 Advanced options in the Ventilation tab

Constant ventilation rate

The ventilation rate will be kept at the user's specified level all year regardless of wind conditions, pressure differences and more. Windows will not be opened.

Note This is an unrealistic ventilation option and should only be used for special cases. For instance if required by local building legislation.

Ventilation settings

Mechanical ventilation system

Choose one of the predefined ventilation systems from the drop-down menu. To view or edit the settings press Mechanical ventilation system.

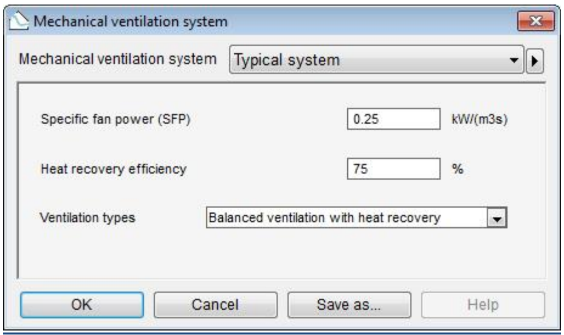


Figure 19 Settings for mechanical ventilation system

Settings that can be changed are:

- **Specific fan power (SFP) in W/(m³s)**

  The SFP tells how much energy is used by the ventilation system. The higher the number the more energy is used.

- **Heat recovery efficiency**

  The heat recovery efficiency tells how much heat that can be recovered. The higher the value the more energy for heating is saved

- **Ventilation type**

  The system types are: Balanced ventilation with heat recovery, balanced ventilation with no heat recovery, extract ventilation with no heat recovery.

Hybrid ventilation settings

Choose one of the predefined settings from the drop-down menu. To change the settings, press Hybrid ventilation settings.

The settings control when to switch between the two ventilation systems.

A manual control schedule can be chosen from the drop-down menu and edited as described in the heating and cooling section. An automatic control algorithm can be used. The system uses a set point to determine which system to use. If the outdoor temperature is higher than the set point, natural ventilation will be used and vice versa.

Start simulation

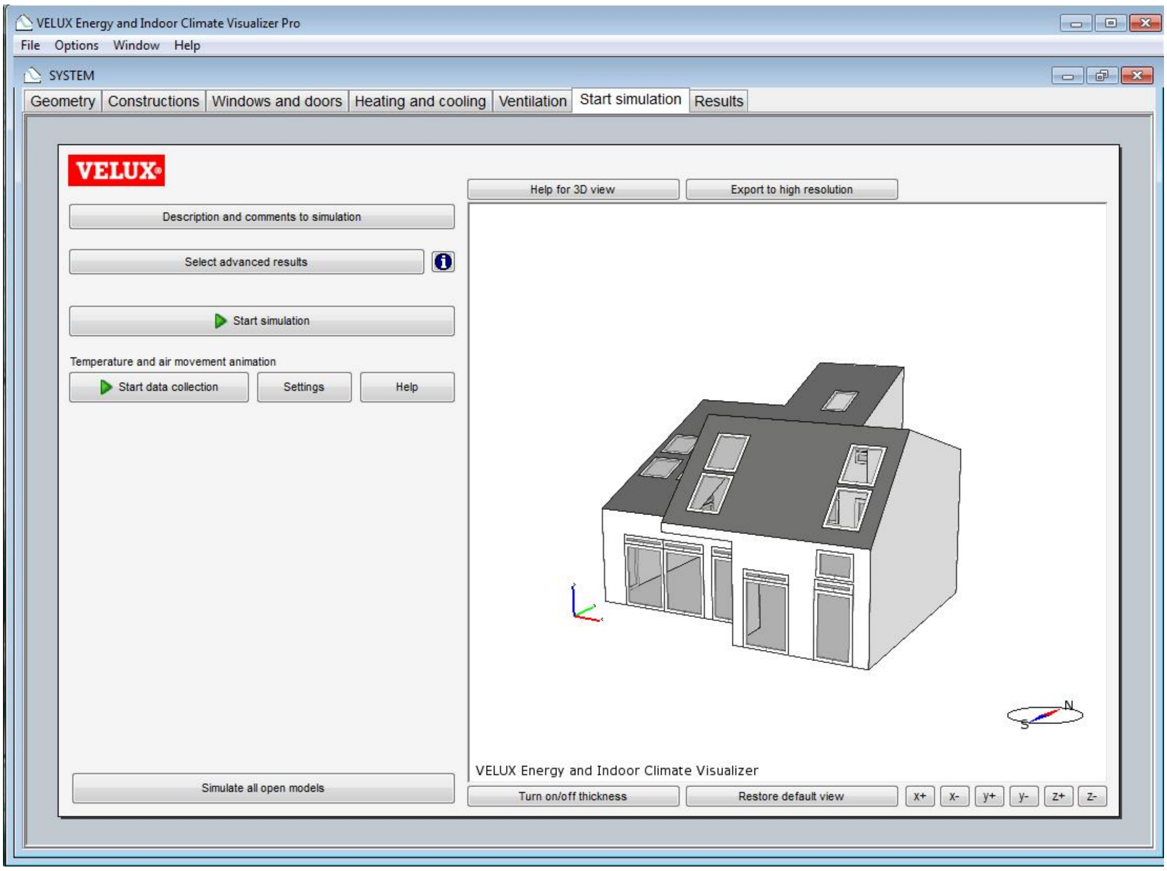


Figure 20 Start simulation tab

At this tab, the project is described and the simulation is started, and additional results can be selected to be included in the output.

This button opens the Description dialogue box where information about the project can be entered. The information will be included in the results report.

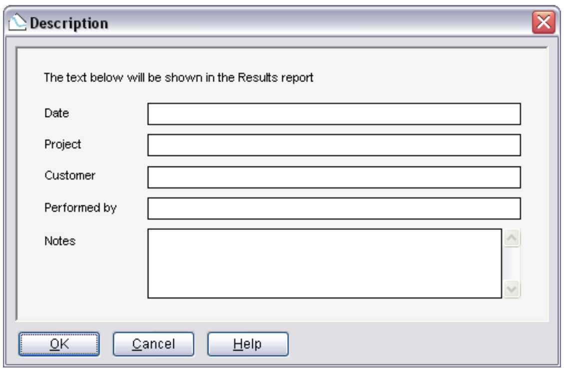


Figure 21 Description dialogue box

Note: Changes to the description will not be updated in the reports before a simulation has been run.

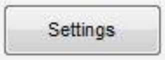
By pressing this button, you will see the available advanced results, which can be logged during the simulation. The options selected here have no influence on the results report. The options only have an influence on which advanced results will be available after the simulation for analysis by experienced users.

All options can be selected, but some of the options will generate large data files (more than 100 MB).

Press the "Start simulation" button to start the simulation.

If more than one model is to be simulated, press the "Simulate all open models" button. Pressing this button will start the simulation of all models which are open in the program, one after another.

If you want the results to be displayed in a form of animation after the simulation process is over, click the “Start data collection” button. Pressing this button will open the simulation progress window.



Before starting the collection of data, you can adjust settings for the simulation, by simply pressing the “Settings” button.

On the upper part of the window it is possible to precise the “Detail level” of the simulation, which includes such parameters as “Layer height”, “Grid resolution”, “Time resolution” and “Limits”. By default, there are three levels of details from the lowest to the highest: “Coarse”, “Medium” and “Fine”. You can also type your own values for certain parameters.

In the bottom part of the window you can precise the range of time for the simulation. Clicking on the calendar icons on the right side it is possible to choose its starting and ending date. You can also type the exact hours. Note that you will only be able to animate results in the specified time range.

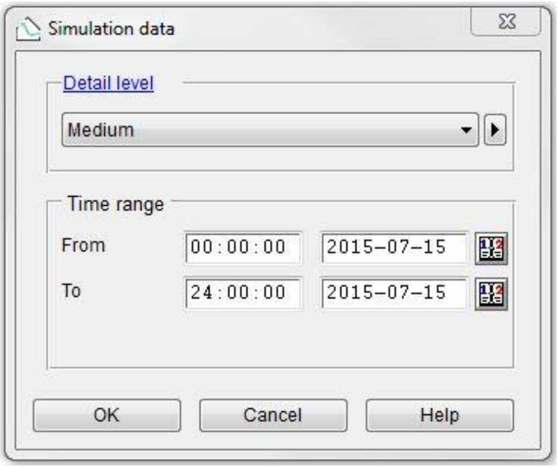


Figure 22 Start simulation tab

While the simulation is running, a simulation progress window will be visible. The date at the top-right corner shows the progress during the year. During the simulation, the indoor and outdoor temperatures are shown on a scale from -10°C to +30°C and the ventilation rate of the building is shown on a scale from 0 to 5 ACH. This view can be used to tell if the building and controls act as expected.

A simulation can be paused by clicking the *Stop* button. To continue click *Resume* and to terminate the simulation click *Abort*. If aborted, reports and animations cannot be made. Only the advanced results are available.

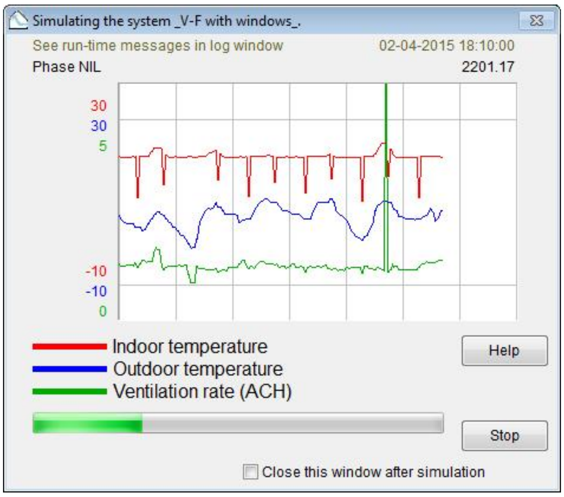


Figure 23 Simulation progress window

Results

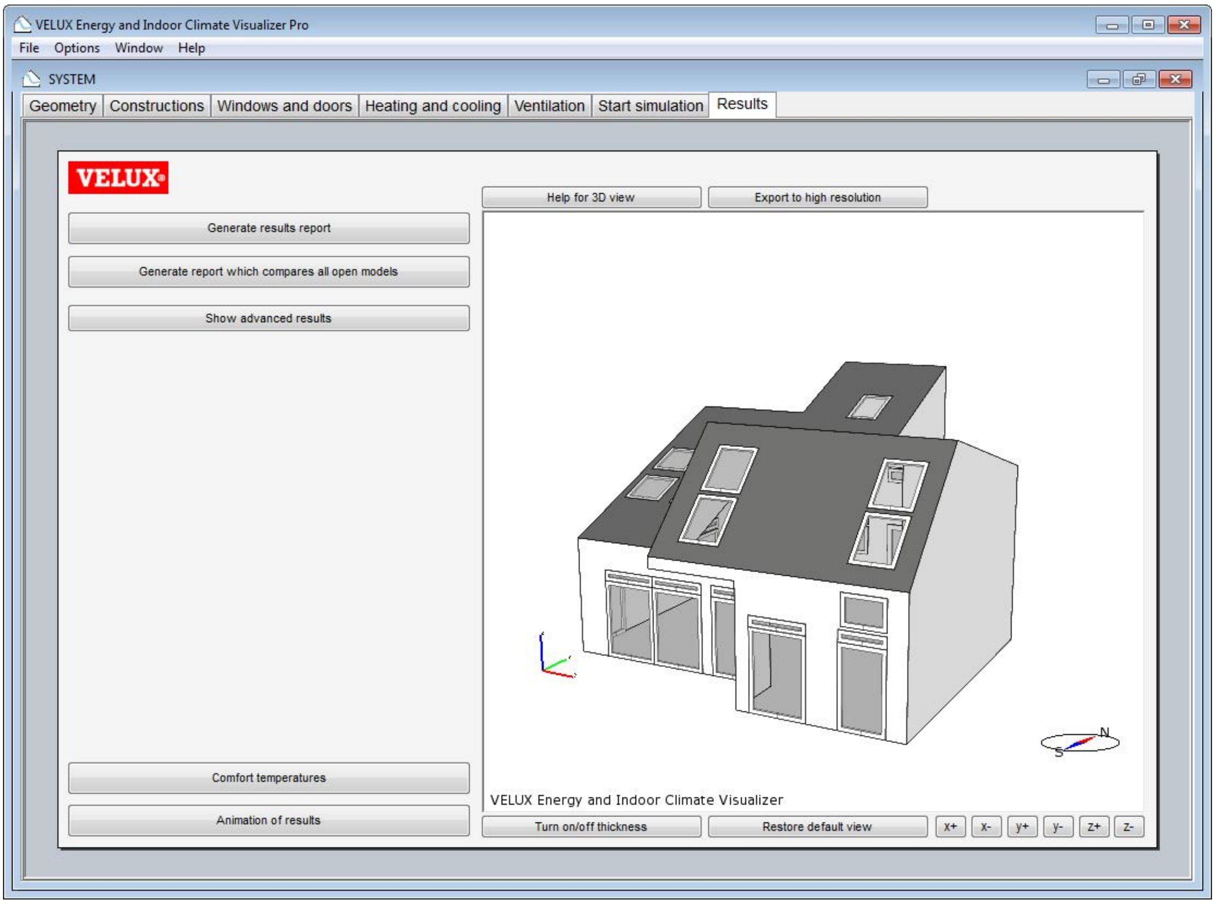
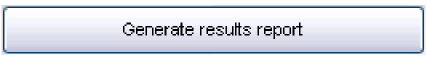


Figure 24 Results tab

At this tab, results are selected and viewed.

