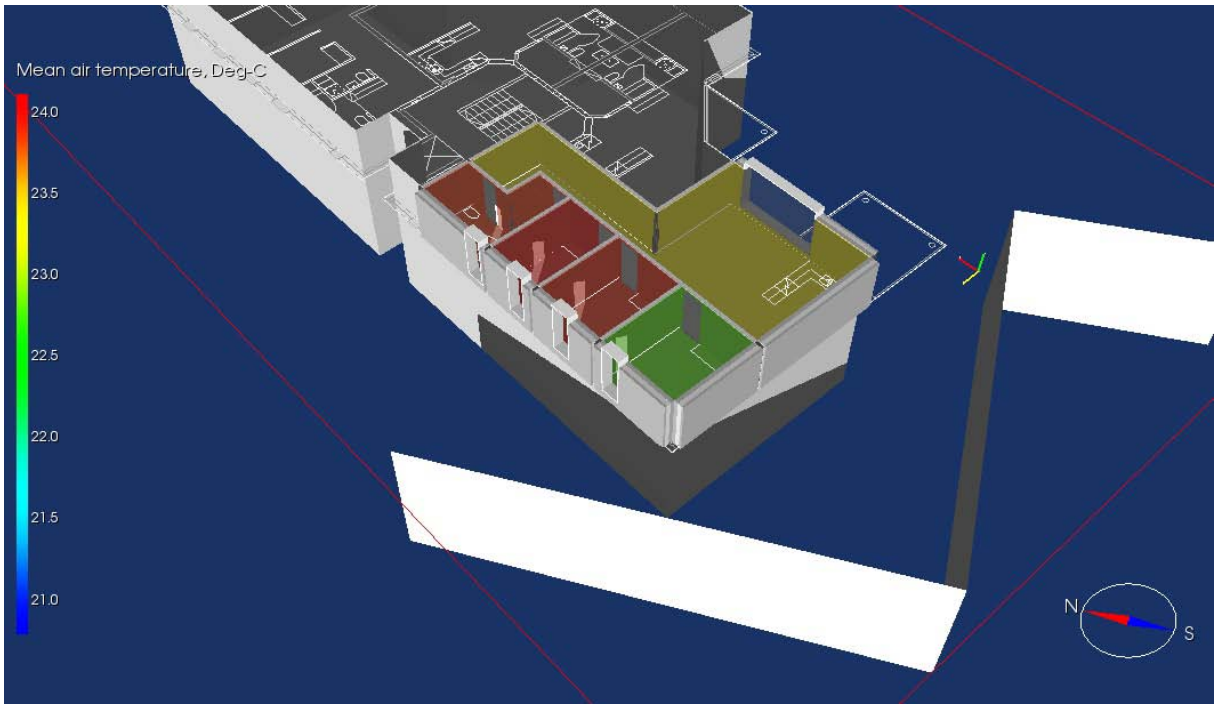
EQUA
SIMULATION TECHNOLOGY GROUP

IDA ICE 4:
Getting Started



EQUA Simulation AB, September 2009

Manual version: 4.0

Contents

1 Introduction

IDA Indoor Climate and Energy (IDA ICE) is a dynamic multi-zone simulation application for the accurate study of the thermal indoor climate of individual zones as well as the energy consumption of an entire building.

The user interface has been designed to make it easy to build and simulate simple cases, but also offers the advanced user the full flexibility of IDA. To provide both efficiency and flexibility, IDA ICE works with three user levels: Wizard, Standard and Advanced. This manual shows how to work in the standard level.

IDA ICE 4 is delivered in two editions: Standard and Expert. The screen shots shown are from the Expert edition of the program. Please note that unless specifically mentioned, all steps can be undertaken with the standard edition.

Chapter 2 gives a brief overview of the user interface. It roughly explains what can be done where, but does not go into details. You should not worry about this and try to make it to the end of the chapter. The actual learning example starts in Chapter 3. From that point, take care in always trying to understand what you are doing.

Basically, the screenshots will show you how to act, while the text explains what you are doing and provides useful hints. Make sure you take a look at the online help texts as well. These are easiest reached by pressing F1, when you have the dubious window active.

Caption for symbols in screenshots

Numbers with reference from screenshot to text

Hints about possible actions, not belonging to the learning example. These can safely be omitted without losing the thread.

Indication of a screen sector

Single left mouse click

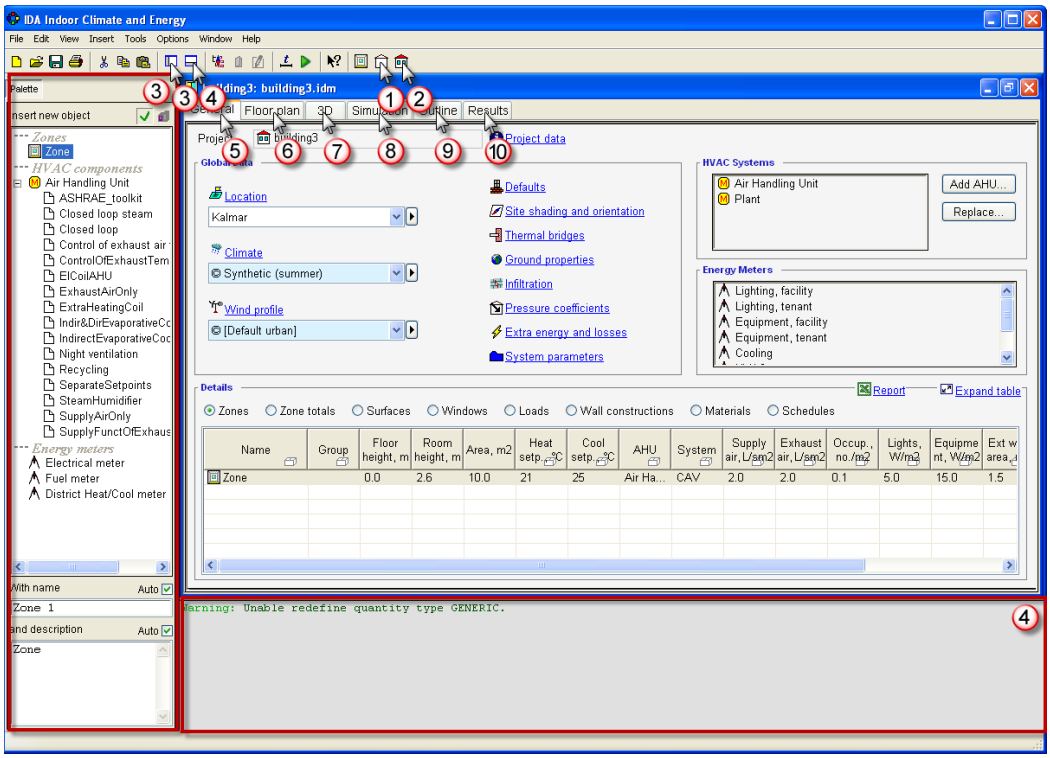
Single right mouse click

Double left mouse click

Drag and drop

Drag and drop with pressed Ctrl-key

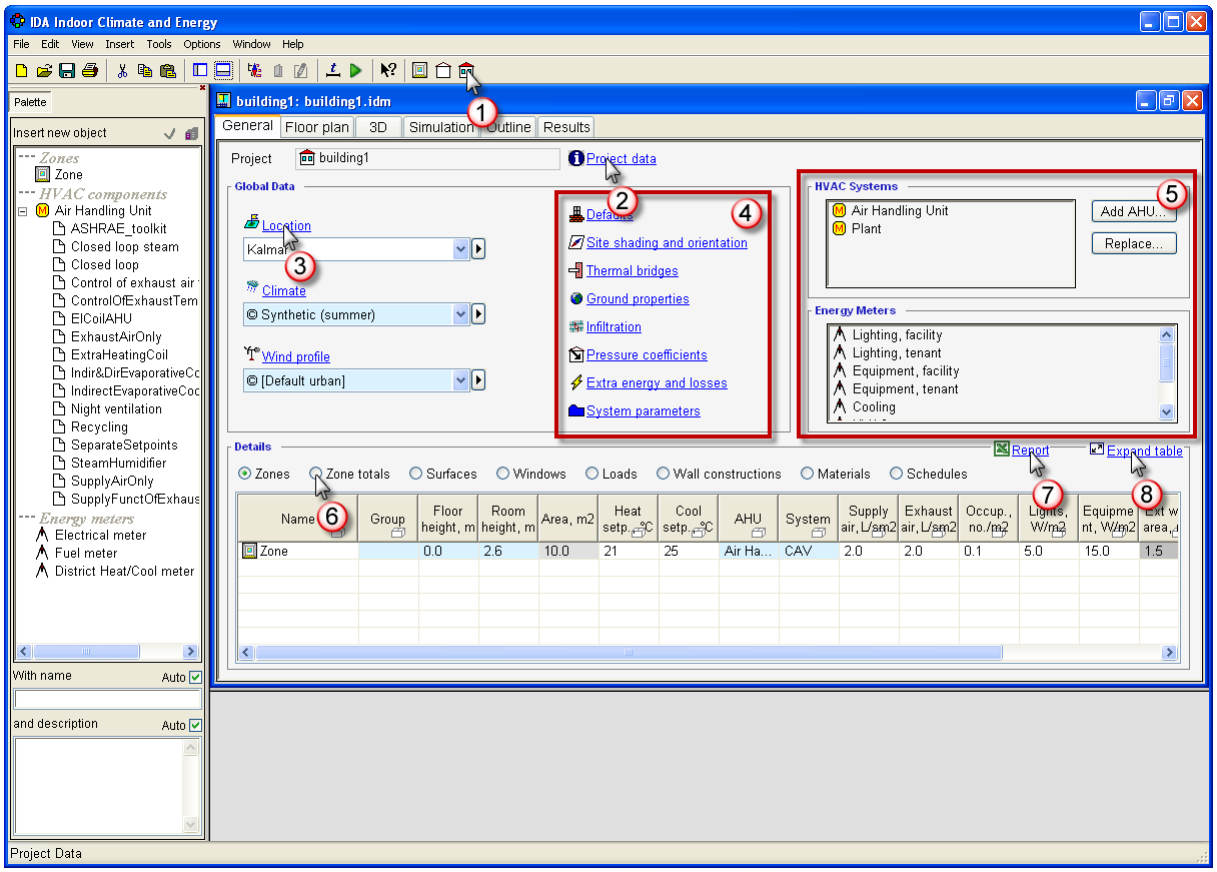
2 Overview of Standard Level (Does not belong to the learning example)



Screenshot 1

- ☞ (1) Click this button to start with an empty building.
- ☞ (2) Click this button to start with a building with a single zone. Unlike starting with an empty building, a project ready to simulate will be opened up. This building contains the geometry of a single zone with a southerly orientation. The building has default settings for wall constructions, glazing, shadings, location, synthetic weather, mechanical zone ventilation, controller setpoints and everything else needed for a simulation.
- ☞ (3) Click this button to open or close (toggle) the side bar. The side bar contains ***Palettes*** (list of objects to insert) and ***Properties*** (editable parameters for the selected object).
- ☞ (4) Click this button to open or close the ***log window***. The ***log window*** contains error and warning messages. By double clicking on an error message, the program will attempt to take you to the location where the problem can be addressed.
- ☞ (5) General tab: Main information about the project: ***Global Data, HVAC Systems, Energy Meters*** and tables with model details. Individual tables can be selected by clicking on the corresponding radio button. Many parameters can be changed directly in this table. The tables can be exported to Excel for reports.
- ☞ (6) Floor plan tab: 2D view of the building geometry. ***Building body, zones, windows*** and ***doors*** can be inserted and edited here.
- ☞ (7) 3D tab: The model and results can be visualized and animated here. Selecting an object will open up a property page in the side bar. Double clicking on an object will open up the object form.
- ☞ (8) Simulation tab: Simulation options are given here
- ☞ (9) Outline tab: Outline view of the project (Expert edition only)
- ☞ (10) Results tab: Overview of the simulation results

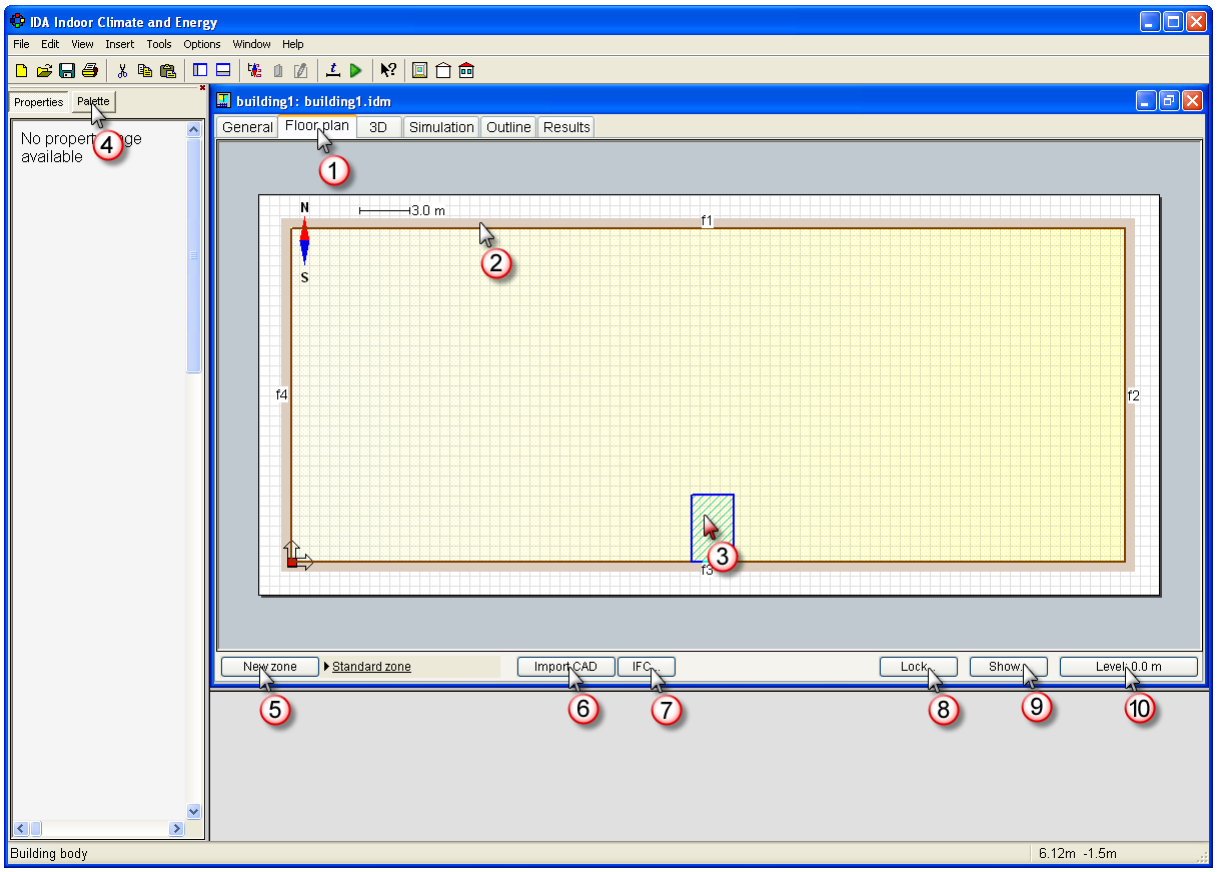
General tab



Screenshot 2

1. Start new building with a single zone
2. Modify Project data
3. Modify Location data: ***Geographical position, Design Day*** data.
   - ☞ 4. In this section you have access to different parameters that are valid for the whole building. This will be explained in more detail in Sections 11 through 14.
   - ☞ 5. In this section, you have access to the structure and parameters of the air handling unit(s) and building plant, as well as the meters for keeping track of energy and emissions. This will be explained in more detail in Section 10.
6. Change the table view: Data related to zones, surfaces, windows, loads, constructions, etc. can be viewed and edited here.
7. Export the input value tables to Excel
8. Expand the current input value table to a separate (larger) window.