Generate report

The results reports are printable reports, which contain the main results of the simulation. The reports cover the needs of most users. The contents can be customised.



By pressing this button, a report is generated with results of the model.

In the top right corner, a menu is shown, The additional results in the menu can be turned on and off. The menu can be hidden if it interferes with the content.

The report is an HTML file, which can be printed and saved from the file menu. The "Save" function will only save the text and not the diagrams, so it is recommended to use a PDF conversion utility tool. Choose "Print" from the file menu, and select a pdf printer. See *report help* for more information.

By pressing this button, a report which compares the results of all the models which are open in the EIC Visualizer is created. Several models can be open at the same time and this function is used to compare variants of the same building, e.g. a basic project and a project with additional windows or sunscreening products.

The report can be changed, printed and saved according to the same principles as the single report.

When this button is pressed, it is possible to animate the operative temperature and compare it to the comfort range and other simulation results. Each open project will be compared to the active project.

The comfort range is based on the active project and is calculated on the basis of the outdoor temperature, according to the European Standard EN15251. The outdoor temperature is also shown.

Note: If models with different climatic conditions or models with and without mechanical cooling are compared, the comfort ranges of the active project is shown. The comfort range is based on the outdoor temperature and the presence of a cooling system.

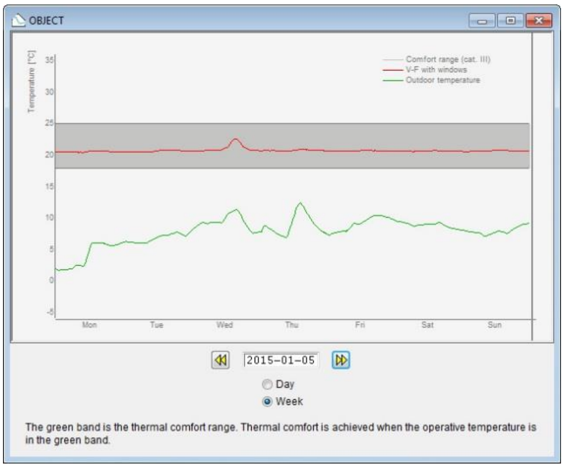


Figure 25 Comfort temperatures

The graph shows the temperatures and comfort range for either one day or one week.

Under advanced results, the comfort range (class I, II and III) and outdoor temperature together with the operative temperature of the open projects can be seen for the entire year.

When this button is activated, it is possible to create an animation of results obtained from the simulation. There are two types of animation – colour animation and arrow animation, differing with the form of visual results presentation.

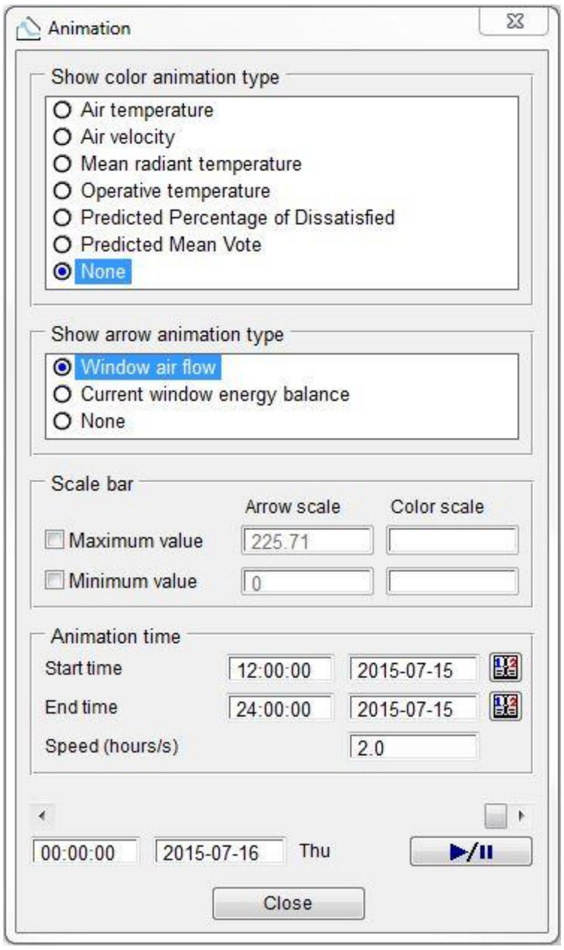


Figure 26 Animation window

Color animation

In the colour animation type the results are represented by colors, according to the scale of values, present on the left side of the 3D model window. You can influence the scale range by specifying the minimum and maximum value for particular parameter.

In the 3D view of the model, you can see the results as a volume, filling the interior of the building or moving across it. The volume represents all the values of the animated parameter in the specified range. In order to see specific values in a certain part of the building and their changes in time you have to go to the horizontal section view. Setting the section plain height to about 1 m allows you to see the animated changes of parameters' values on the approximate height of person's activity.

Air temperature

The air temperature for the current time step is represented by colors in Celsius Degrees according to the scale of values. In the horizontal section view, on the section pane you can observe how it varies, depending e.g. on the airflows entering the building through the openable windows. On the animation it can be clearly observed how time of the day (and accordingly position of the sun), direction and velocity of the wind etc. influence the air temperature.

Mean radiant temperature

The mean radiant temperature for the current time step is represented by colors in Celsius Degrees according to the scale of values. The mean radiant temperature (MRT) is defined as the uniform temperature of an imaginary enclosure in which the radiant heat transfer from the human body is equal to the radiant heat transfer in the actual non-uniform enclosure.

Displaying the mean radiant temperature animation on the horizontal section pane, you can observe how the parameters changes in time, how is it influenced by the position of windows and other factors.

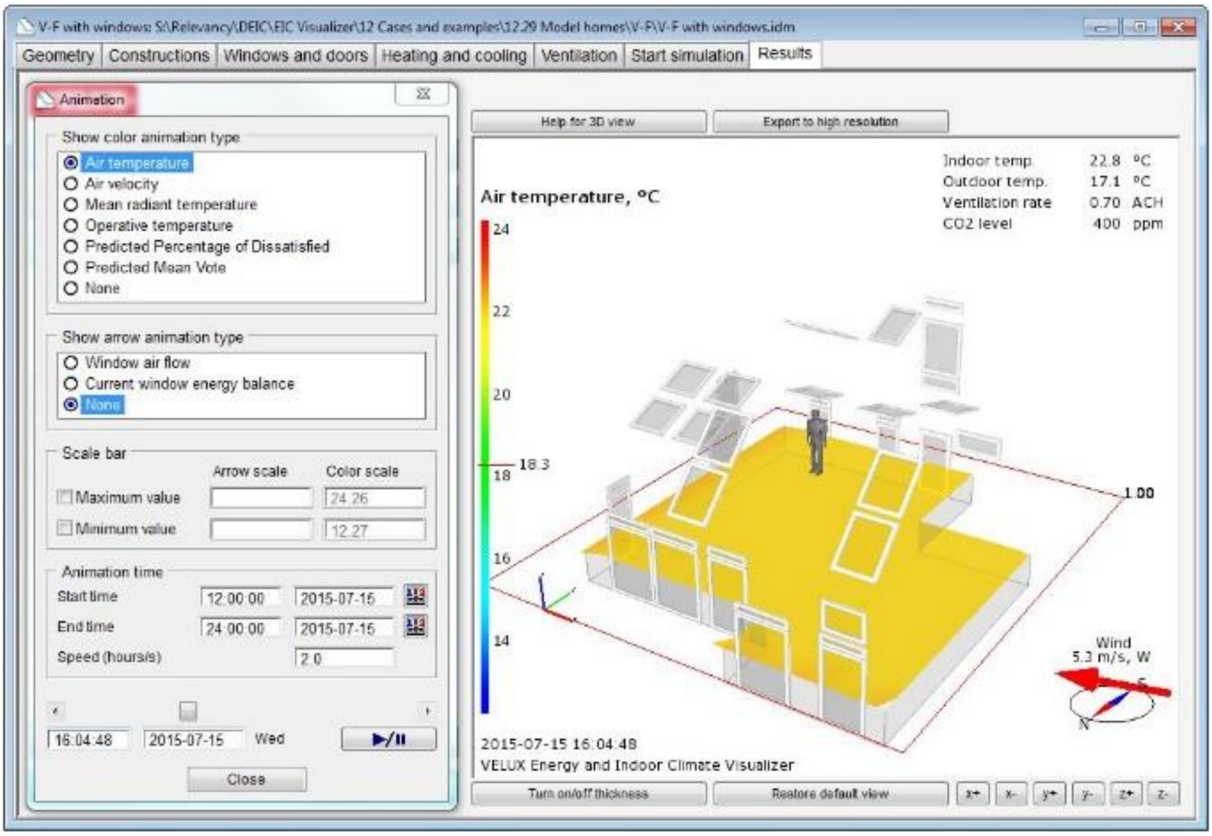


Figure 27 Air temperature animation

Air velocity

Air velocity in m/s can also be displayed in a form of color animation. On the horizontal section view of the model you can observe where the air movement occurs in the building for a current time step, what is its direction and the value of air velocity according to the specified range of values. If in the design there are windows openable for natural ventilation implemented, it is clearly visible how they are causing the air movement. Its velocity is obviously dependent on the time of the day, wind properties etc.

Operative temperature

Another indicator of indoor thermal control that can be displayed in a form of animation is operative temperature. Operative temperature is defined as a uniform temperature of an imaginary black enclosure in which an occupant would exchange the same amount of heat by radiation plus convection as in the actual non uniform environment. It is derived from air temperature, mean radiant temperature and air speed.

Operative temperature animation should also be displayed on the horizontal section pane. It can be then easily observed how does the parameter change and what factors is it influenced by.

Predicted percentage of dissatisfied

Another indicator of thermal comfort in the building that can be represented as a color animation in VELUX Energy and Indoor Climate Visualizer is Predicted Percentage of Dissatisfied. PPD predicts the percentage of occupants that will be dissatisfied with the thermal conditions. The unit for the parameter is % - as the name indicates, and therefore the range of its values should always be 0 – 100 % (from 0 % to 100% persons dissatisfied with the indoor climate). As it is not possible to please all of the people all of the time, the recommended acceptable PPD range for thermal comfort from ASHRAE 55 is less than 10% persons dissatisfied for an interior space.

Displaying the animation on a horizontal plane set to the height of the person activity (about 1 m) you can observe how the PPD indicator changes during the day in the particular parts of the building.

Predicted mean vote

Predicted Mean Vote is another thermal comfort indicator that can be displayed in a form of color animation. The PMV index predicts the mean response of a larger group of people according the ASHRAE thermal sensation scale:

+3 hot

+2 warm

+1 slightly warm

0 neutral

-1 slightly cool

-2 cool

-3 cold

In the animation settings, the range of PMV values should follow the ASHEAE scale with the minimum value of parameter -3 and maximum 3. The optimal value, assuring good quality of thermal comfort in building is 0 – neutral.

Arrow animation

In this type of animation, you can see the results represented by the arrows. The window air flow and current window energy balance parameters' values are indicated by arrows' size, colour and shape.

Ventilation flows

Arrows show the flow through the individual windows. The size and colour of the arrow represents the magnitude of the airflow in l/s according to the scale.

There can be two airflows through each window. This represents how pivoting roof windows work, but also applies to other types of windows. The airflow can enter through the window in the same direction at the lower and upper part of the window, but can also have opposite directions.

The airflows take into consideration that there is infiltration in the building (air entering the building through leakages in the façade and connections between construction compenents). Due to the stack effect, it is common that air will enter the house through façade windows and be extracted through roof windows.