Floor plan tab



Screenshot 3

1. Go to the Floor plan tab
2. Select an object to edit its properties in the side bar (ensure that the ***Properties*** and not the ***Palette*** view of the side bar is active)

NB The steps below are for orientation only, don't try to build anything serious yet.

☞ 3. Rename, cut, copy, delete, replace or edit objects

4. Switch to palette to insert more objects

☞ 5. Insert a new zone. How to do this is explained in more detail later.

☞ 6. Import CAD files as background drawing.

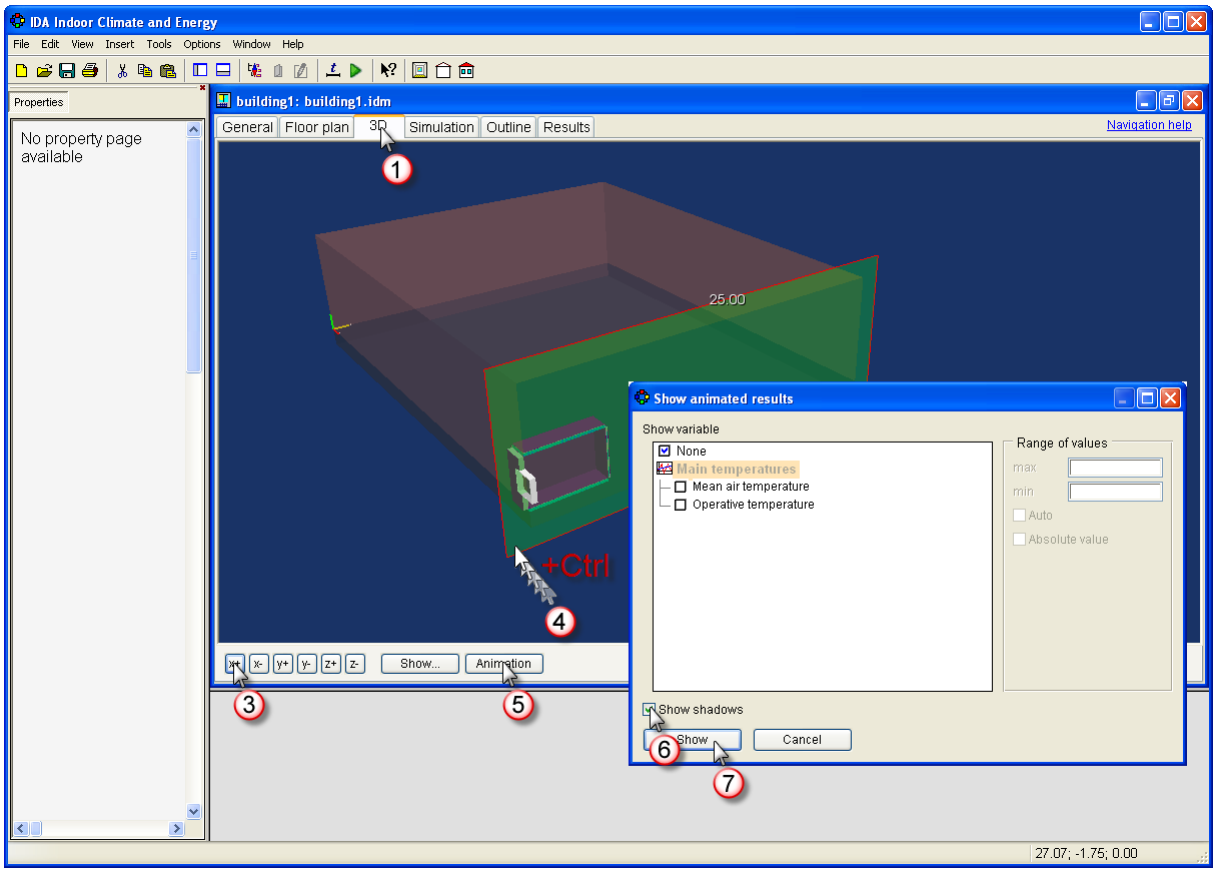
☞ 7. Access the IFC menu (expert edition only) to import or map IFC objects.

☞ 8. Protect objects to avoid them to be moved or deleted

☞ 9. Set and remove a view filter to exclude object types from being shown

☞ 10. Change the level where the floor plan is being shown

3D tab

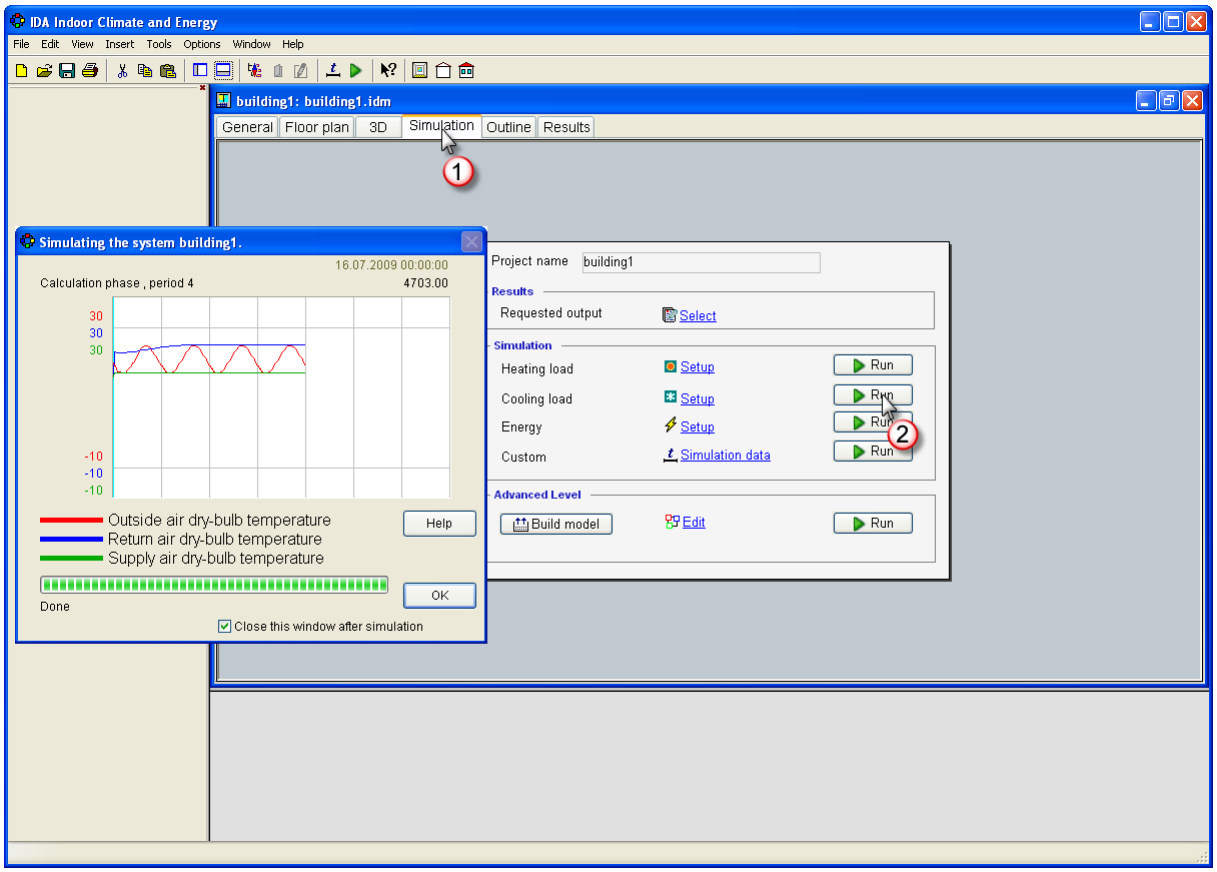


Screenshot 4

1. Go to the ***3D tab***
2. Use the left mouse button to rotate the building, the right mouse button to zoom and the middle mouse button to pan. When clicking on the F-key, a new focus (for rotation and zoom) is set at the cursor's place.
3. Cut the building in positive x-direction
4. Move the cutting plane
5. Animate calculation results
6. Activate shadow animation
7. Start animation

NB This is a shadow animation only. How to animate result variables will be explained later. At the moment, we do not have any results to show, since we did not simulate yet.

Simulation tab

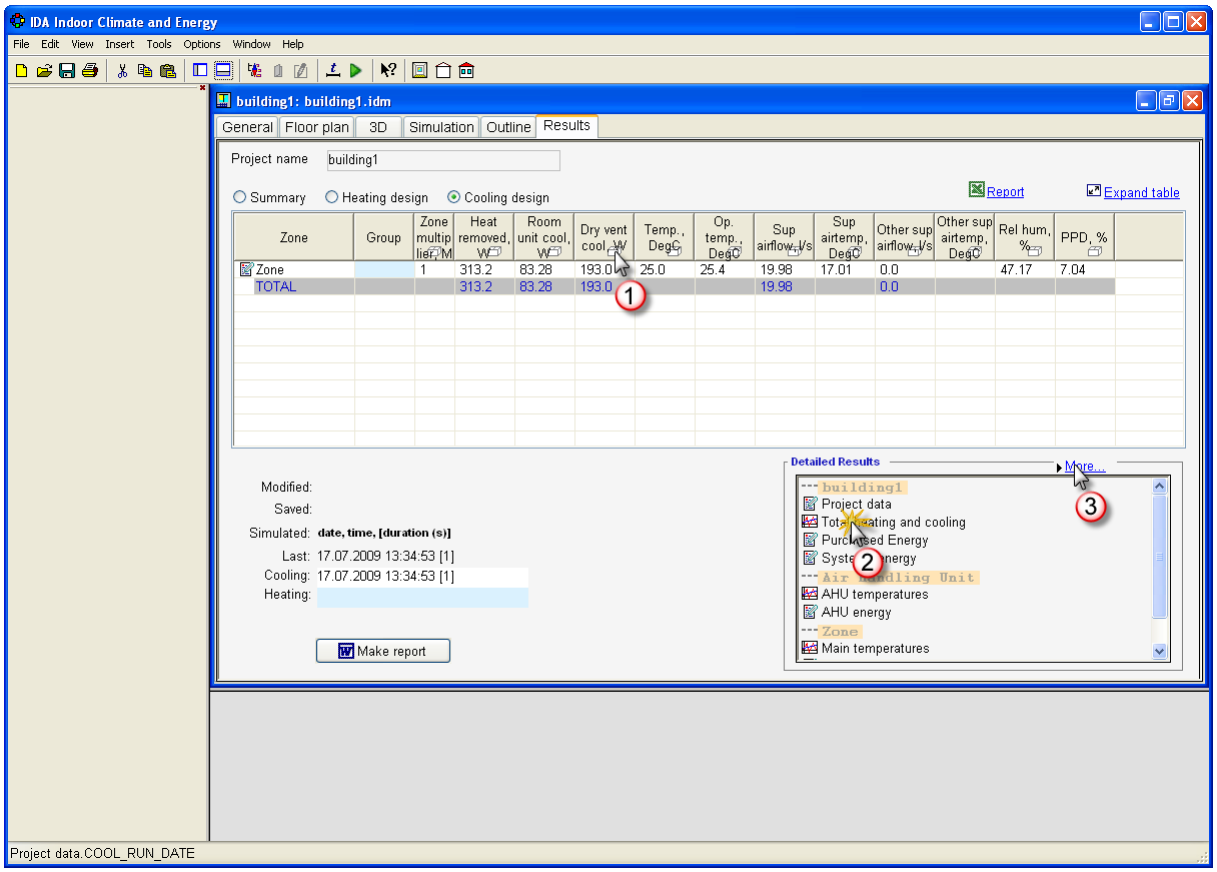


Screenshot 5

1. Go to the ***simulation*** tab
2. Start a ***cooling load*** calculation

NB You can start 4 different types of simulations: Heating load calculation, cooling load calculation, energy calculation or customized calculation. These will be explained in more detail in Section 15.

Results tab



Screenshot 6

After a simulation, the program switches to the ***Results*** tab.