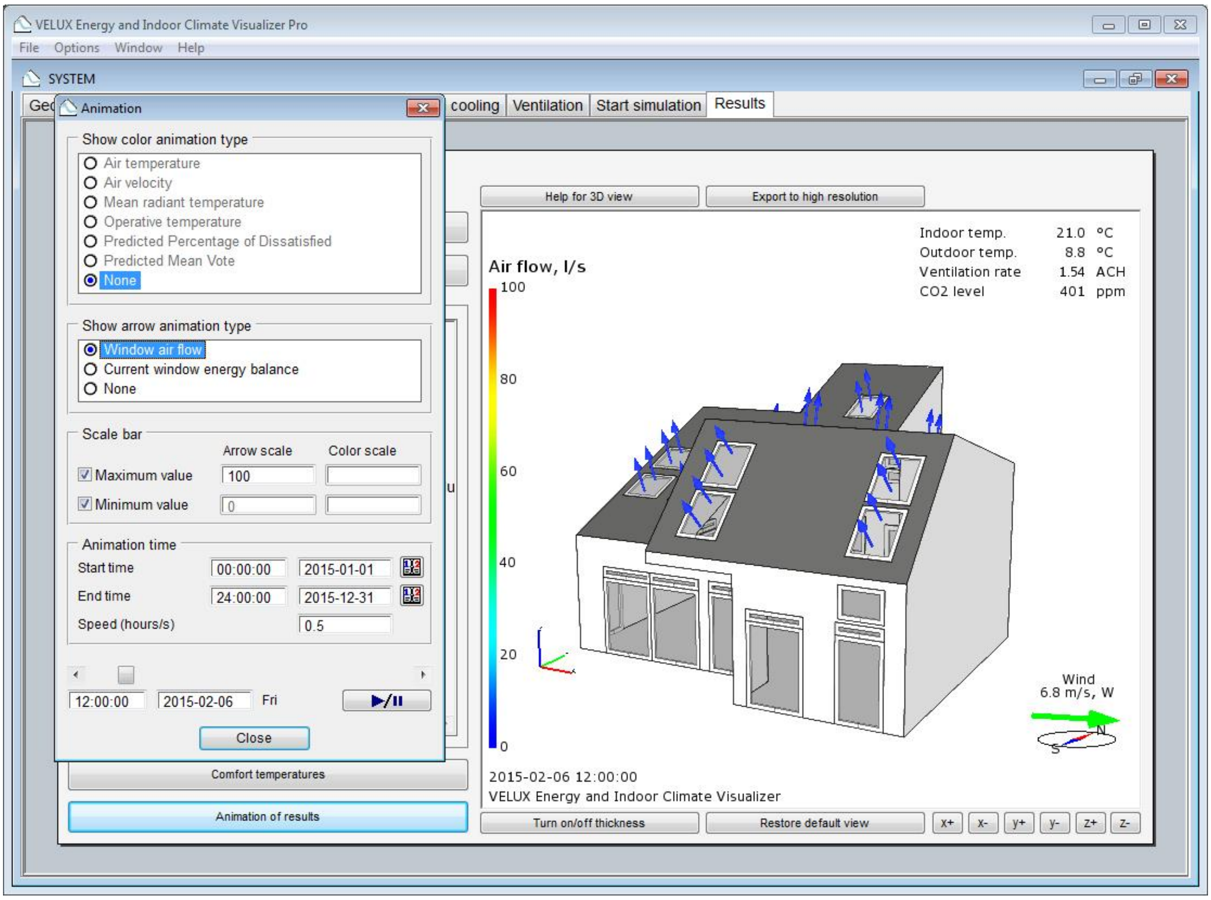


Figure 28 Window air flows animation

Current window energy balance

Arrows show the energy flow in and out of the individual windows for the current time step. The size and the colour represent the magnitude of the energy flow according to the scale. The arrow with two arrow heads shows the solar gain and the arrow with one arrow head show the transmission loss. The transmission loss can be in both directions but not at the same time.

Note Current window energy balance should not be compared with energy balance equations for a whole year.

Animation settings

It is possible to change the start and end time of the simulation. This can be used to investigate a typical summer, winter or spring day, for example. The animation speed can also be adjusted. The higher the number in hours per second, the faster the animation will run.

Scale bar: Max.: This option can be used to adjust the scale of the arrows. The maximum value is automatically assigned to the highest airflow or energy flow occurring during the animation period, but this can be much higher than the typical values. It will often be helpful to reduce the maximum value to 50 l/s or less for ventilation. For the current energy balance animation, the maximum value should be adjusted according to the season in question.

Show advanced results

In this view, experienced users can select detailed results to analyse specific issues.

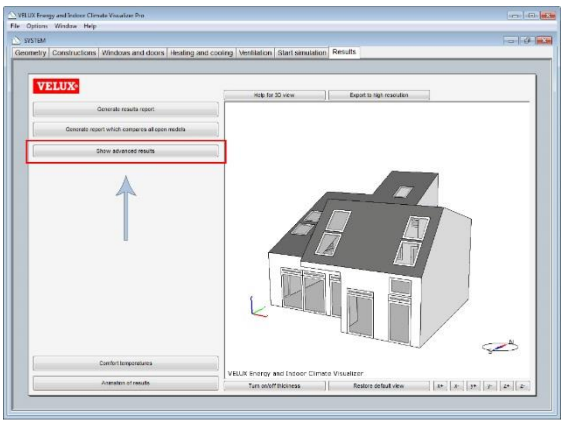


Figure 29 Advanced results of the animation

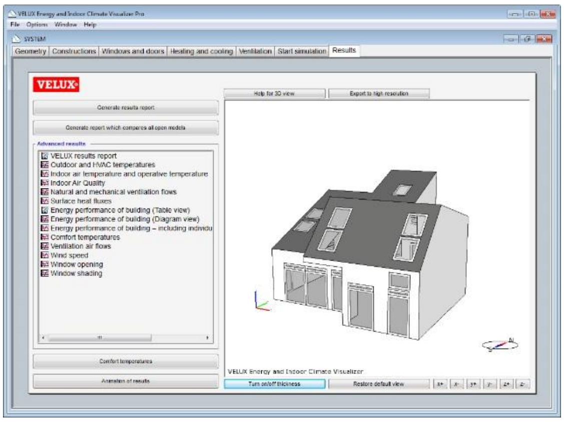


Figure 30 List of the advanced results

Each advanced result will open a diagram. This can be changed to a table view using the tabs at the top of the results window.

The arrows at the bottom of the results window can be used to change from annual to for example monthly results.

The energy balance for each window in a project can be found in "Energy performance of building – including individual windows". For each window there is a column titled QSOLAR and a column titled QTRANSM. QSOLAR is the heat gain, and QTRANSM is the transmission. QTRANSM will be negative during the winter season. On warm summer days, it can be positive when the outdoor temperature is higher than the indoor temperature.

Data can be exported directly to Excel via the logo at the bottom right corner. The standard exported values uses the time steps used in the calculations. To get hourly values, use the table pane and change the table properties to hourly values. Then copy the data manually into Excel. This method will export the hourly mean values of the preceding hour. More details on this issue are found in the technical background document.

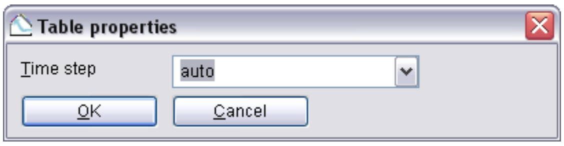


Figure 31 Time step settings

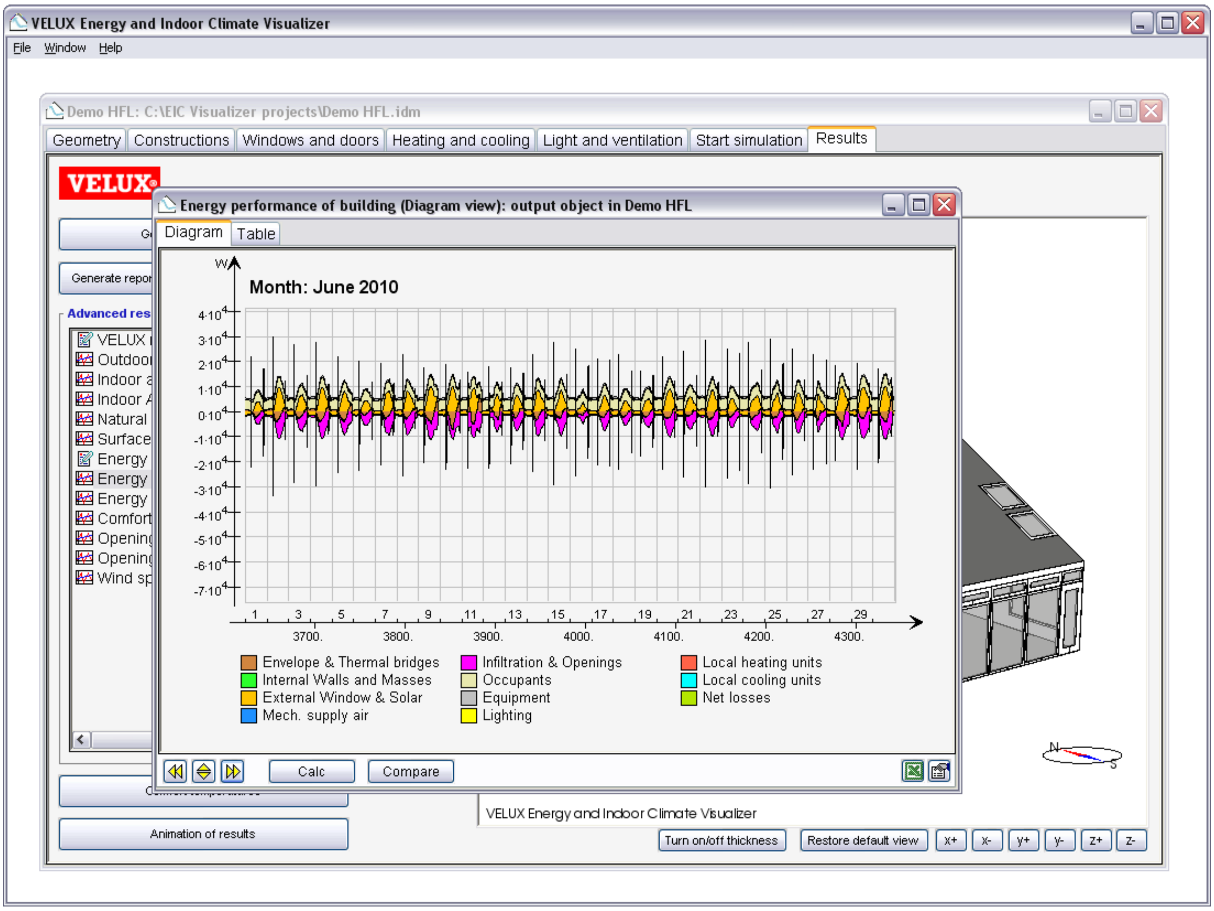


Figure 32 Advanced results

Using the 3D view

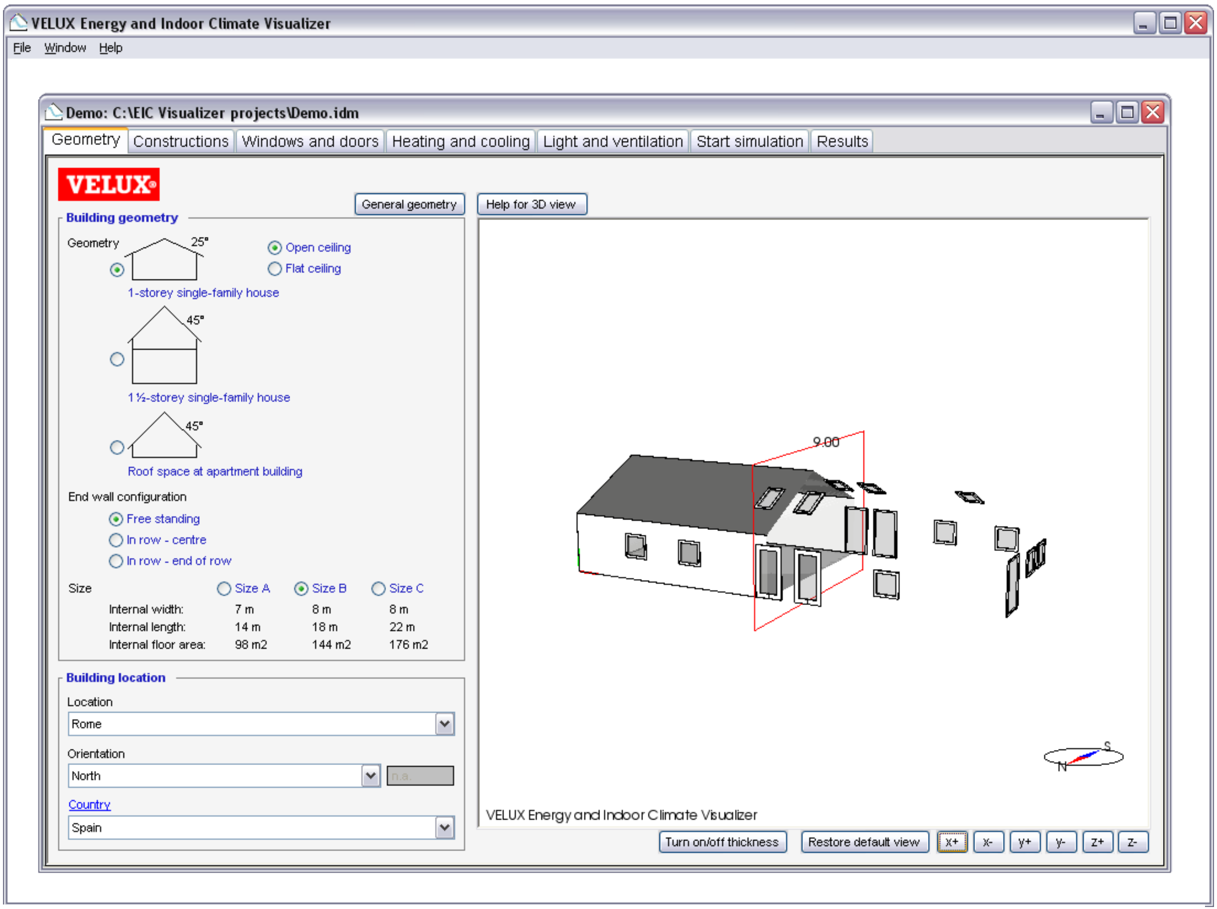


Figure 33 3D view

The geometry of the building is shown in the 3D view to the right with solid walls showing the wall construction. A compass is shown to keep track of the orientation of the building. The 3D model can be interactively rotated, zoomed and panned.

Descriptions of buttons:

Turn on/off thickness: This button will turn on or off the thickness of the constructions, see **Error! Reference source not found.**.

Restore default view: This button resets the section view and displays the full building.

x+: Cut 3D model along the x-axis removing all geometry on the positive side of the cut plane.

x-: Cut 3D model along the x-axis removing all geometry on the negative side of the cut plane.

y+: Cut 3D model along the y-axis removing all geometry on the positive side of the cut plane.

y-: Cut 3D model along the y-axis removing all geometry on the negative side of the cut plane.

z+: Cut 3D model along the z-axis removing all geometry on the positive side of the cut plane.

z-: Cut 3D model along the z-axis removing all geometry on the negative side of the cut plane.

Description of mouse operations:

Select object: Click left mouse button to select an object. The selected object is shown in blue.

Move and rotate the model: Hold down left mouse button to move and rotate the model. The model is always oriented so that the positive z-axis is upwards.

Cut: Hold down left mouse button and press Ctrl-key. Click within red frame, hold down and move mouse. Move the cut plane.

Move the model up, down, right or left: Click middle mouse button (or both the left and the right mouse buttons on a two-button mouse). Hold down and move the model around.

Open right mouse button menu: Click right mouse button.

Zoom in/zoom out: Hold down right mouse button and move the mouse. Move the mouse upwards to zoom in and downwards to zoom out.

Zoom extends: Click right mouse button menu: Zoom and pan the model so that the entire model is visible (Hotkey R).

Set focus: Click right mouse button menu: Set the point around which the model is rotated and towards which it is zoomed (Hotkey F).

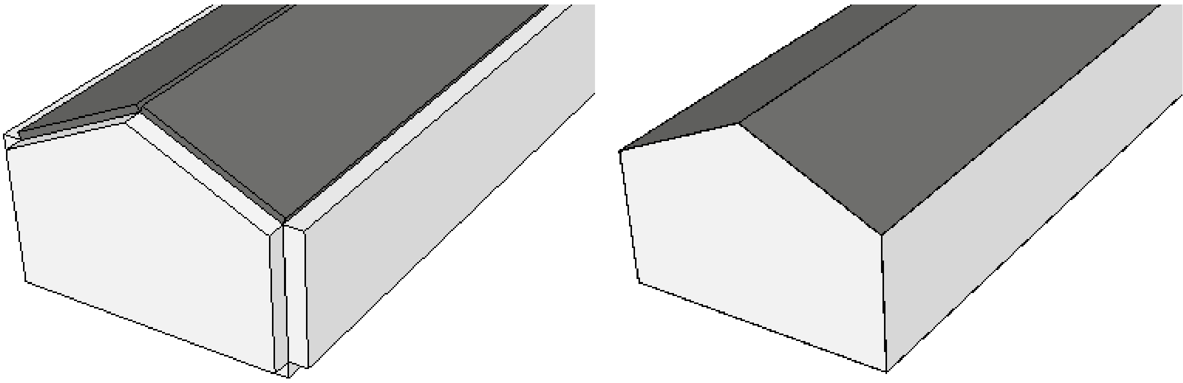


Figure 34 Turn off/on thickness

Appendix

Geometry

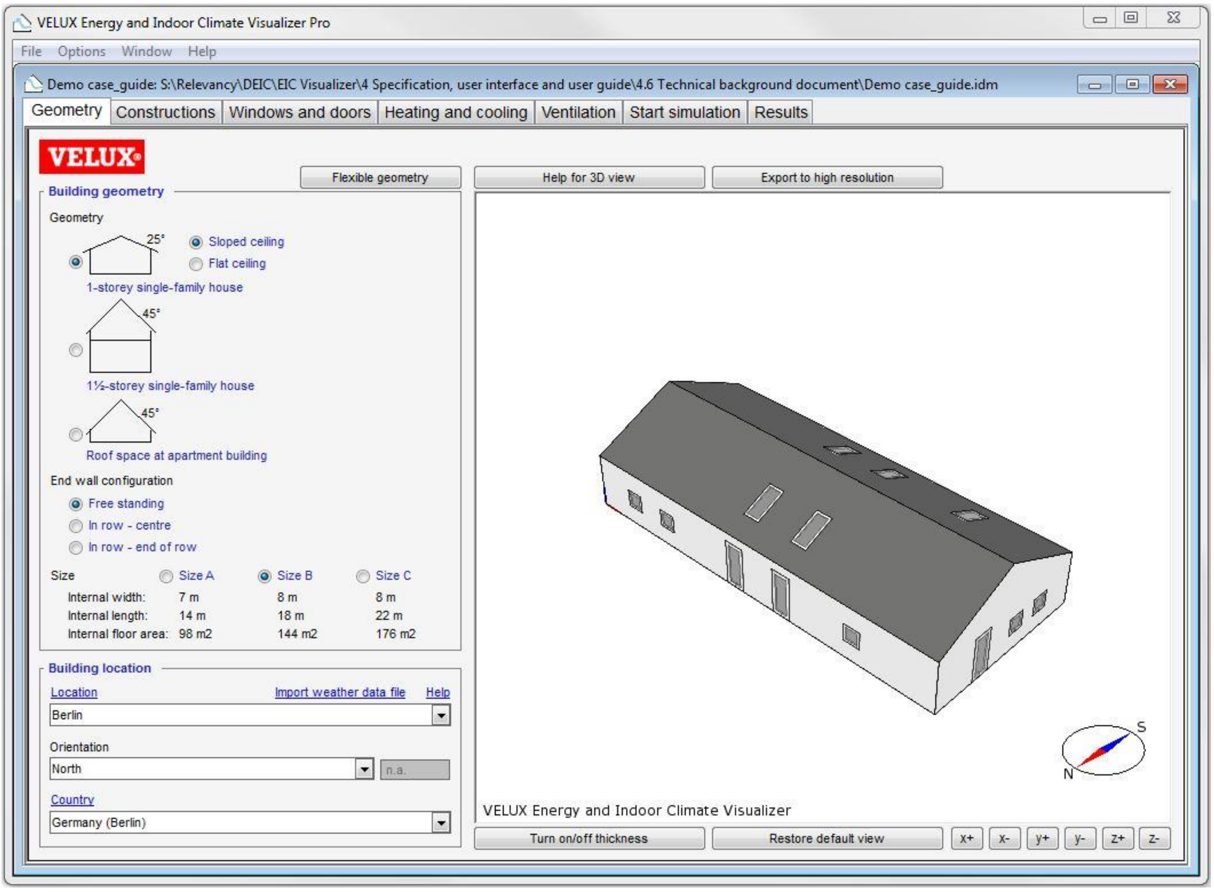


Figure 35 Geometry tab

The house volumes are based on internal areas. For the 1-storey house, the floor area is simply the width myltiplied by the length of the house.

For the 1½-storey house and the roof top apartment, the floor area is only counted for the part of the floor, where the height from floor to ceiling is 1,5 m or higher. The floor area, height and volume of each house type are found in the tables below.

Table 2 Dimensions of 1-storey house with flat ceiling

1-storey house, flat ceiling	A	B	C
Internal width	7 m	8 m	8 m
Internal length	14 m	18 m	22 m
Internal floor height	2,5 m	2,5 m	2,5 m
Internal floor area	**98 m²**	**144 m²**	**176 m²**
Internal volume	245 m³	360 m³	440 m³

Table 3 Dimensions of 1-storey house with an open ceiling

1-storey house, open ceiling	A	B	C
Internal width	7 m	8 m	8 m
Internal length	14 m	18 m	22 m
Internal floor height	2,5 m	2,5 m	2,5 m
Internal floor area	**98 m²**	**144 m²**	**176 m²**
Internal volume	325 m³	494 m³	604 m³

Table 4 Dimensions of 1½-storey single family house

1½-storey single family house	A	B	C
Internal width	7,5 m	8,0 m	8,0 m
Internal length	8,0 m	10,0 m	12,0 m
Ground floor height, internal	2,5 m	2,5 m	2,5 m
First floor height, internal	0,8 m	0,8 m	0,8 m
Ground floor area, internal	**60 m²**	**80 m²**	**96 m²**
First floor area, internal	**49 m²**	**66 m²**	**79 m²**
Total floor area, internal	**109 m²**	**146 m²**	**175 m²**
Internal volume	311 m³	424 m³	509 m³

Table 5 Dimensions of a house with an roof space

Roof space (on top of building)	A	B	C
Internal width	11,0 m	11,5 m	12,0 m
Internal length	7,0 m	9,0 m	11,0 m
Internal floor height	0,8 m	0,8 m	0,8 m
Internal height from floor to roof top	6,3 m	6,6 m	6,8 m
Ground floor area, internal	**67 m²**	**91 m²**	**117 m²**
First floor area, internal	**28 m²**	**41 m²**	**55 m²**
Total floor area, internal	**95 m²**	**131 m²**	**172 m²**
Internal volume	273 m³	380 m³	502 m³

When using the row house type, the walls to neighbouring buildings are considered adiabatic in the simulation. The wall type for the adiabatic walls cannot be edited; it is fixed as a heavy wall construction with a U-value of 0,29 W/m²K.

The floor of the roof top apartment house type is adiabatic. It cannot be edited and is a light floor construction with a U-value of 0,76 W/m²K.

The climate data files used in the EIC Visualizer are the ASHRAE climate data files published at http://apps1.eere.energy.gov/buildings/energyplus/cfm/weather_data.cfm.