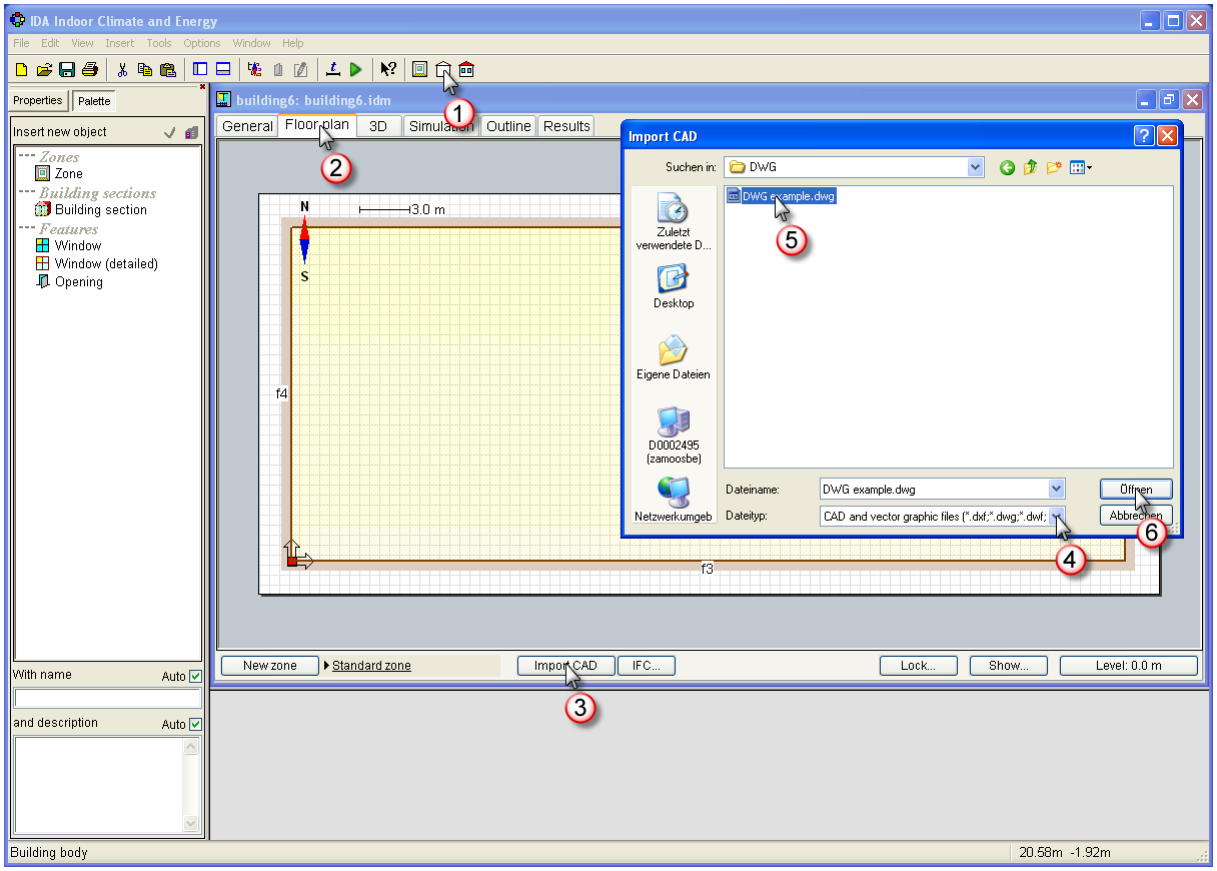
1. Visualize a result column in the 3D model.
2. Look at the ***time series*** diagram

☞ 3. Sum energy reports of several zones or of specific zone groups or compare the current result set with a set from previous simulations.

Help texts

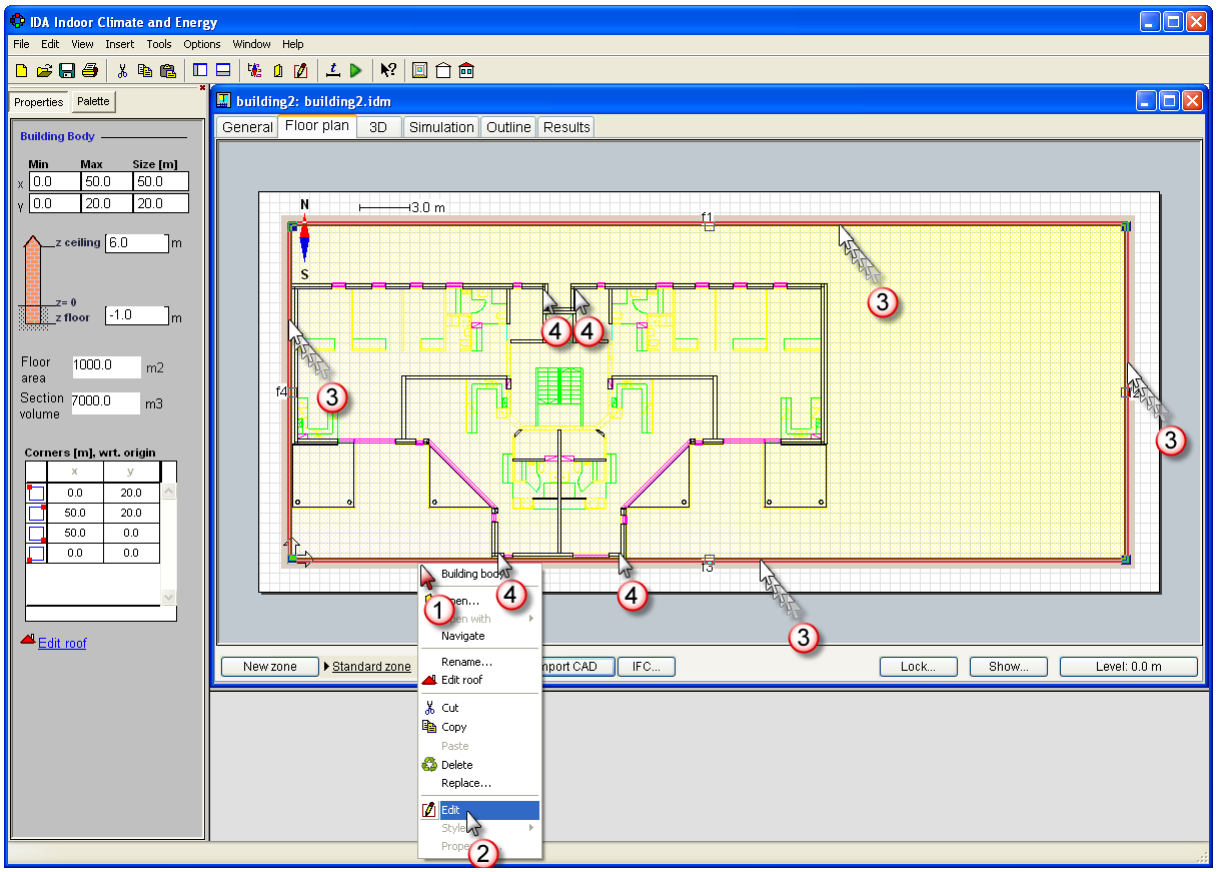
Press the F1-key or choose Help -> Help topic to find help texts.

3 Building Geometry and CAD Import (Start of the learning example)



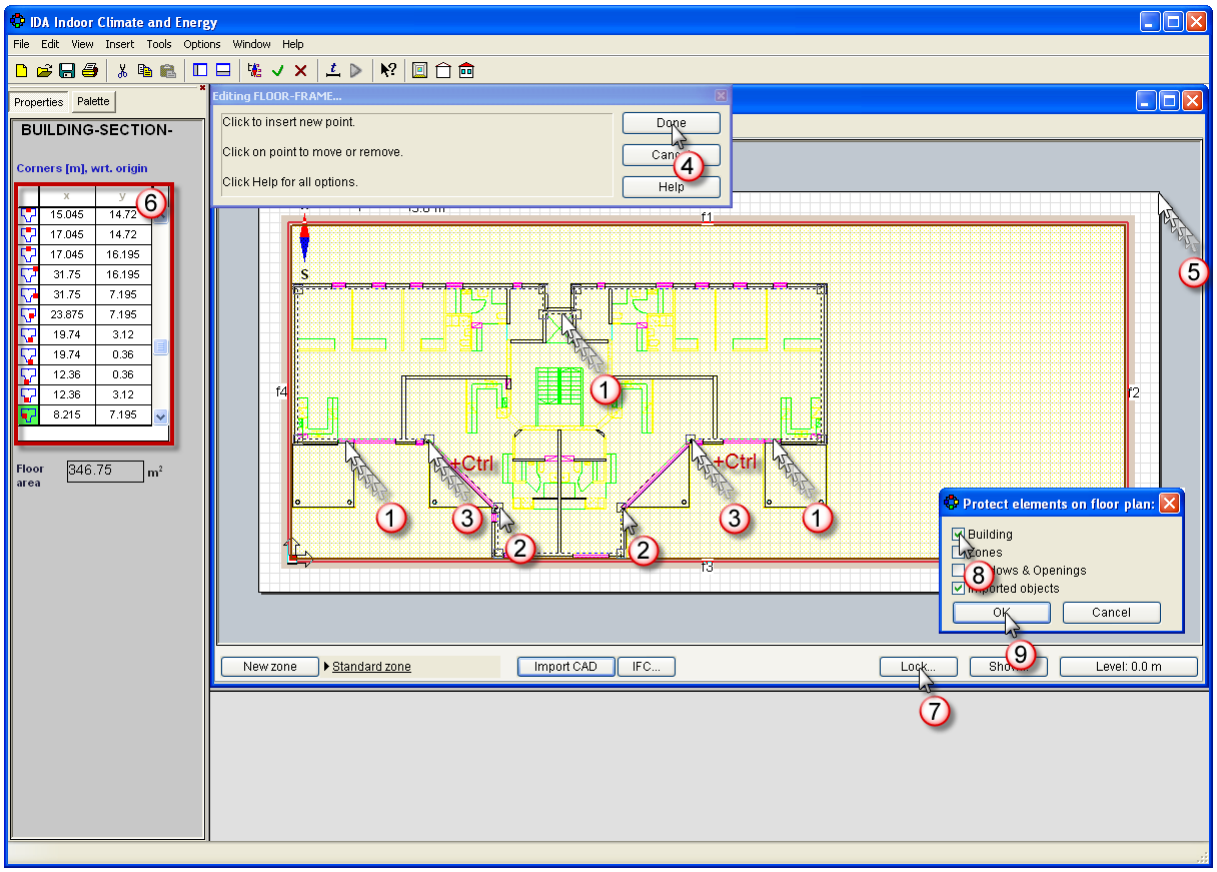
Screenshot 7

1. Start with a new empty building
2. Go to the Floor plan tab
3. Choose CAD import
4. Choose the appropriate file type
5. Browse to the desired CAD file (the DWG example used in this guide can be found among the samples in the IDA installation folder (Normally: **C:\Program Files\IDA\samples\ICE\DWG example.dwg**)
6. Open the chosen file and then click “OK” in the ***Preferences*** window



Screenshot 8

1. Open the building body menu
2. Select "Edit"
3. Move the building border (wait at line to snap to CAD line of inner surface)
4. Add new points



Screenshot 9

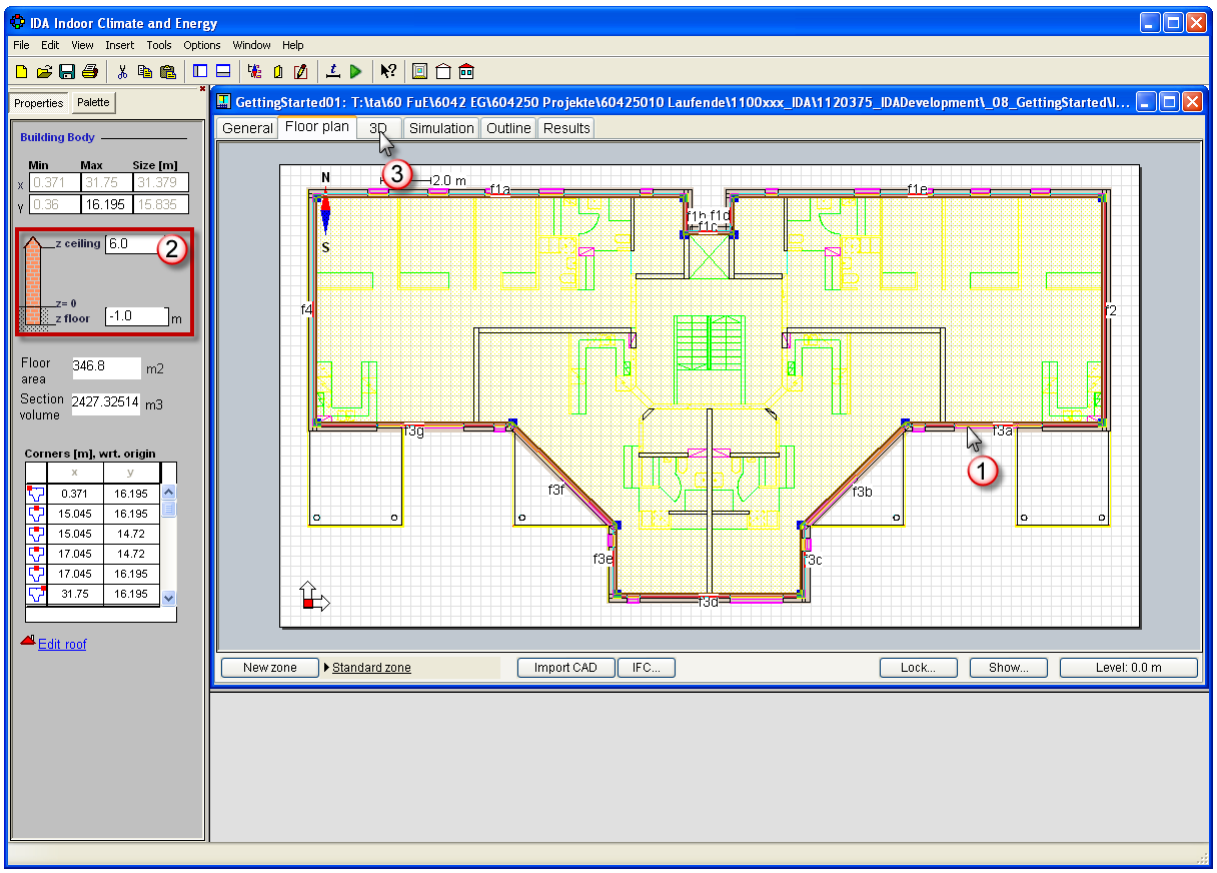
1. Move building border between two points (snap to CAD line of inner surface)
2. Add new points
3. Drag and drop points with pressed Ctrl-key to move them in a non-orthogonal direction.
4. Finalize building shape

NB You can carry out several amendments and then 'activate' them by clicking the "Done" button. All changes can also be cancelled by clicking the "Cancel" button.