Constructions

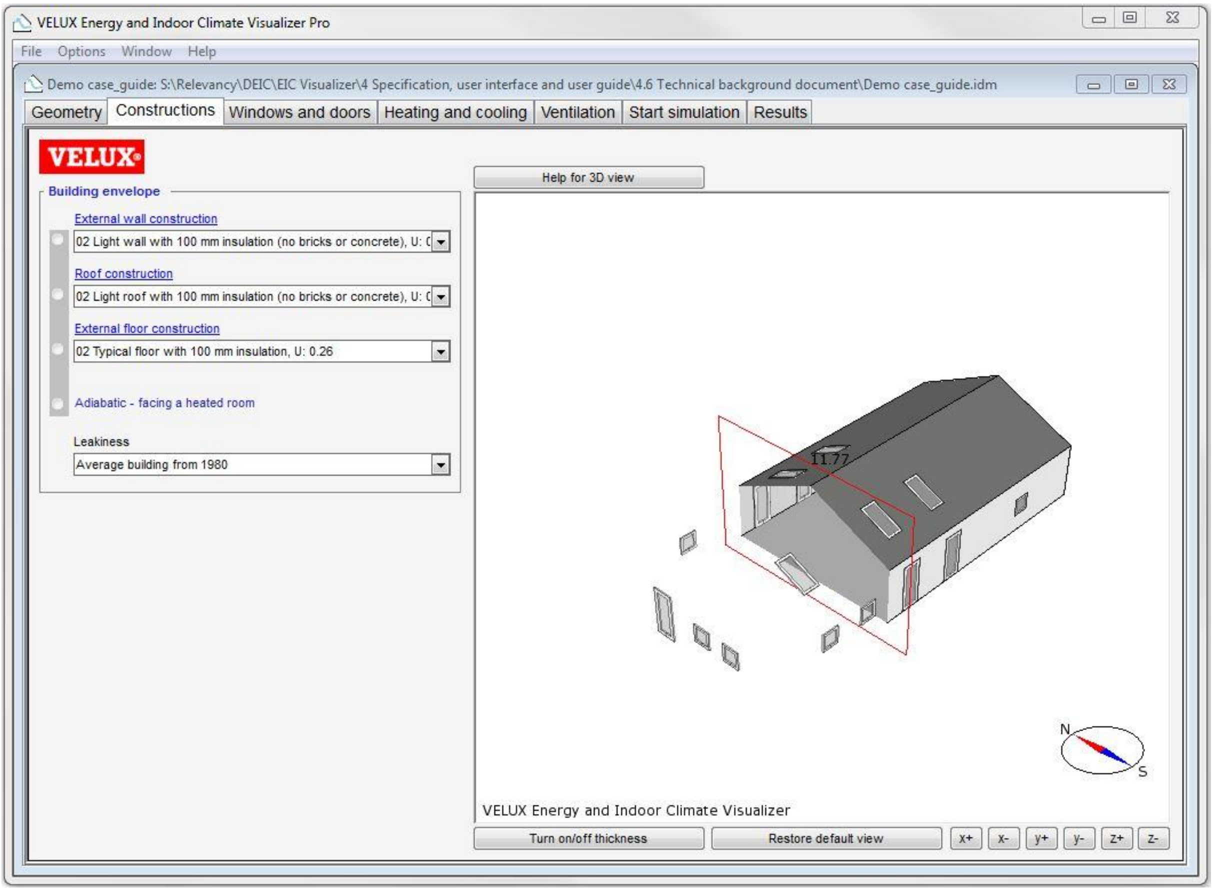
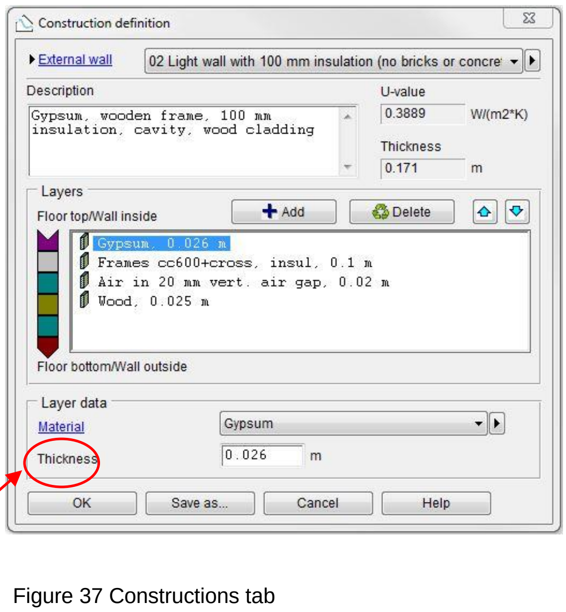


Figure 36 Constructions tab

The properties of each construction type can be seen by clicking the construction type (blue text and underlined). This opens the Construction definition dialog, where the U-value and thickness of the construction are seen. It is also seen which materials are used in the construction and the thickness of each material can be changed.

Material properties can be seen and edited by clicking the Material (blue text and underlined) under Layer data. This opens the Material dialog.



Click to edit material properties

Figure 37 Constructions tab

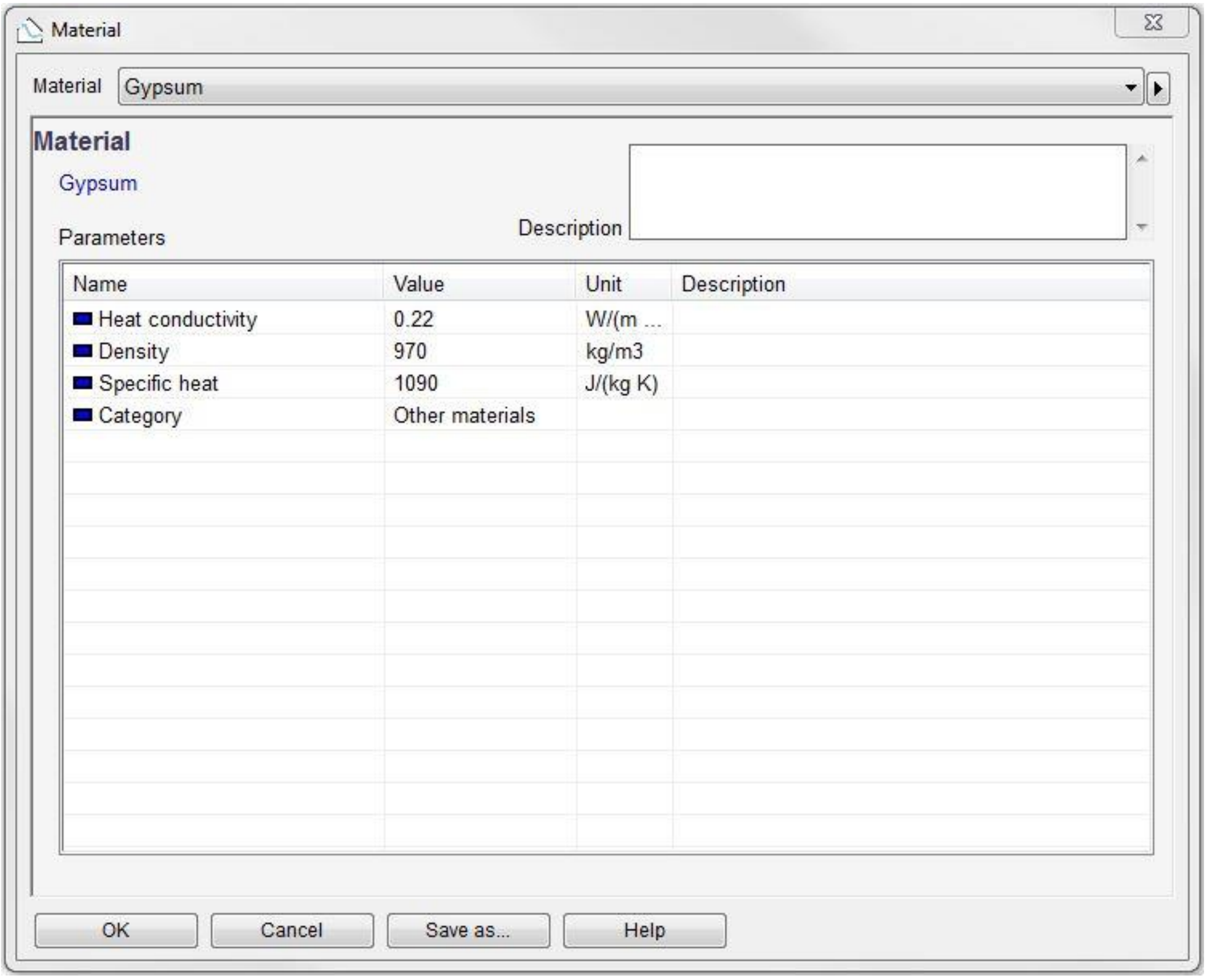


Figure 38 Constructions tab

At the Material dialog, the properties of each material can be seen and edited.

U-values

The U-values seen on the Constructions tab are based on fixed surface resistance coefficients. This means that the U-values seen here are an approximation of the actual U-values used in the simulation. In the simulations, surface resistance coefficients are not fixed numbers, but vary continuously depending on temperature differences, air velocities and radiant long wave exchange between the surface and the surroundings. The EIC Visualizer calculates the actual surface resistance coefficient during each time-step.

Ground

Below the lowest layer of construction, 0,5 m of clay is included as a slap on ground construction. Below the layer of clay, the ground temperature is determined based on ISO 13370.

Thermal bridges

To include thermal bridges joints between walls, ceiling and floor are handled by using exterior surface area (meaning that corners are included twice).

The thermal bridge related to the joint between window and building envelope (roof/wall) is treated differently for façade windows and roof windows.

Table 6 Thermal bridges' values determination

	Ψ, connection between window and building envelope
Roof windows	$\Psi = 0{,}000174 * t_{insulation} + 0{,}0399$ W/mK where the unit of $t_{insulation}$ is in mm
Façade windows	0,05 W/mK

Internal walls

The thermal mass of internal partition walls is included in all EIC Visualizer models. The area of internal partition walls depends on the geometry of the house. For all houses, the same length of internal wall in relation to the floor area is used. This number is 0,32 m of wall per m² of house.

The corresponding area of internal partition walls is then calculated for each house type, considering the actual floor area and the average ceiling height.

Table 7 Internal walls areas

	m² internal walls		
Size type	A	B	C
1-storey house, flat ceiling	77,7	114,2	139,6
1-storey house, open ceiling	103,1	156,8	191,7
1½-storey single family house	98,5	134,5	161,4
Roof space (on top of building)	86,7	120,7	159,1

The internal walls are assumed to be of 75 mm lightweight concrete.

Roof space of model for 1-storey building with horizontal ceiling

The roof space is not considered in the simulation. This is a simplification as the roof space will function as a thermal zone, but the effect is assumed to be neglectable in most cases.

Leakiness

The table below is showing the leakiness rates, which are used in the EIC Visualizer. The data is taken from EN 13465 table A.2, which is based on data from Sweden.

Table 8 Leakiness values

Construction period	Leakiness at 50 Pa [ACH]
Leaky 1950	20
Average 1950	13
Airtight 1950	6
Leaky 1980	10
Average 1980	6
Airtight 1980	2
Leaky 1995	6
Average 1995	4
Airtight 1995	1
Leaky 2005	4
Average 2005	2
Airtight 2005	1
Passivhaus	0,6

c_p-values for house types

The c_p-value used for the ventilation calculations are the same for all house types and sizes. The values are taken from the AIVC report TN 44 and apply to low-rise buildings with a length:width ratio of 2:1 and surrounded by buildings of similar height. The values are seen in the table below.

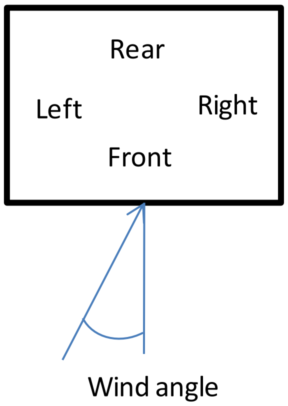


Table 9 Wind angle values

	Wind angle								
Face	0	45	90	135	180	225	270	315	360
Facade, front	0,06	-0,12	-0,2	-0,38	-0,3	-0,38	-0,2	-0,12	0,06
Facade, rear	-0,3	-0,38	-0,2	-0,12	0,06	-0,12	-0,2	-0,38	-0,3
Facade, left	-0,3	0,15	0,18	0,15	-0,3	-0,32	-0,2	-0,32	-0,3
Facade, right	-0,3	-0,32	-0,2	-0,32	-0,3	0,15	0,18	0,15	-0,3
Roof front, pitch 25°	-0,49	-0,46	-0,41	-0,46	-0,4	-0,46	-0,41	-0,46	-0,49
Roof rear, pitch 25°	-0,4	-0,46	-0,41	-0,46	-0,49	-0,46	-0,41	-0,46	-0,4
Roof front, pitch 45°	0,06	-0,15	-0,23	-0,6	-0,42	-0,6	-0,23	-0,15	0,06
Roof rear, pitch 45°	-0,42	-0,6	-0,23	-0,15	-0,06	-0,15	-0,23	-0,6	-0,42

Windows and doors

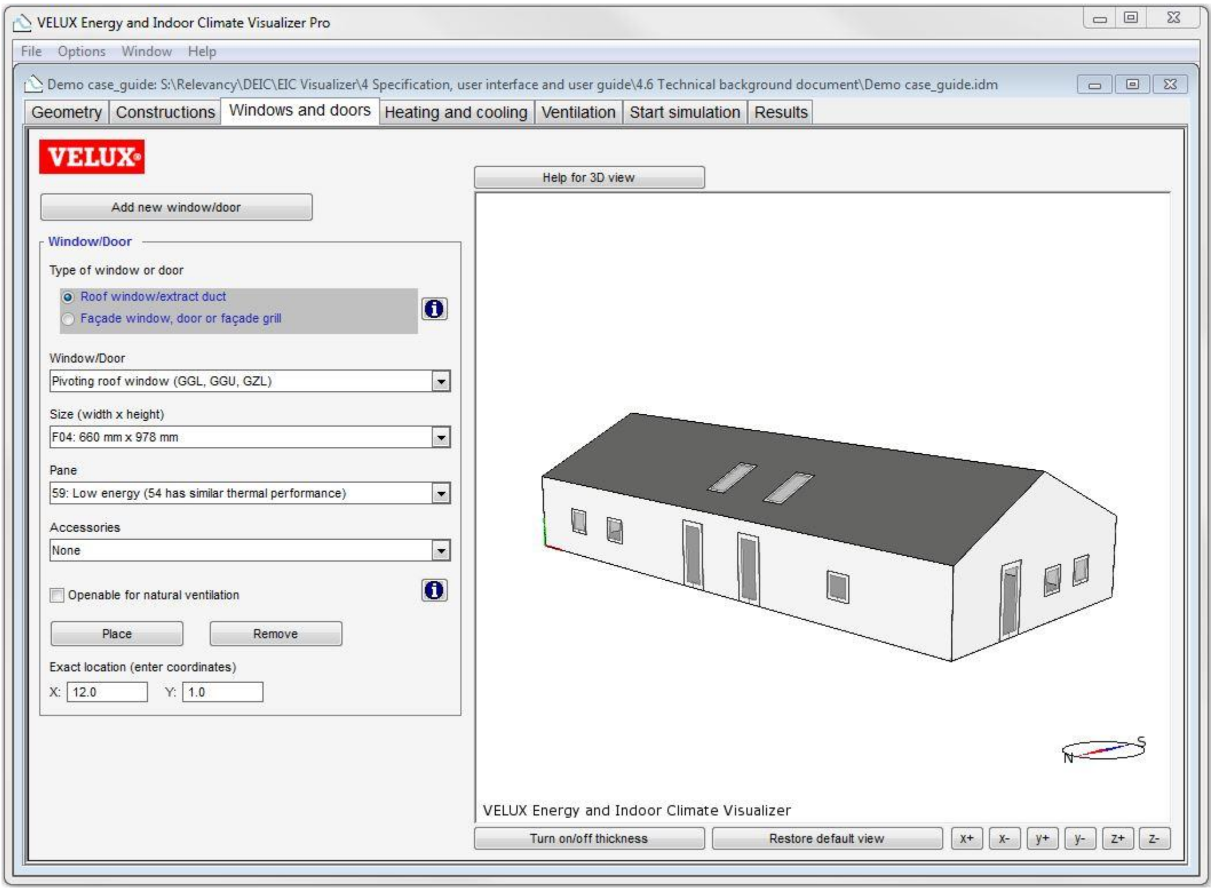


Figure 39 Constructions tab

Here windows and doors are added and edited. When you add or change a value, the 3D model is updated to reflect the change and show the window or door.

Thermal properties of windows

The thermal properties for windows take the actual slope and glass area into account, as well as the effect of accessories on both thermal resistance and g-value.

The U-value of the window is calculated based on:

- The window size, i.e. glass percentage
- The U-value and width of top, side and bottom parts of the frame. The U-value of the frame depends on the window type.
- The linear transmission coefficient for the connection between pane and frame (psi-value). A psi-value per pane is used.
- Angle-dependent pane U-values are used for each pane.
- g-, τ_v- and τ_e-values are used for each pane.
- For each solar shading accessory, a multiplier for the g-value and a multiplier for the τ-value are defined for each pane.
- For each solar shading accessory, a value is defined for each pane which should be subtracted from the U-value of the pane.

For the 1-storey house with flat ceiling, a light shaft connects the roof window with the house. The thermal resistance of the shaft walls is considered to be equal to that of the roof construction. The area of the shaft multiplied by the U-value of the shaft is treated as a thermal bridge in the calculation.

Custom Pane

If needed the user can type in values for a custom pane. The needed values are:

g-value The thermal transmittance of the glass

tv The light transmittance of the glass

te The solar direct transmittance

psi The linear loss between frame and glass unit

Uglass for different slopes with a step of 5°. The U-value should be declared for the glazing alone. The total U-value of the window is dependent on the size of the window.

Based on the numbers the U-value is calculated according to EQUATION.

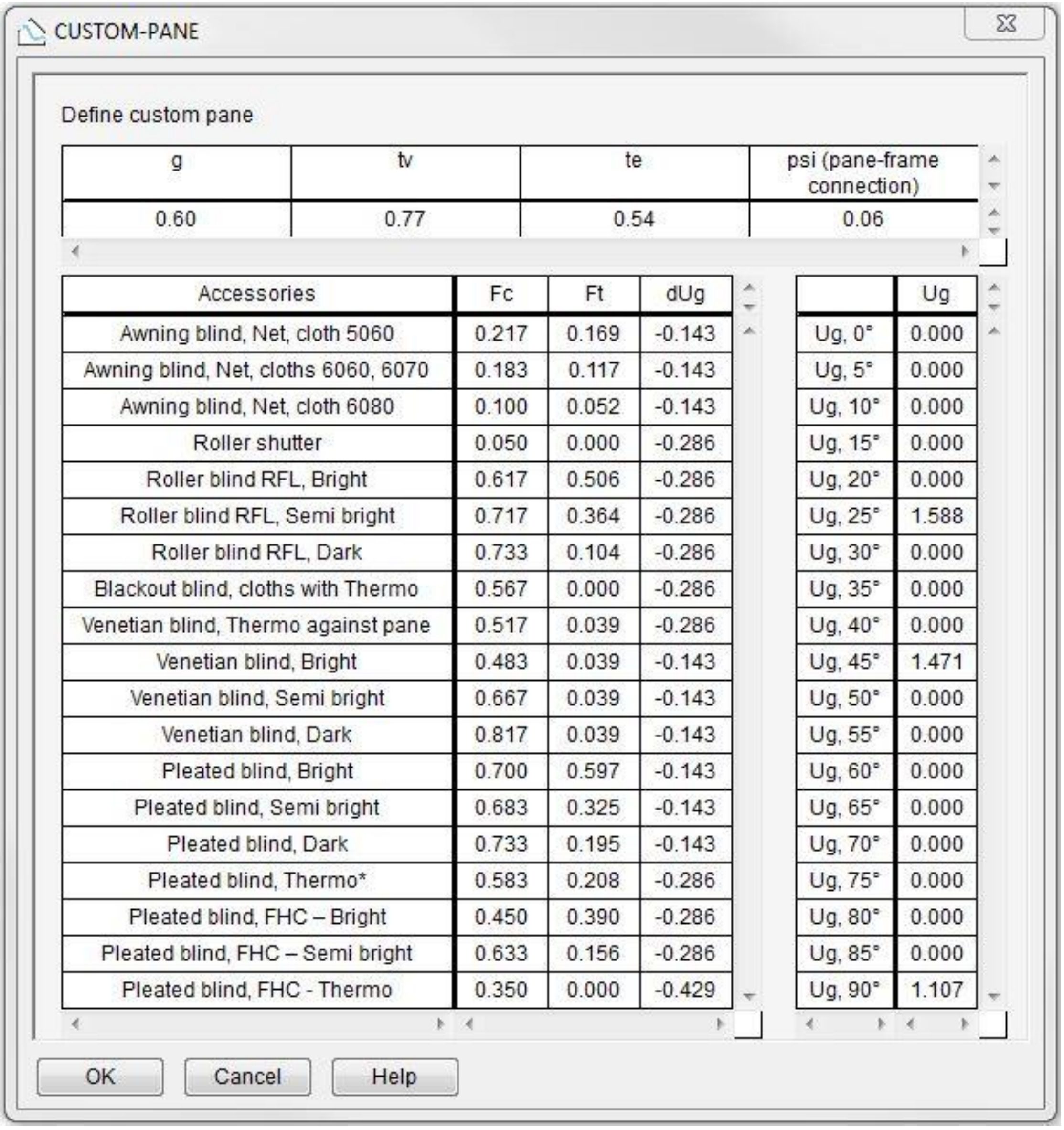
$$Uw = \frac{Ag \cdot \left(\frac{1}{\frac{1}{Ug} + \Delta Rg} \right) + Af \cdot Uf + l * \Psi}{Aw}$$

Solar shading devices for the custom pane can also be edited. The needed parameters are:

Fc – Solar shading ratio (Fc = g system/ g pane)

Ft – Solar shading visual ratio (Ft = t system/ t pane)

dUg – U-value reduction

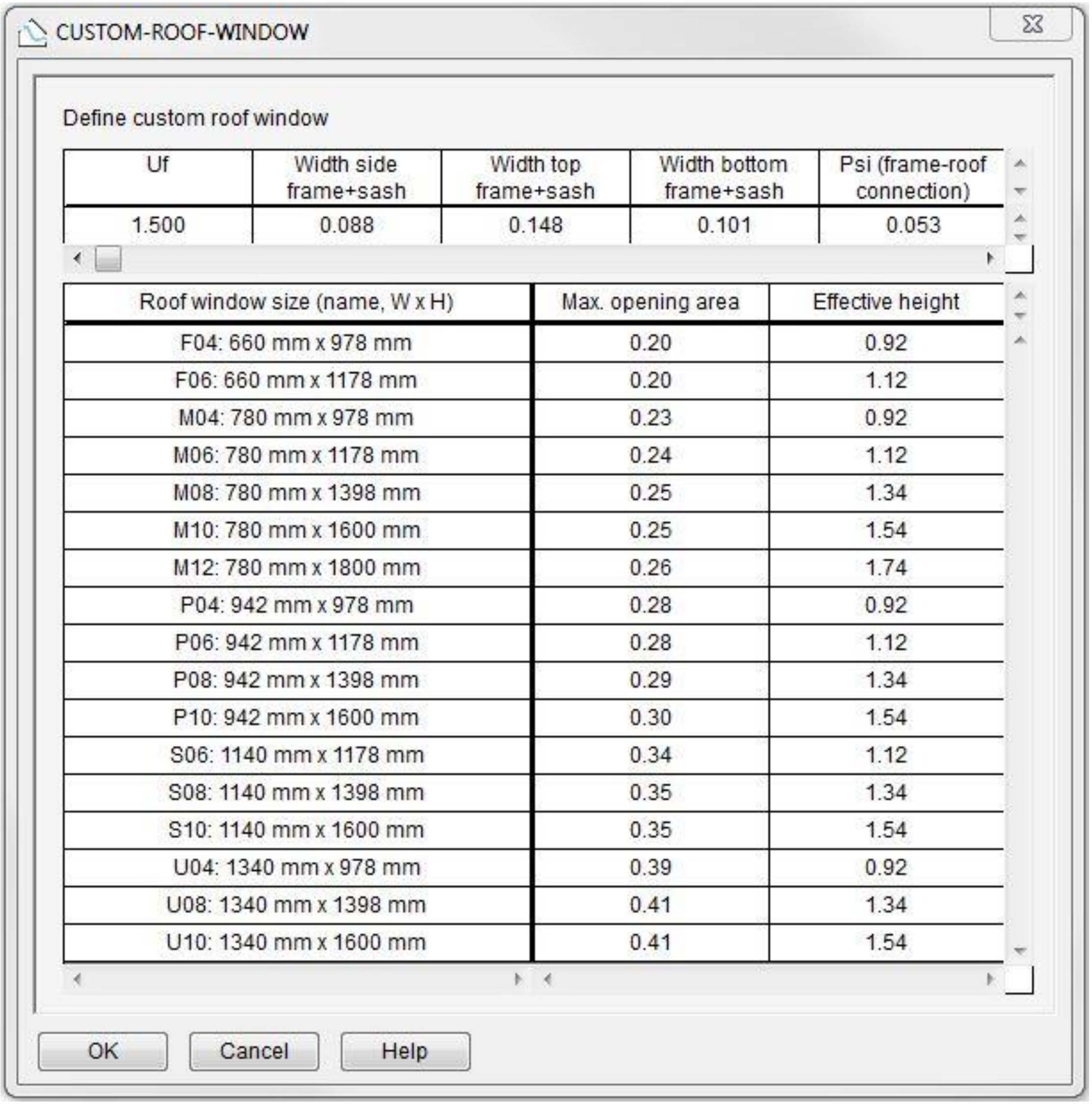


g	tv	te	psi (pane-frame connection)
0.60	0.77	0.54	0.06

Accessories	Fc	Ft	dUg
Awning blind, Net, cloth 5060	0.217	0.169	-0.143
Awning blind, Net, cloths 6060, 6070	0.183	0.117	-0.143
Awning blind, Net, cloth 6080	0.100	0.052	-0.143
Roller shutter	0.050	0.000	-0.286
Roller blind RFL, Bright	0.617	0.506	-0.286
Roller blind RFL, Semi bright	0.717	0.364	-0.286
Roller blind RFL, Dark	0.733	0.104	-0.286
Blackout blind, cloths with Thermo	0.567	0.000	-0.286
Venetian blind, Thermo against pane	0.517	0.039	-0.286
Venetian blind, Bright	0.483	0.039	-0.143
Venetian blind, Semi bright	0.667	0.039	-0.143
Venetian blind, Dark	0.817	0.039	-0.143
Pleated blind, Bright	0.700	0.597	-0.143
Pleated blind, Semi bright	0.683	0.325	-0.143
Pleated blind, Dark	0.733	0.195	-0.143
Pleated blind, Thermo*	0.583	0.208	-0.286
Pleated blind, FHC – Bright	0.450	0.390	-0.286
Pleated blind, FHC – Semi bright	0.633	0.156	-0.286
Pleated blind, FHC - Thermo	0.350	0.000	-0.429