5. Adapt workplane size

☞ 6 The coordinates of the building body can also be edited in the side bar

7. Protect the building (and imported objects) from being unintentionally moved
8. Choose elements to be locked
9. Finalize element protection



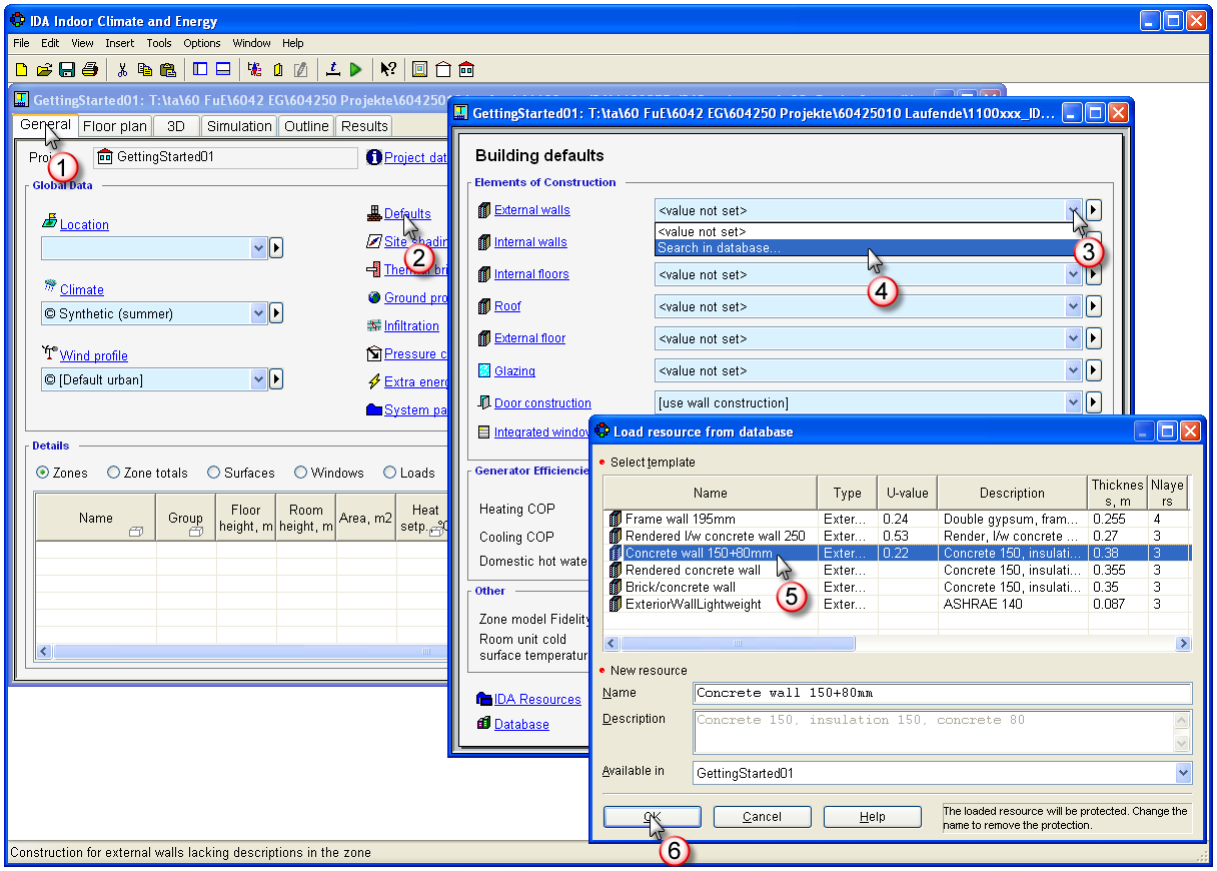
Screenshot 10

1. Mark the building body by clicking on its border
2. Set the building floor and ceiling height

NB Default ground level is always at 0 m. This means that by default, external walls below zero are linked to the ground, while the part of walls above zero are linked to the corresponding building face.

3. Go to the 3D tab to look at your building

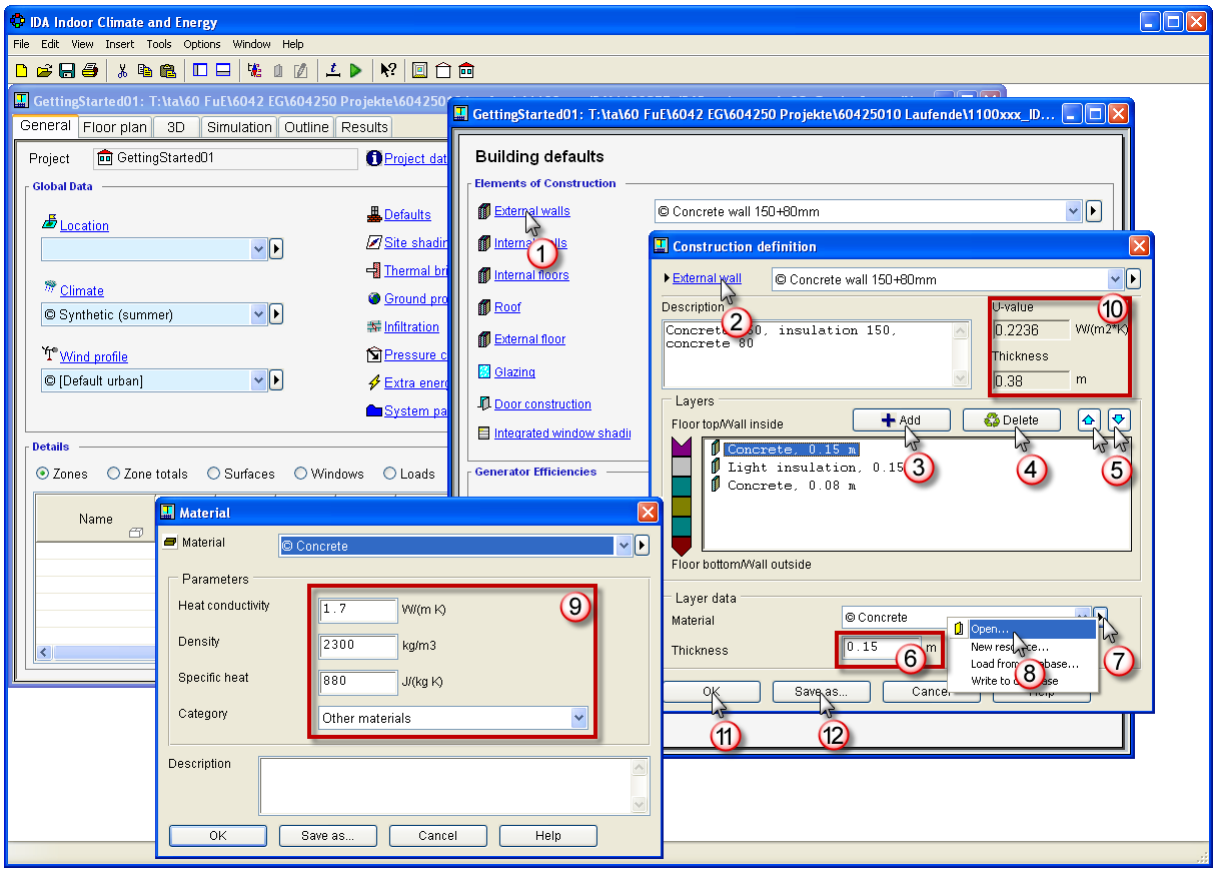
4 Define Default Constructions



Screenshot 11

1. Go to the General tab
2. Go to “Defaults”
3. Choose for external construction ...
4. ... “Search in database...”
5. Choose “Concrete wall 150+80mm”
6. Finalize selection of default construction

NB For all external walls with no specifically defined construction, the default construction for external walls will now automatically be applied.



Screenshot 12

1. Open the construction definition dialog for External walls
2. Change from “External wall” to “generic” so you can use the same construction for elements other than external walls
3. Add a new layer

   ☞ 4. Delete the marked layer

   ☞ 5. Move the marked layer one step up- or downward
6. Change the thickness of the marked layer
7. Load a material from the database
8. Open the material form

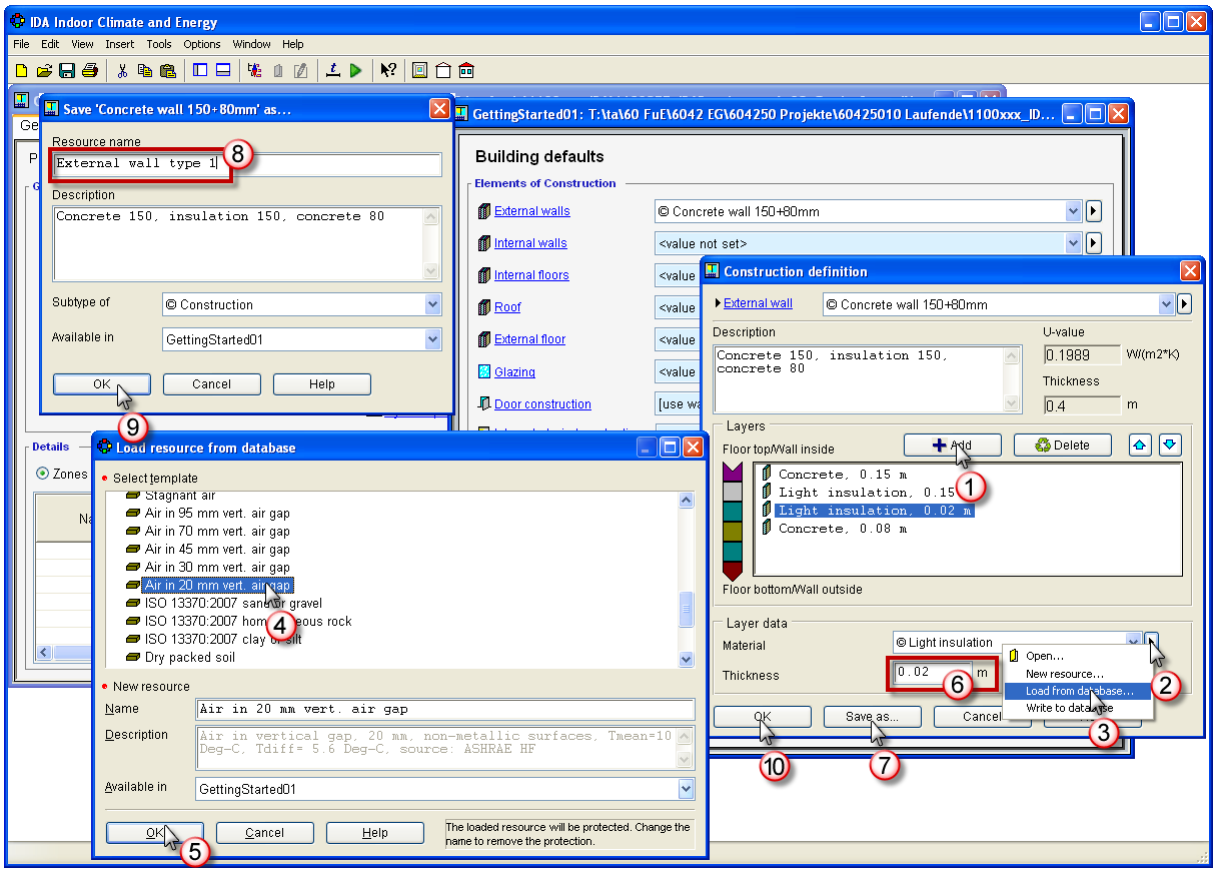
   ☞ 9. Change the physical properties of the material

   ☞ 10. U-value and Thickness of the whole construction will be recalculated automatically after each modification

   ☞ 11. Finalize construction definition by saving with same name

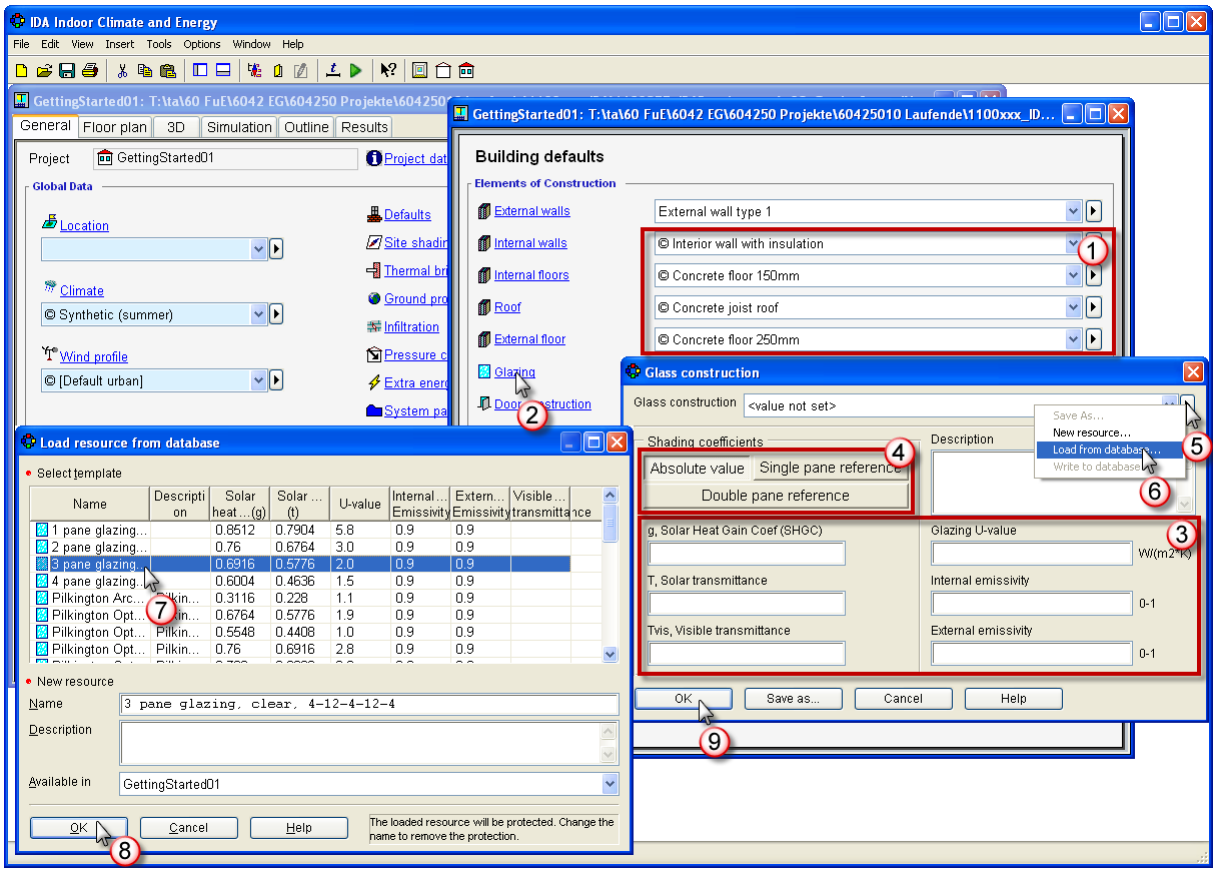
   ☞ 12. Finalize construction definition by saving as a new resource

NB Objects such as the wall construction we are just making are called Resources in IDA. They can be accessed from all relevant places in the program. Resources which are copies of database objects have names beginning with ©. They are protected against modification and cannot be saved under their database name. They can however be saved as an editable case resource, using a different name.



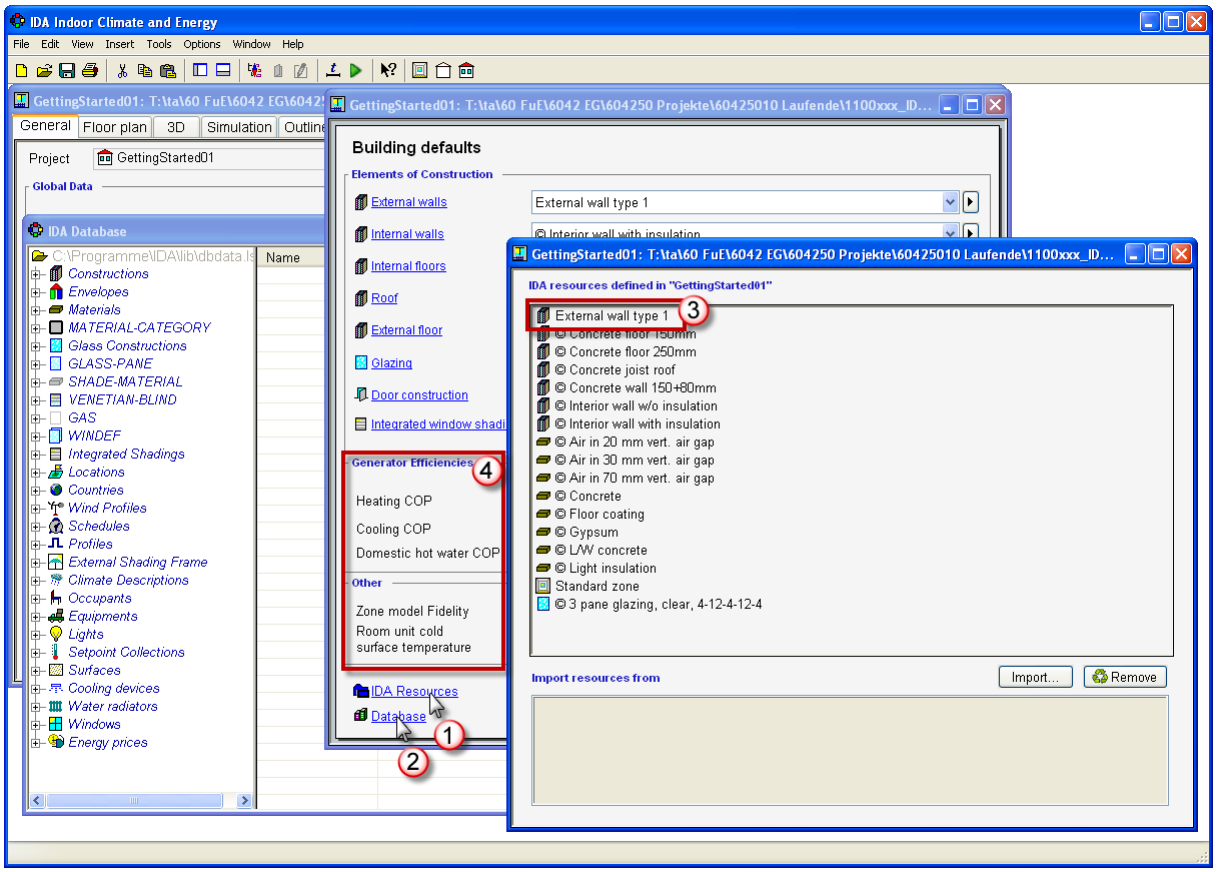
Screenshot 13

1. Add a new layer
2. Choose how to define the new material
3. Load from database...
4. Choose “Air in 20 mm air gap”
5. Finalize Material selection
6. Set layer thickness to 20 mm (= 0.02 m)
7. Save construction as a new resource
8. Set resource name
9. Finalize resource saving
10. Finalize construction definition



Screenshot 14

1. Define default construction for internal walls, internal floors, roofs and external floors by loading them from the database
2. Open the glass construction database
   - ☞ 3. Set your own glazing properties
   - ☞ 4. The shading coefficients can either be given as absolute values or reference to single or double pane
5. Choose how to define glazing properties
6. Choose “Load from database...”
7. Choose “3 pane glazing, clear, 4-12-4-12-4”
8. Finalize glazing selection
9. Finalize glass construction definition



Screenshot 15

☞ 1 Open IDA Resources

☞ 2 Open IDA ICE database, browse around to see what is available. The database is used to distribute useful input data with the program delivery, but items can be added by the user as well (and they will survive a new program version upgrade). Added items are stored on the local machine. Other means are provided for distribution of common input data among, for example, the members of a project team or company. Read the online help by pressing F1 in the database or the resources' window.

☞ 3 "External wall type 1" is an example of a resource and it can be used as the construction of any external wall. A resource can also be written to the IDA ICE database by right-clicking on it and choosing the "Write to database" option. It will then be protected, indicated with a © as its prefix. All resources beginning with © are copies of database entries with the same name and are protected against modification, unless they are renamed.

NB Whenever an element linked to a resource is modified, the program will ask you to choose "OK"(save the modified resource, i.e. all elements linking to this resource will then be modified) or "Copy" (save the modification as new resource, i.e. only this element will be modified) or "Cancel" (do not save, i.e. the modification will be ignored".

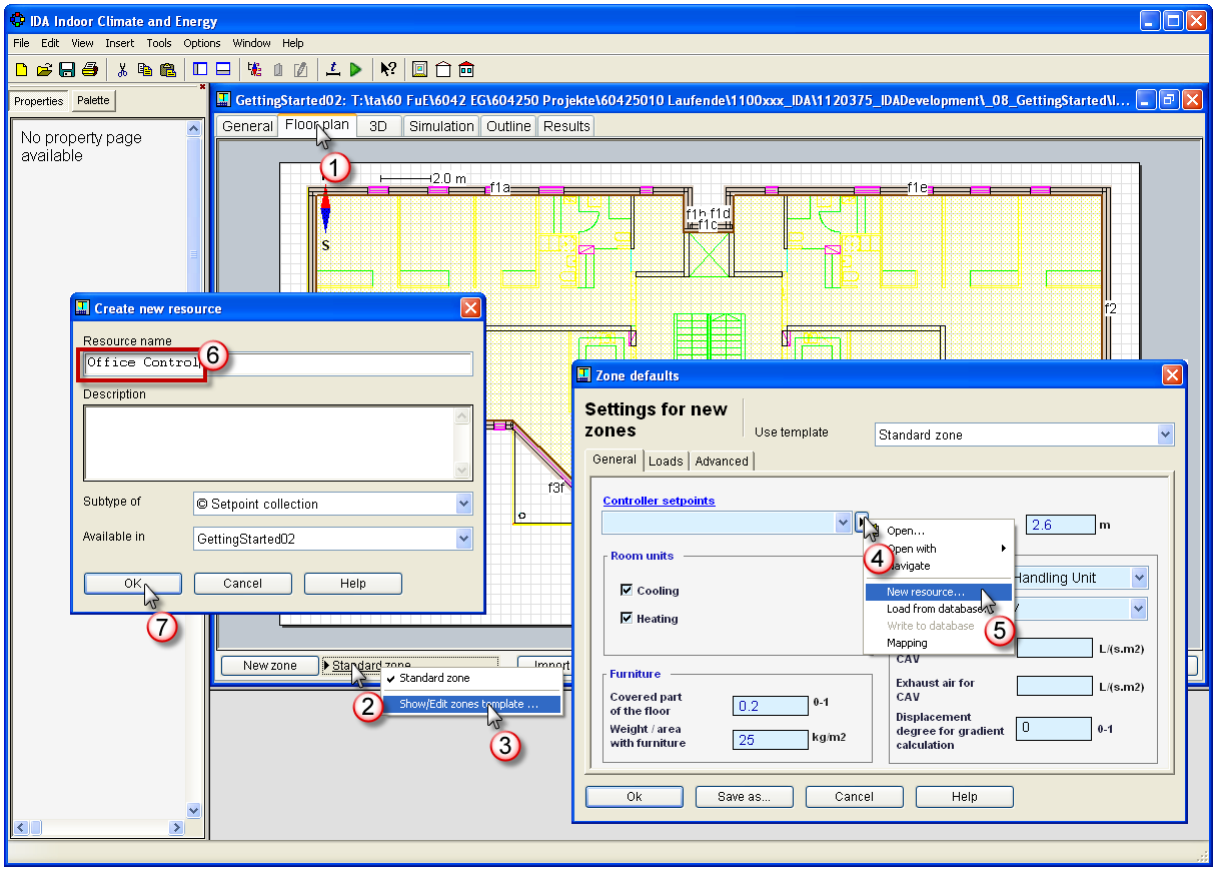
☞ 4 Default efficiencies for heating, cooling and domestic hot water generation (for energy calculation) are also given in the defaults form. Defaults for zone model fidelity (resolution) and the room unit cold surface temperature are also given here.

5 Zone Templates

Zone templates greatly speed up the process of creating a simulation model. They allow the user to pre-define information associated with a zone 'type', instead of separately for every zone. All information in a zone template needs to be area-related.

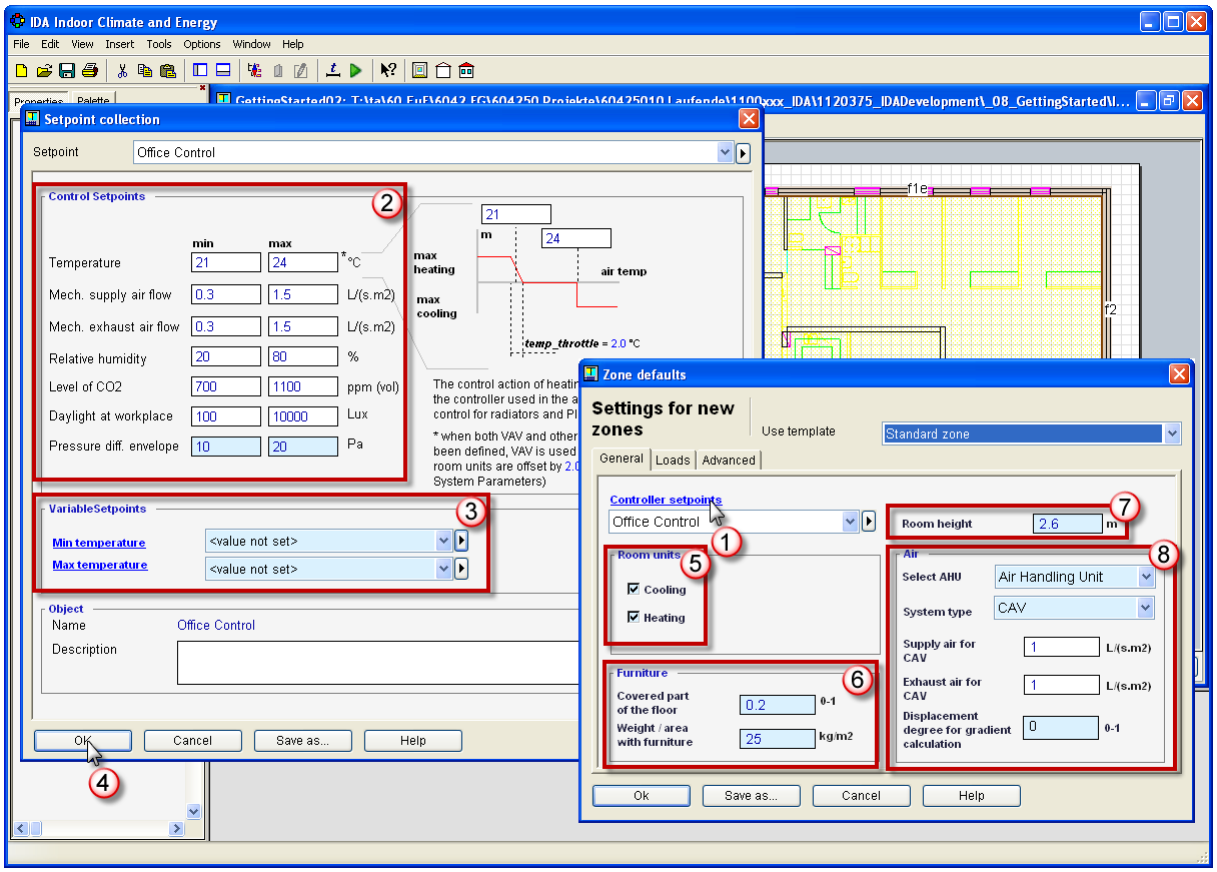
NB Zone templates are not handled as typical IDA resources. The information is only used during the creation of a zone. Subsequent changes to a zone template do not affect zones which have been attributed earlier (using this template).

But zone templates contain references to a set of IDA resources (e.g. control setpoints, internal load schedules etc.). If these resources are edited, from within the zone template dialog, the changes will affect all objects that also reference the same resource.



Screenshot 16

1. Go to the Floor plan tab
2. Open the zone template menu
3. Select "Show/Edit zone template …"
4. Choose how to define the controller setpoints
5. Create a new resource
6. Name new controller setpoints resource
7. Finalize resource creation



Screenshot 17

1. Open the new resource for editing
2. Define control setpoints for zone template. All setpoints are given in a single place. All different devices, such as for example room units, use these setpoints.