	Ug
Ug, 0°	0.000
Ug, 5°	0.000
Ug, 10°	0.000
Ug, 15°	0.000
Ug, 20°	0.000
Ug, 25°	1.588
Ug, 30°	0.000
Ug, 35°	0.000
Ug, 40°	0.000
Ug, 45°	1.471
Ug, 50°	0.000
Ug, 55°	0.000
Ug, 60°	0.000
Ug, 65°	0.000
Ug, 70°	0.000
Ug, 75°	0.000
Ug, 80°	0.000
Ug, 85°	0.000
Ug, 90°	1.107

Figure 40 Constructions tab



Uf	Width side frame+sash	Width top frame+sash	Width bottom frame+sash	Psi (frame-roof connection)
1.500	0.088	0.148	0.101	0.053

Roof window size (name, W x H)	Max. opening area	Effective height
F04: 660 mm x 978 mm	0.20	0.92
F06: 660 mm x 1178 mm	0.20	1.12
M04: 780 mm x 978 mm	0.23	0.92
M06: 780 mm x 1178 mm	0.24	1.12
M08: 780 mm x 1398 mm	0.25	1.34
M10: 780 mm x 1600 mm	0.25	1.54
M12: 780 mm x 1800 mm	0.26	1.74
P04: 942 mm x 978 mm	0.28	0.92
P06: 942 mm x 1178 mm	0.28	1.12
P08: 942 mm x 1398 mm	0.29	1.34
P10: 942 mm x 1600 mm	0.30	1.54
S06: 1140 mm x 1178 mm	0.34	1.12
S08: 1140 mm x 1398 mm	0.35	1.34
S10: 1140 mm x 1600 mm	0.35	1.54
U04: 1340 mm x 978 mm	0.39	0.92
U08: 1340 mm x 1398 mm	0.41	1.34
U10: 1340 mm x 1600 mm	0.41	1.54

Figure 41 Constructions tab

Ventilation properties of windows

For both roof windows and façade windows, a maximum opening area is calculated for each window size. The opening area is defined as:

- Pivoting roof windows: based on 22 cm from bottom of frame to bottom of sash, corresponding to a fully opened VELUX Integra window.
- Top-hung roof windows: based on 30° between frame and sash.
- Openable façade windows: based on 20° between frame and sash.
- Openable façade windows higher than 2 metres: based on 10° between frame and sash.

The ventilation flap of roof windows is treated separately. The airflow rate depends on the width of the window and the pressure difference across the window. The airflow rate is defined as:

$$q_v = (3.70 \cdot \text{width} - 0.126) \cdot dp^{0.53}$$

Where:

- Width [m]
- dP [Pa]
- q_v [l/s]

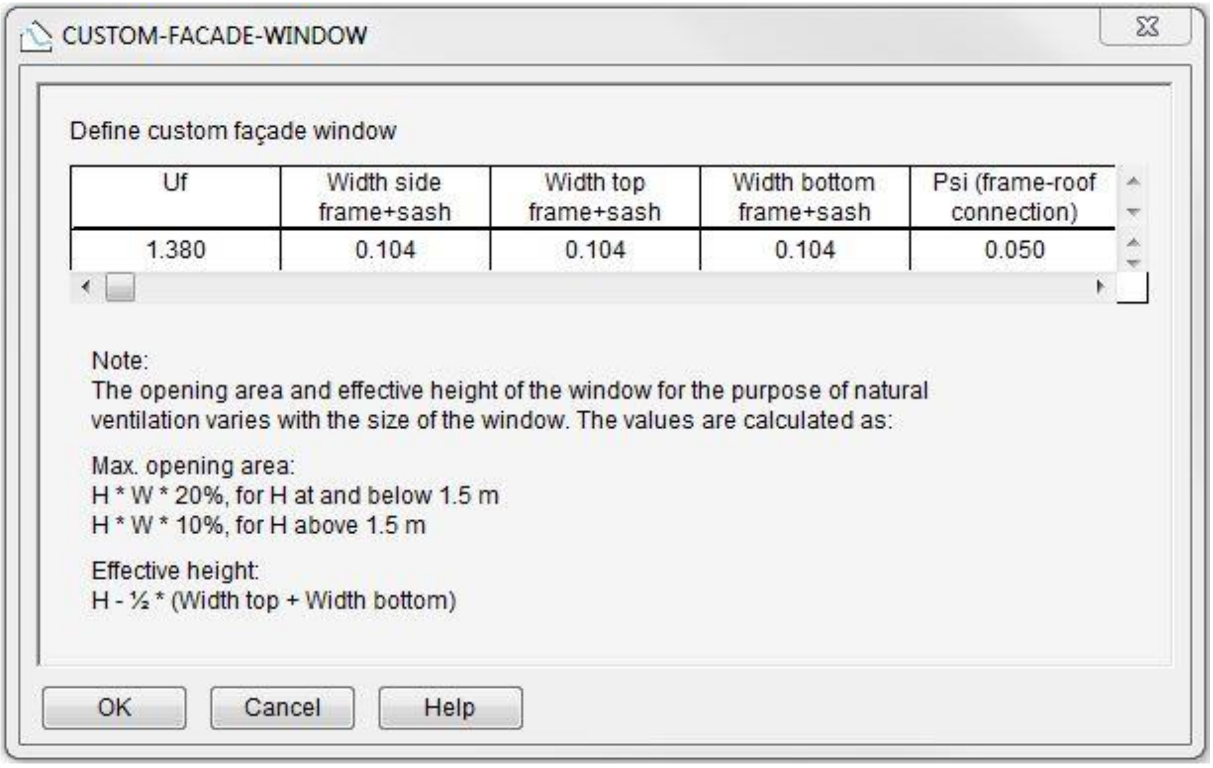


Figure 42 Constructions tab

Heating and cooling

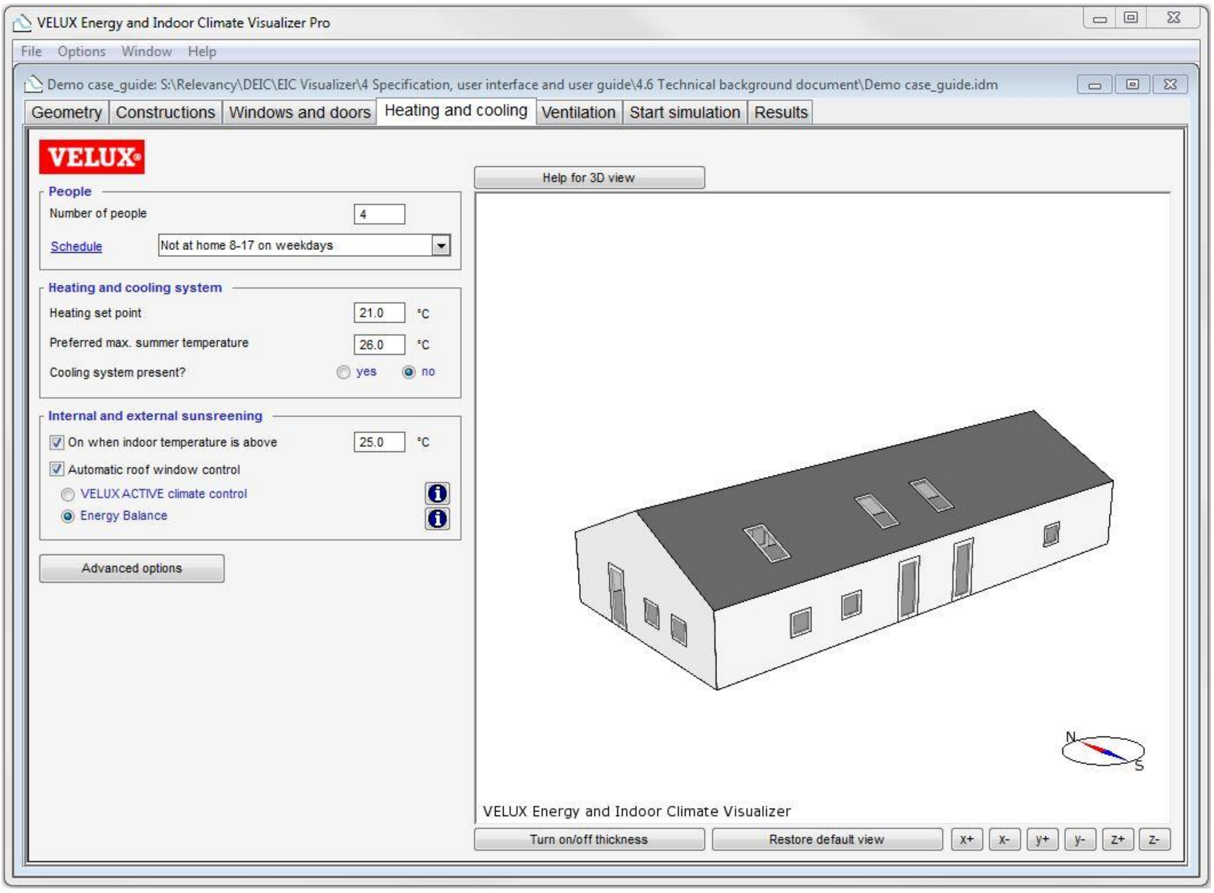


Figure 42 Constructions tab

At this tab the controls for heating, cooling and solar shading are selected, as well as the schedule for the occupants of the house.

Occupants

The clothing insulation (clo) of occupants varies throughout the year based on a proportional control: When the PMV is lower than -1, the people will wear maximum clothes and when the PMV is higher than 1, the people will wear the minimum amount of clothes. Clo will vary as 0,85±0,25 and cannot be changed be the user.

Advanced Shedule settings

In the advanced Schedule settings, you can create additional rules for the occupancy schedule by simply clicking the “Add” button. The rule that you have just created appears in the Rules window. Beneath you can set the Daily schedule for it, which appears in a form of timeline, similar to that in the basic schedule settings for weekdays and weekends. Next you can choose the starting and ending date for the rule, using the calendar and select the days of the week when the rule is valid (e.g. 01.07 – 31.08 on Wednesdays, Thursdays and Fridays). After the rule is defined you can describe it and save.

The advanced schedule settings can be used when there is a time during the year, when occupancy significantly differs from a ‘normal’ schedule. It can be for instance during the holidays, when adults are not going to work and children are going on a summer camp and so on.

Electrical lighting

The electricity demand for electrical lighting is determined based on the amount of daylight entering the building as an average of the lux level on a working plane.

The daylight model calculates the target position of the direct light beam from each window. Each surface that is hit will then reflect diffusely. A radiosity model is applied to negotiate diffuse light exchange according to approximate view factors.

The default values for installed power for electric light include the effect of light fixtures. The table below shows the values used in EIC Visualizer. A linear function is used to determine the power consumption when the daylight level is between 0 lux and the given set point.

The installed power in W/m² for 3 types of light bulbs and 3 set points based on average light fixtures

Table 10 Light levels dependance on installed lighting power

Set point	100 lux	50 lux	25 lux
Incandescent (7,2 lm/W)	13,9	6,9	3,5
Fluorescent (44 lm/W)	2,3	1,1	0,6
Mixed (26 lm/W)	8,1	4,0	2,0

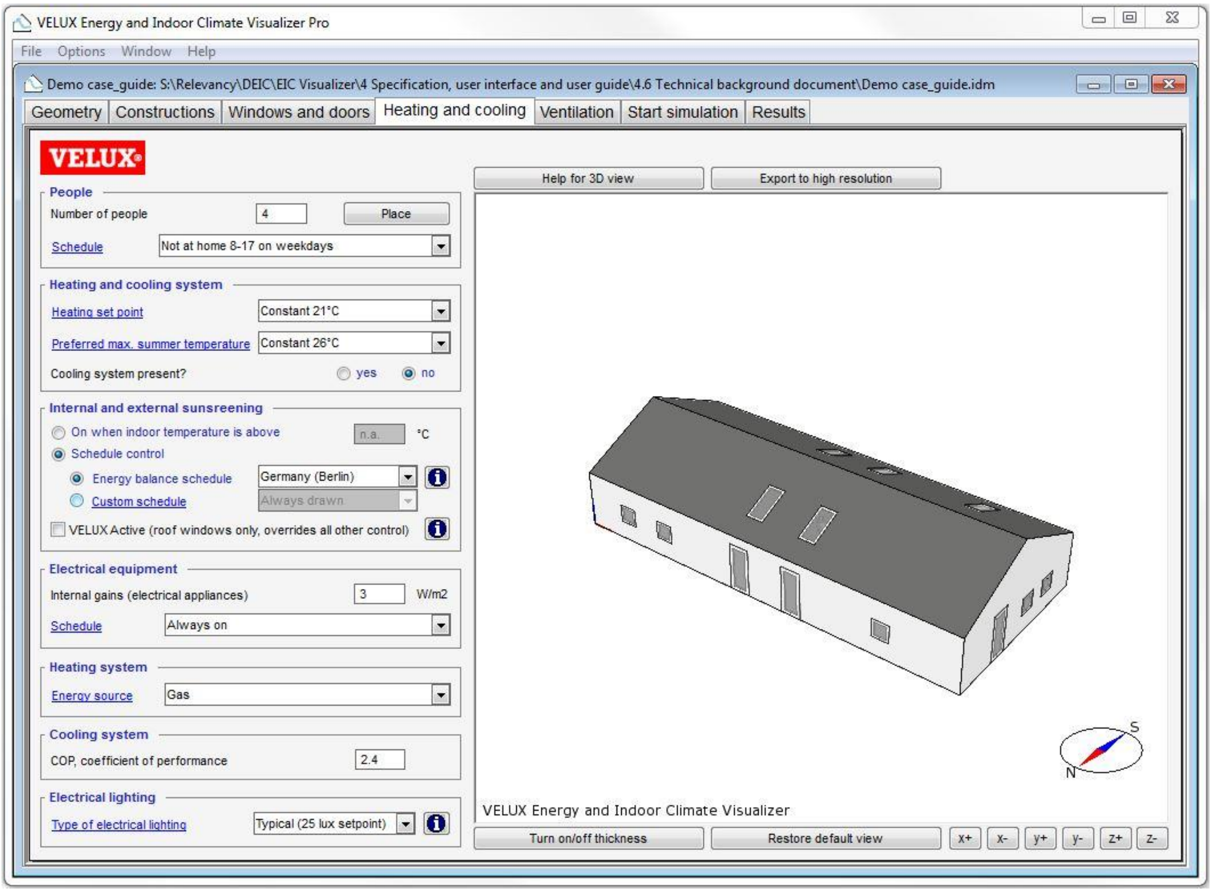


Figure 43 Constructions tab

Ventilation

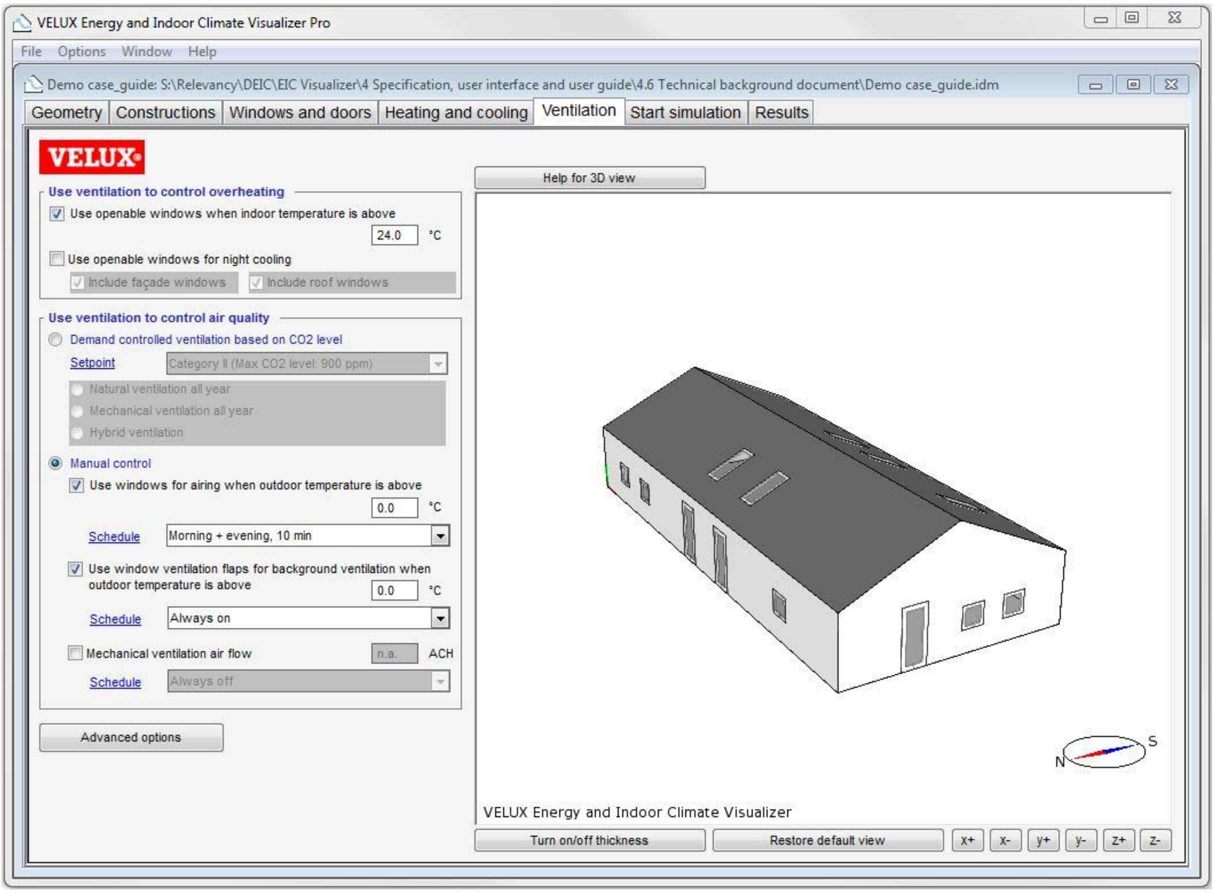


Figure 43 Constructions tab

At this tab the controls for lighting and ventilation are selected.

Airflow model

The airflow model used in the EIC Visualizer is a pressure driven model. Cracks in the building façade and windows are defined with regard to airflow characteristics. The result is a calculation of airflow that considers infiltration through the façade and controlled natural ventilation through windows as one, i.e. these two components constitute the airflow and thus the ventilation rate of the building.

The leakiness of the building is defined as the the leakiness of a building pressurized at 50 Pa with the leakage equally distributed on the facades. Windows are defined with a maximum openable area, and the opening is modulated up to this area according to the control options selected.

Results

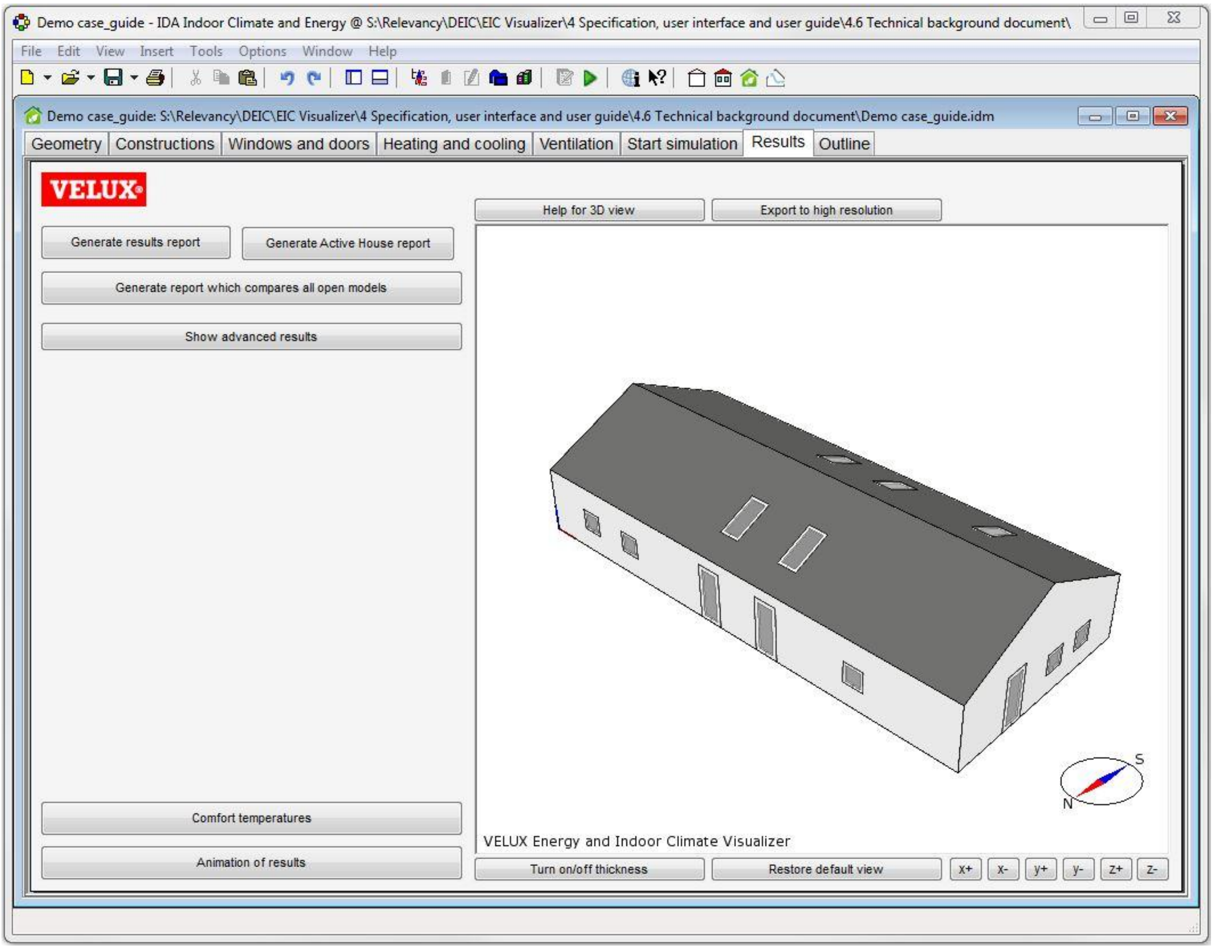
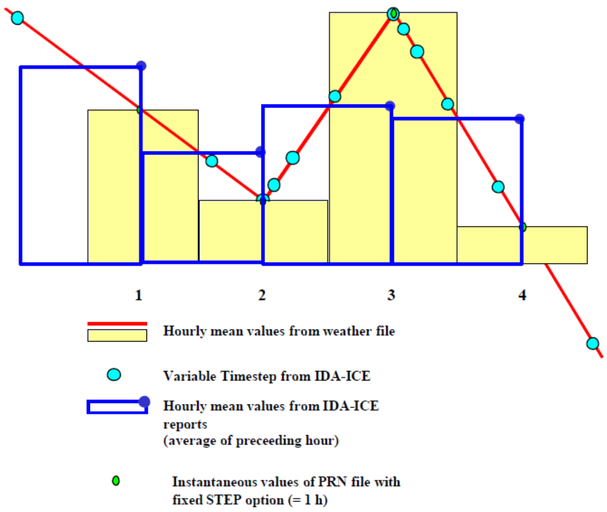


Figure 43 Constructions tab

At this tab results are selected and viewed.

A note about timesteps in VELUX EIC viz.

The simulation engine uses a variable timestep integration scheme and in conjunction with weather input files with fixed hourly timesteps and printed EIC reports (also with fixed hourly timesteps but for the preceeding hour) seemingly strange results can occur. The figure below represents a single problem variable, say the outdoor air temperature in various possible representations. (The location of timesteps and shape of solution curve is not quite realistic but that is of minor consequence here.)



All weather data files (input as well as output) are interpreted as containing instantaneous values of a variable, i.e. no integration over a certain time period is done or assumed. When the PRN-file happens to be generated from measured weather data, which usually represents mean values over some period, the given value should be the average around the current time point.

However, in the results post processing in IDA ICE, the values are presented as the average over the preceeding hour. In a case such as in the example above this can lead to quite different results. The existence of this different convention in the same environment may be unfortunate but it is an artifact of other considerations which are not fully presented here (c.f. average of a month, a week or a day). The hour between time 0 and 1 is called 1, just like the first month of the year is called January.

For users that have a need to compare results as accurately as possible, IDA Solver can

interpolate results to an arbitrary equidistant timestep. To access this feature from ICE 3.0, select a suitable Time step for output on the Advanced tab of the Simulation Data dialog. All generated .prn files will then have the requested, fixed timestep. Equidistant data is useful for results comparison in program such as Excel and Matlab.