   ☞ 3. Temperature setpoints can optionally be given with by schedules.
4. Finalize setpoint definition

   ☞ 5. Define whether zones will (initially) have local heating and/or cooling units.

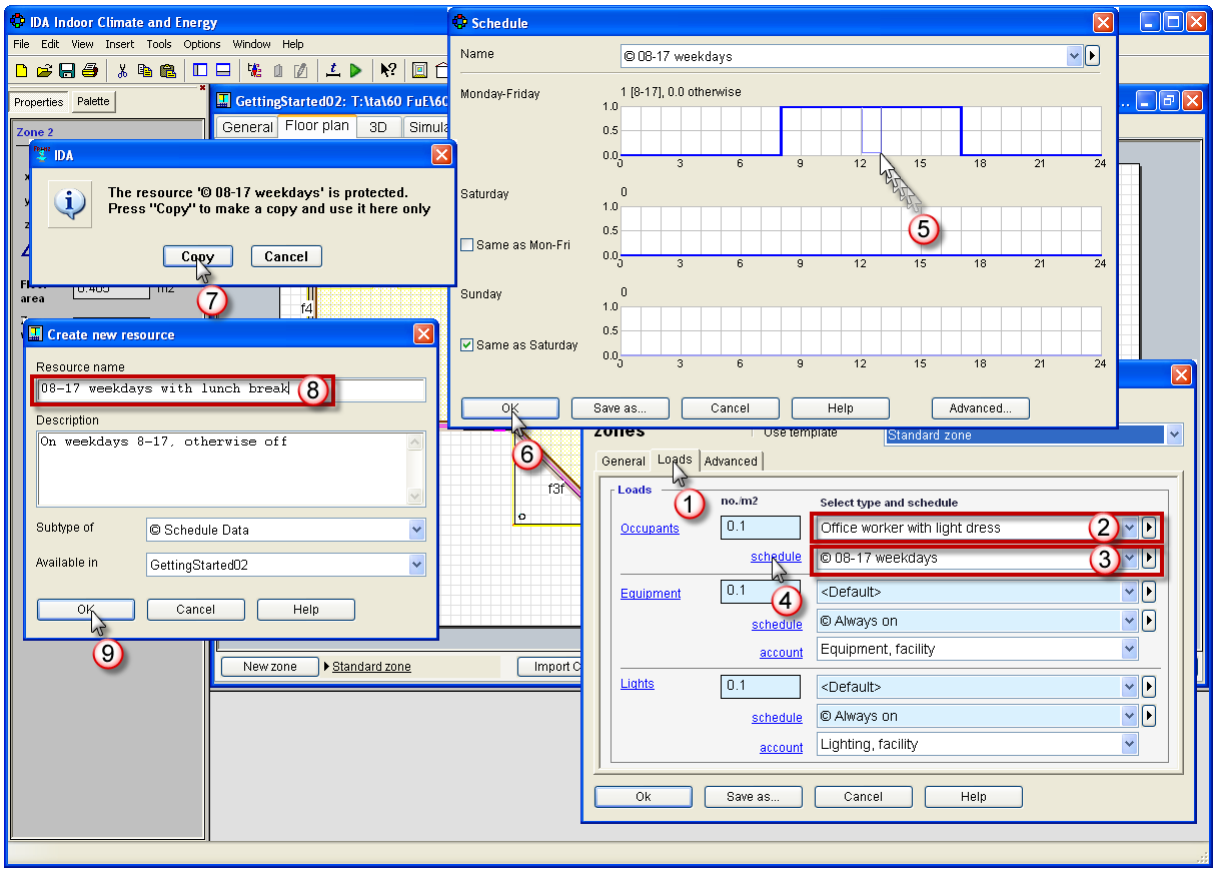
   ☞ 6. Thermal mass from furniture (e.g. store room shelves, furniture, plants, etc.)
7. Define default room height.

8. ☞ In cases where several air handling units have been specified, you can specify which unit delivers air to this zone.

   Define the air volume flow control strategy as CAV

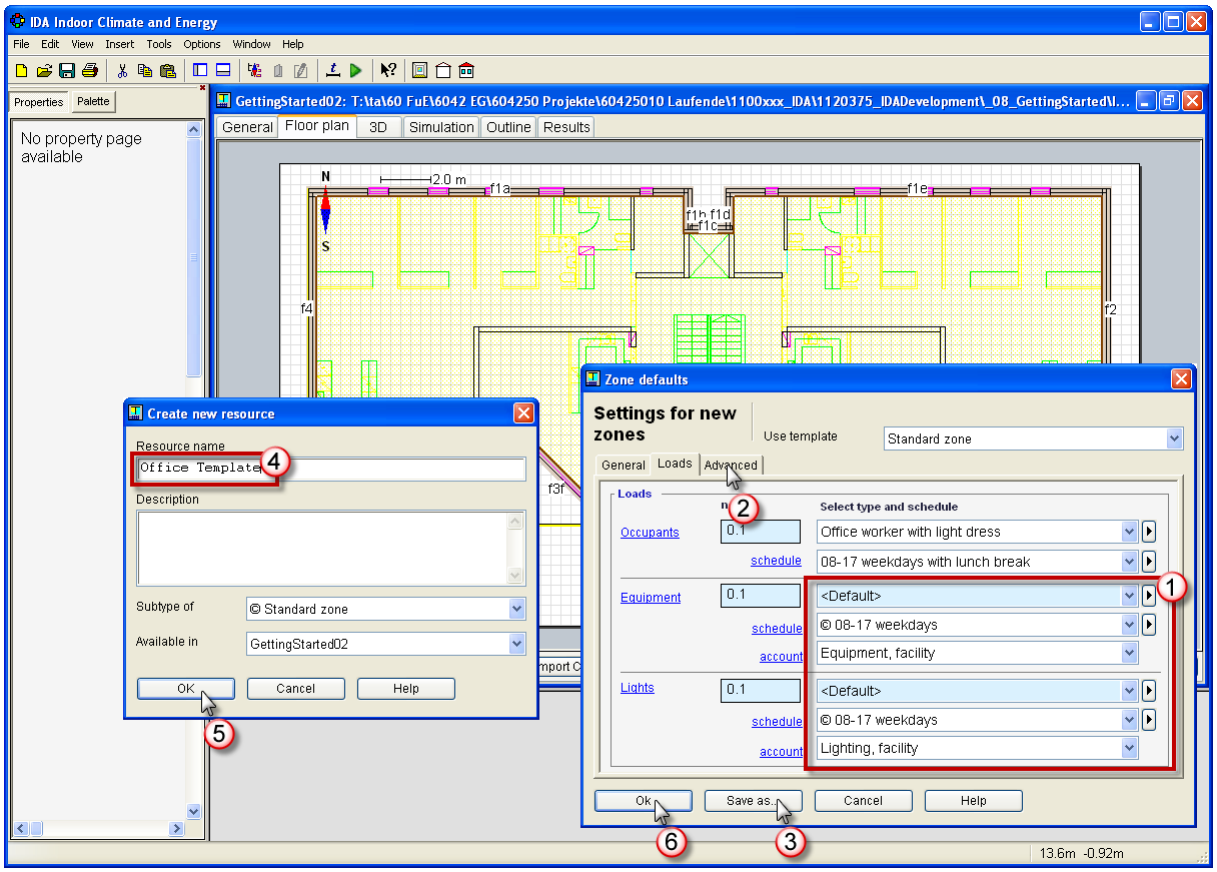
   Define supply and exhaust air for constant air volume flow (CAV).

NB For VAV (Variable Air Volume) systems, minimal and maximal supply and exhaust air volume rate is taken from the controller setpoints as well as the setpoints for the selected control strategy (humidity, CO_2 and/or temperature).



Screenshot 18

1. In the zone template form, go to the Loads tab
2. Select “© Office worker with light dress” from database (resource for occupant type)
3. Select “© 08-17 weekdays” from database (resource for occupancy schedule)
4. Open occupancy schedule
5. Insert lunch break
6. Finalize schedule modification
7. You will be asked to confirm creation of the new resource. Since the schedule is from the database, it will be protected against modification, i.e. make a new copy.
8. Give name for the new resource
9. Finalize creation of new resource



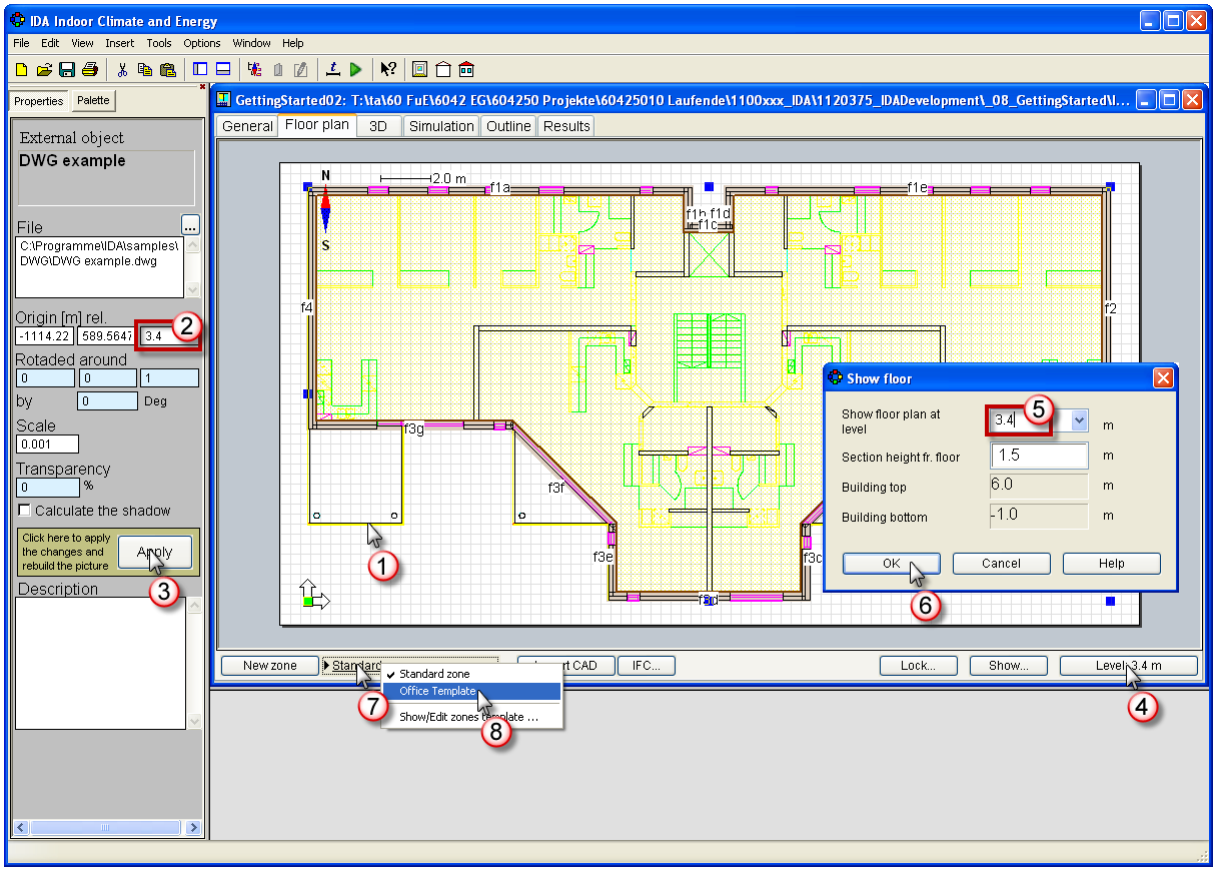
Screenshot 19

1. For equipment and lighting, choose a schedule from the database and an energy meter account.

   ☞ 2. In the Advanced tab, you can define specific default constructions for this zone type as well as maximum heating and cooling power for room units. The latter is only important for deliberate undersizing of room units.

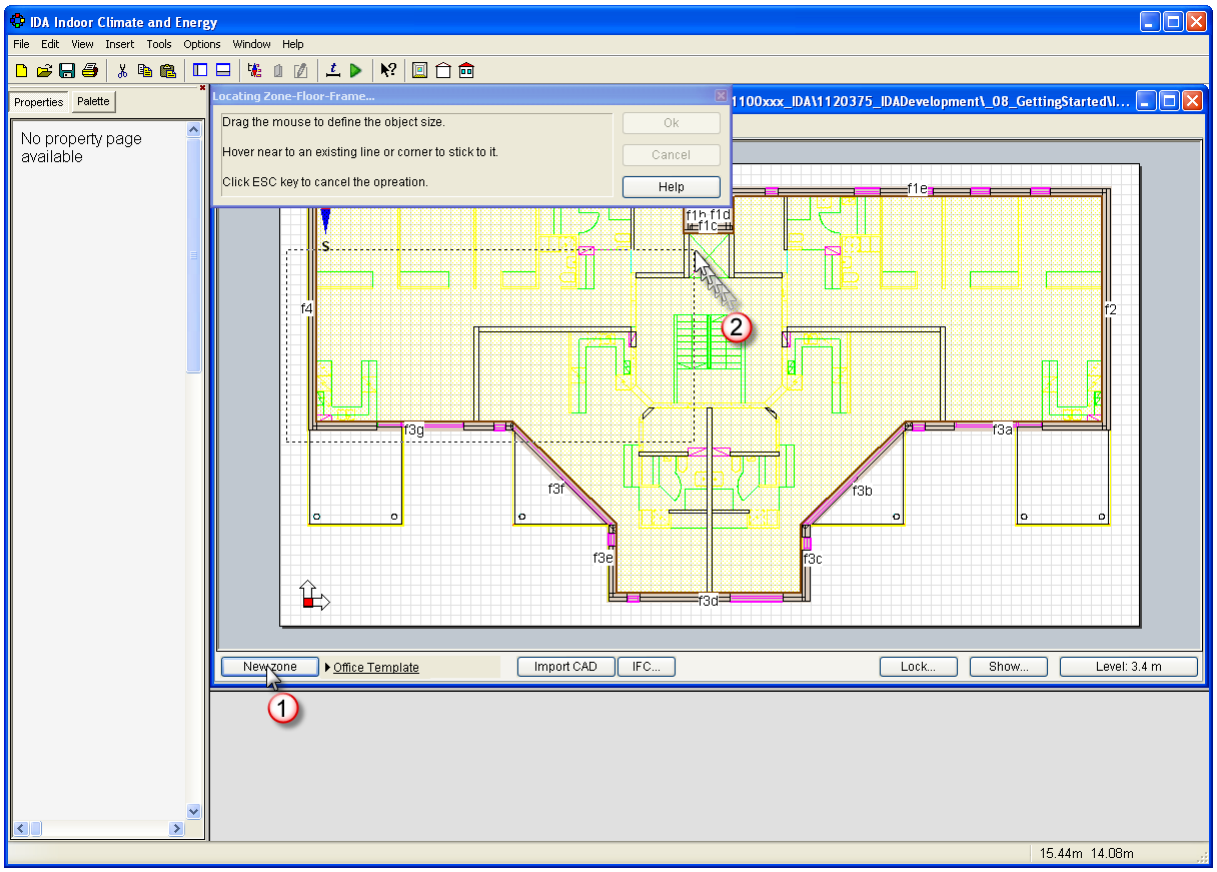
3. Save the zone template as new
4. Name the zone template
5. Finalize zone template saving
6. Finalize zone template modification

6 Inserting Zones



Screenshot 20

1. Select the CAD object
2. Set plan height (from ground level)
3. Confirm the CAD properties
4. Open the floor plan level height form
5. Type new view level
6. Finalize view level setting
7. Go to the zone template menu
8. Choose the zone template for new zones

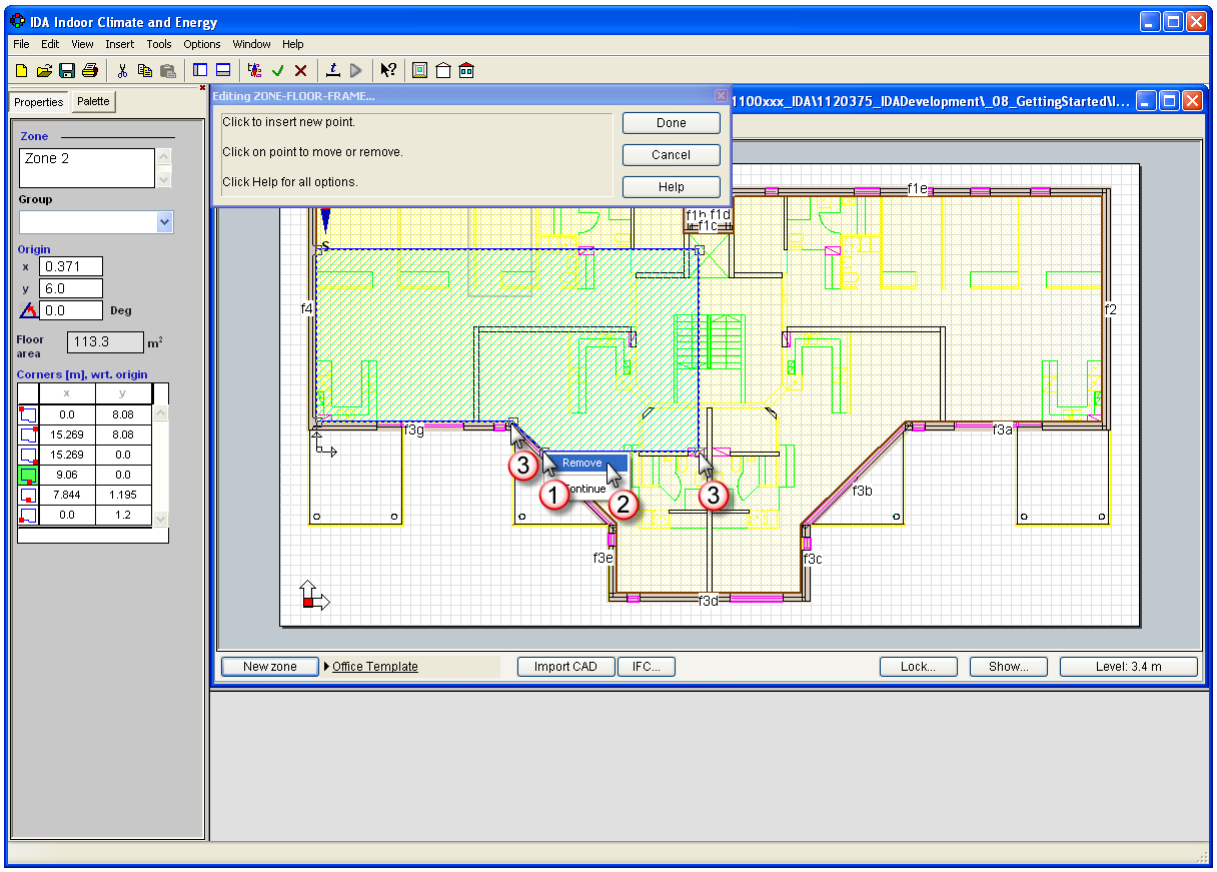


Screenshot 21

1. Start inserting of new zone
2. Draw a rectangular, rough shape of the zone by starting at bottom left, intentionally outside the building, and going top right

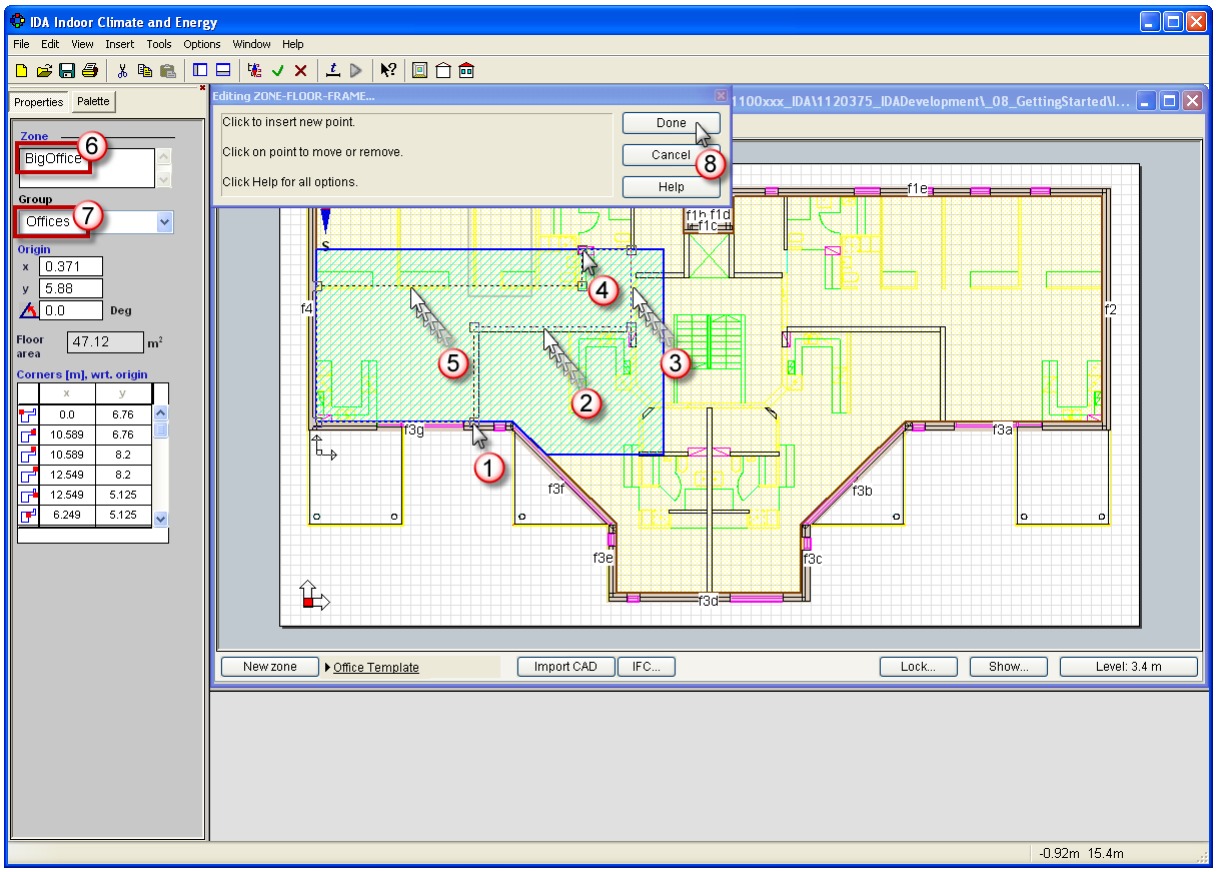
NB IDA ICE will automatically exclude areas outside the building body from the zone area. Already inserted zones are also automatically excluded.

NB Having finished the drawing of the zone, the program will automatically go into the edit mode for further amendments to the zone geometry.



Screenshot 22

1. Choose a point to be removed
2. Choose “Remove”
3. Remove other unnecessary zone points following the same strategy.



Screenshot 23

1. Set new point
2. Move the wall to the desired location.

NB The program automatically includes a new wall as the two walls are no longer in one line.

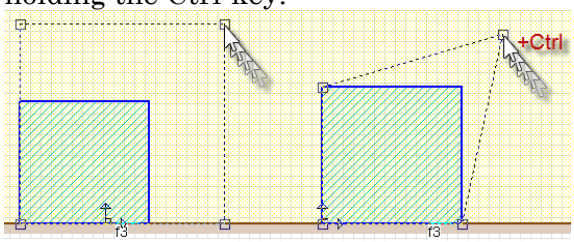
3. Move the second wall to the desired location
4. Set new point
5. Move the third wall to the desired location
6. Name the new zone
7. Define a zone group by giving a name.

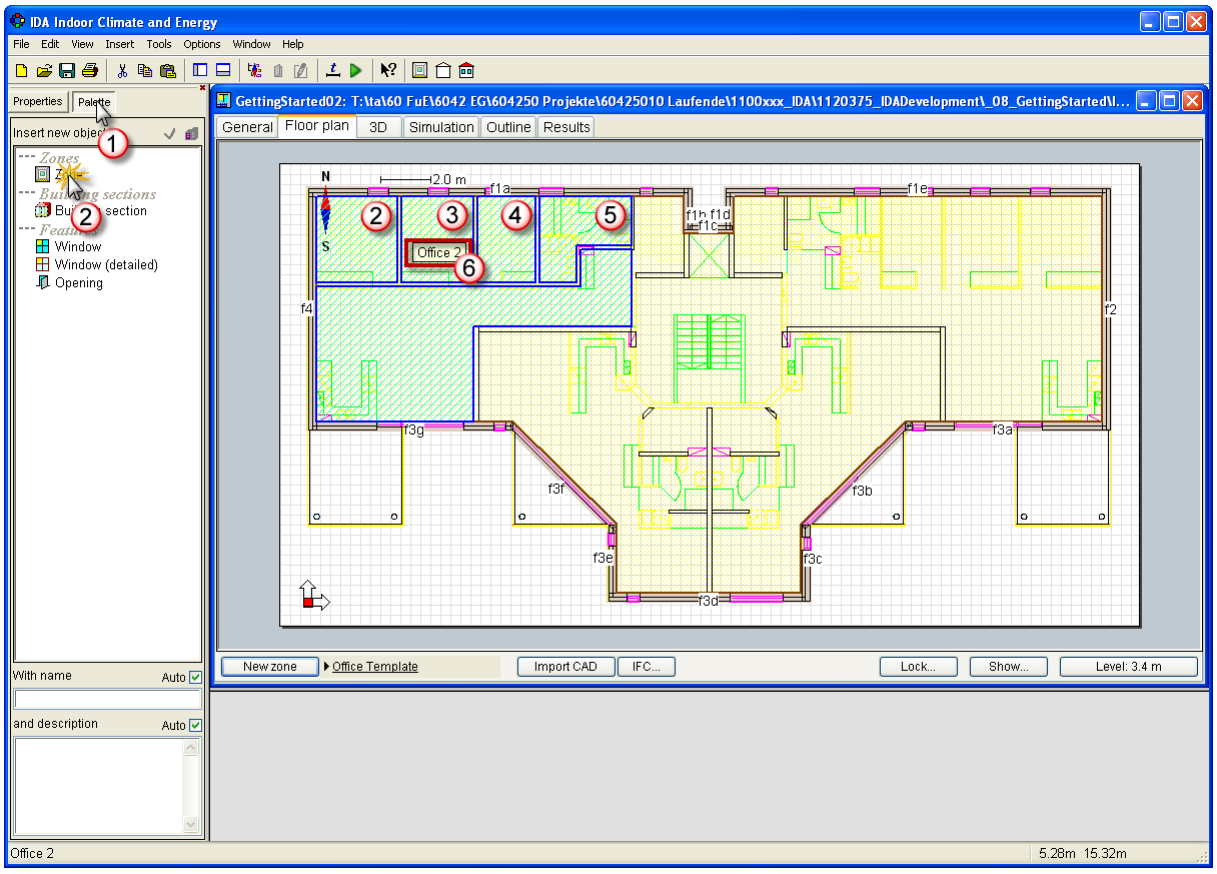
NB Zone groups are used to determine for example energy balance in a subset of zones, e.g. for a particular apartment, building section, tenant type etc.

8. Finalize zone insertion

NB When you click “Done” from the zone edit mode, values for the new zone will be calculated from area specific values given in the zone template. Later resizing of the zone will not adapt these values. To profit from the zone template, it is thus important to edit the correct zone shape before finalizing zone insertion.

NB Note that there is a difference between moving points with or without clicking and holding the Ctrl-key.





Screenshot 24

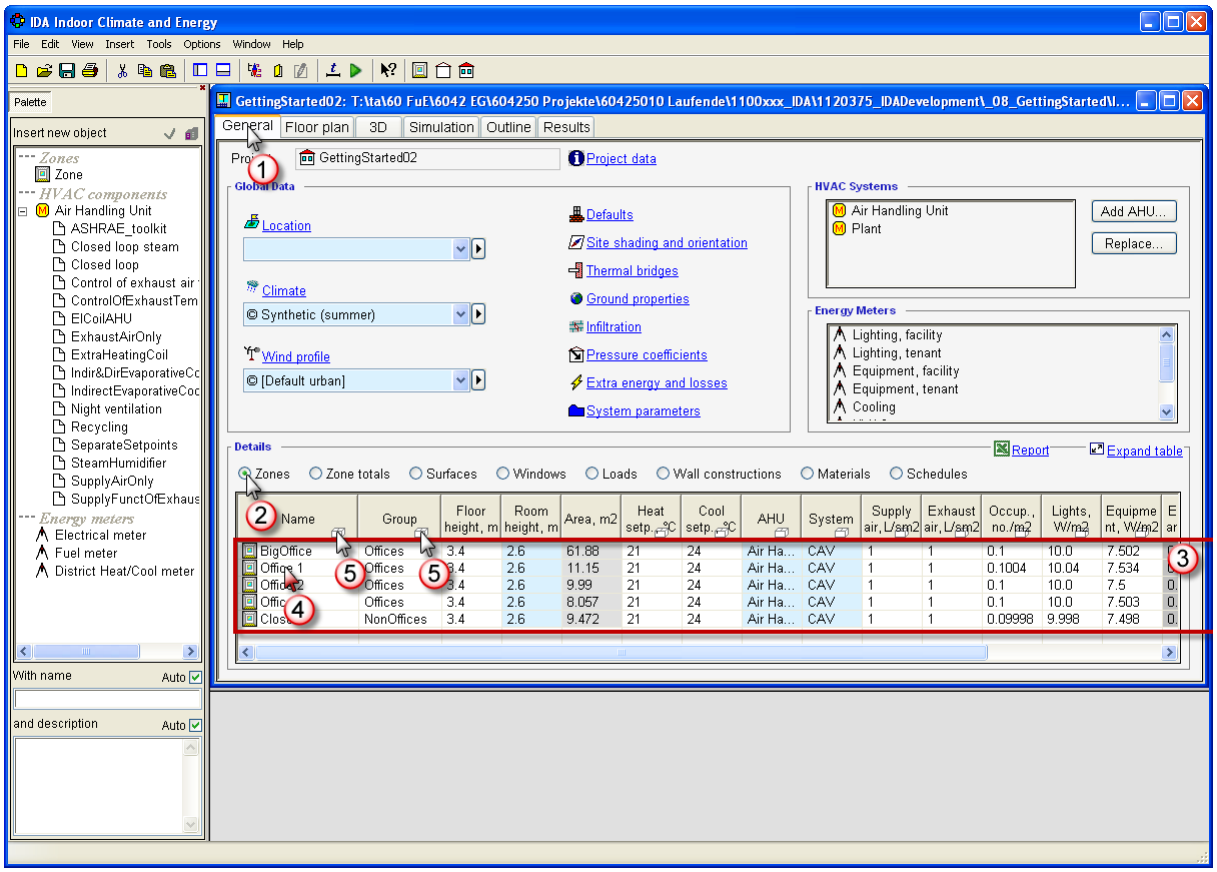
1. In the side bar, go to the Palette tab
2. Insert a second zone (double-clicking on “zone” in the side bar has the same effect as clicking on the “new zone” button), naming it “Office 1” and assigning it to the same zone group “Offices”
3. Insert a third zone, naming it “Office 2” and assigning it to the same zone group “Offices”
4. Insert a forth zone, naming it “Office 3” and assigning it to the same zone group “Offices”
5. Insert a fifth zone, naming it “Closet” and assigning it to a new zone group “NonOffices”
6. Move the cursor over the zones and the zone names will appear as tooltips

NB In case you forgot to name a zone or want to change the zone name, there are several ways to do this:

- Right-click on zone and choose “Rename...”
- Right-click on zone, choose “Edit” and rename in side bar

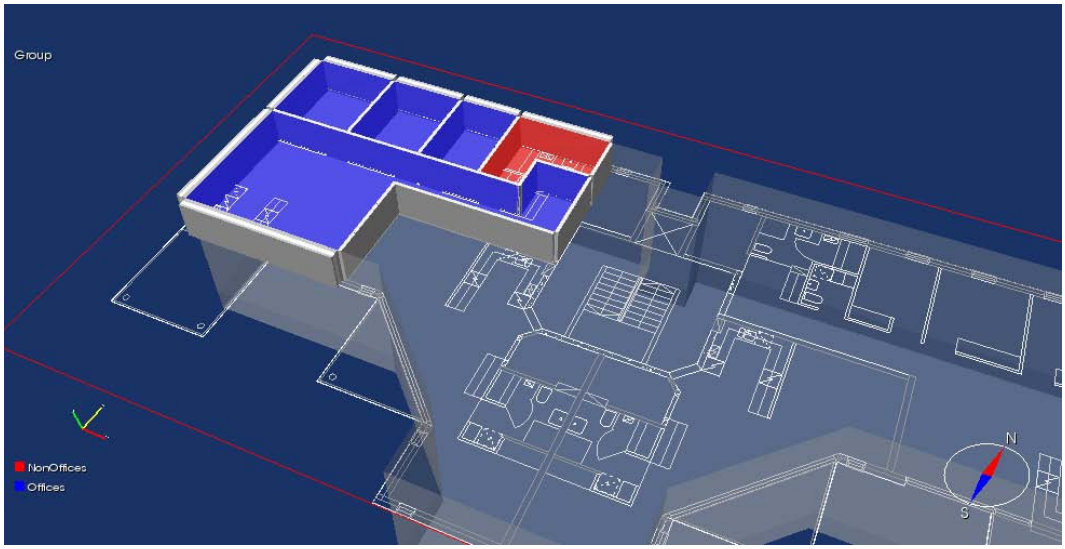
NB The program will automatically detect how zones are thermally connected:

- Zones are regarded as adjacent, if the distance between them is 0.5 m or less.
- The same applies for adjacency to external faces.
- Wall parts having no adjacent zone or face are by default treated as adiabatic (perfect insulation at center of wall).



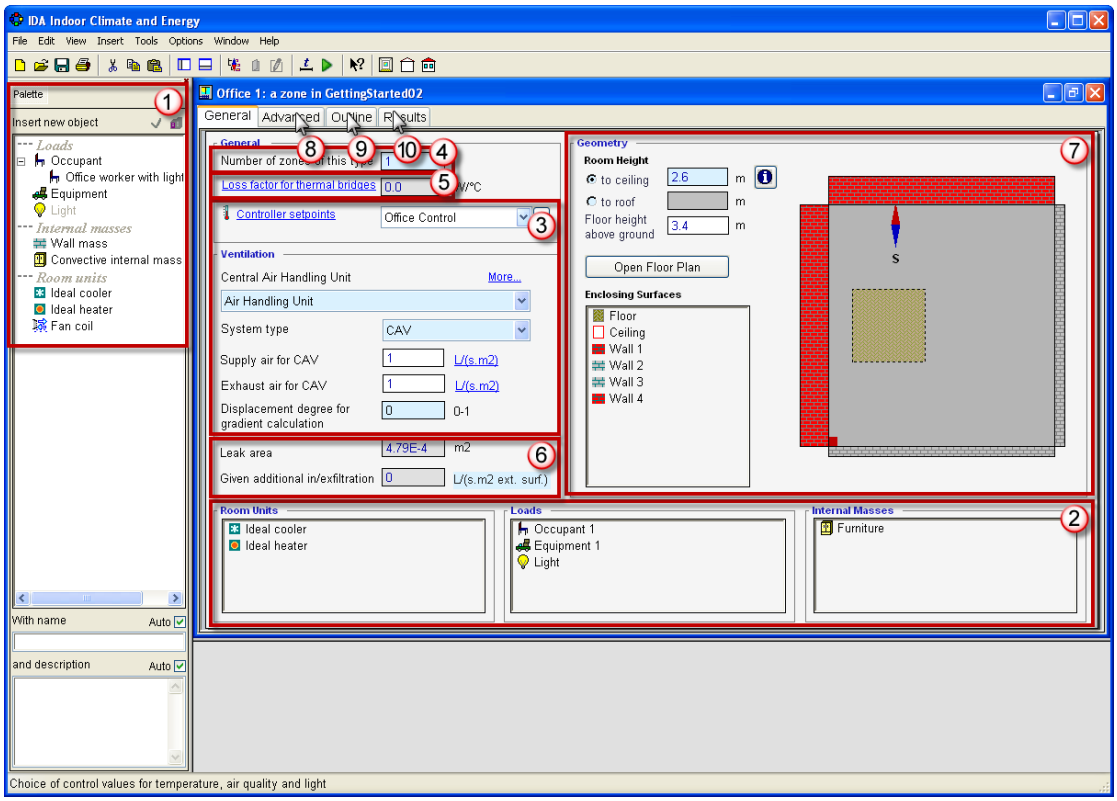
Screenshot 25

1. Go to the General tab
2. Select Zones table (if not already selected)
   - ☞ 3. In the table, you can change all parameters, except for values highlighted in grey. Values highlighted in blue are linked to defaults. Changing these values will break this link. You can however restore the link by right-clicking on the value and choosing “Mapping/Restore link”.
   - ☞ 4. Open, rename, cut, copy, delete or replace a zone.
5. Click on the box icons in the column titles to visualize the column values in the 3D tab.



NB There are different ways of opening a zone form:

- Go to the General tab and double-click on the zone name in the Zones table
- Go to the Floor plan tab and double-click the zone
- Go to the 3D tab, mark any wall of the zone and click on “Open zone” in the side bar



Screenshot 26

☞ (1) In the Palette tab of the side bar, you find objects that can be inserted into a zone. Insert new objects by double-clicking on them or by dragging the symbols to the zone form.

☞ (2) All objects in the zone of this category will be listed here. The zone template influences the initially inserted objects and their properties. Double-click an object to edit it.

☞ (3) These parameters also come from the zone template. Change them anytime here.

☞ (4) To simulate many almost identical zones, a multiplier is defined here. All variables coupled with the system (system loads, supply and exhaust air volume rate, also natural ventilation etc.) will be multiplied by this factor.

☞ (5) The thermal bridge loss factor of the zone towards ambient is indicated here. It is normally calculated from the Thermal bridge coefficients defined from the general tab.

☞ (6) Values for infiltration are indicated here. They are normally calculated from the Infiltration parameters defined in the general tab.

☞ (7) Boundary conditions of the different zones surfaces are indicated in this section in two different views: Plan view and table. Construction elements marked with red are external (because of their proximity to the building body). Double-click on the elements (in the plan or in the table) to open their forms. Floor and room height can also be changed here.

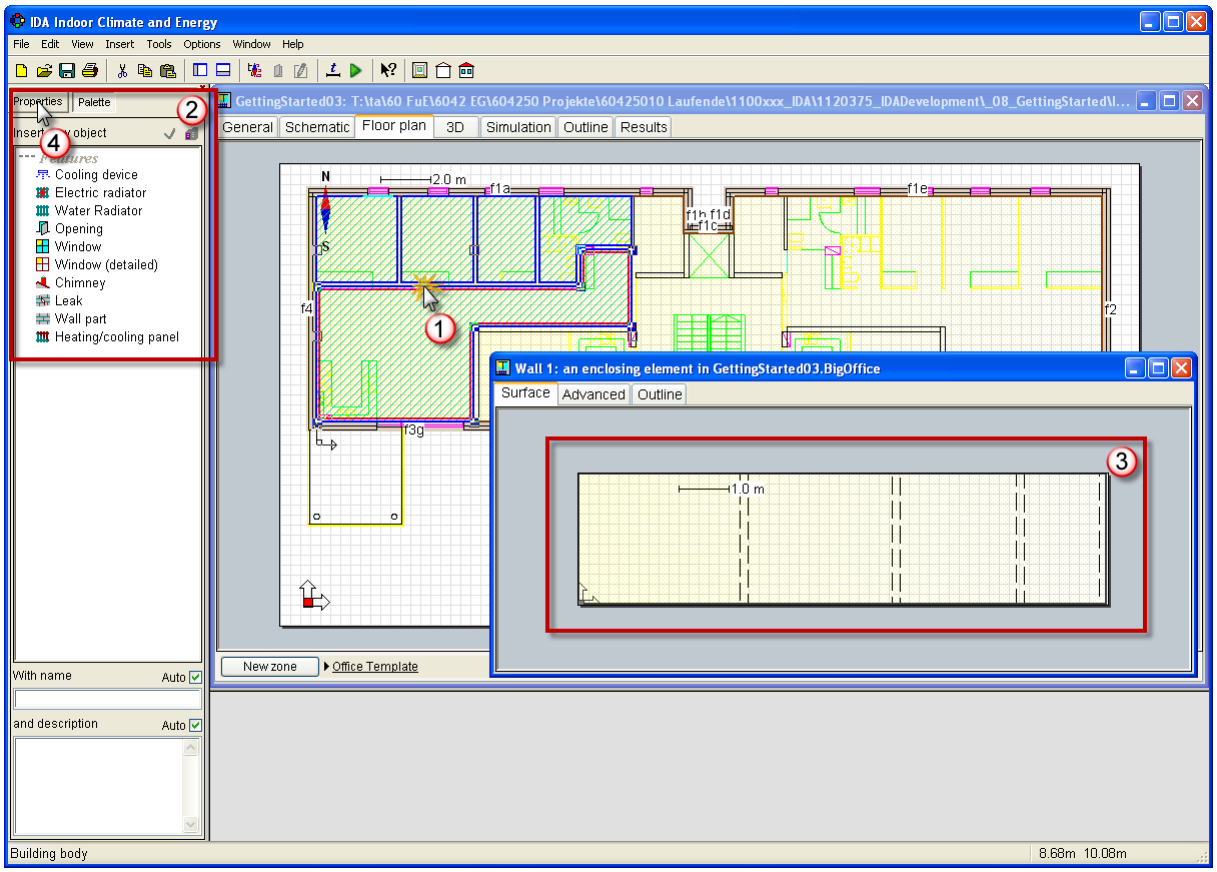
☞ (8) Go to the Advanced tab to modify further zone properties.

☞ (9) The Outline tab is available in the expert edition only.

☞ (10) Go to the Results tab to study results for this zone after simulation.

NB There are different ways of opening a wall form:

- Open the zone form and double-click the wall on either table or plan view
- Go to the 3D tab and double-click the wall
- Go to the Floor plan tab and double-click the corresponding zone borderline
- Go to the Floor plan tab, mark the zone, right-click its borderline and choose “Open...”
- Go to the General tab and double-click on the surface name in the Surfaces table



Screenshot 27

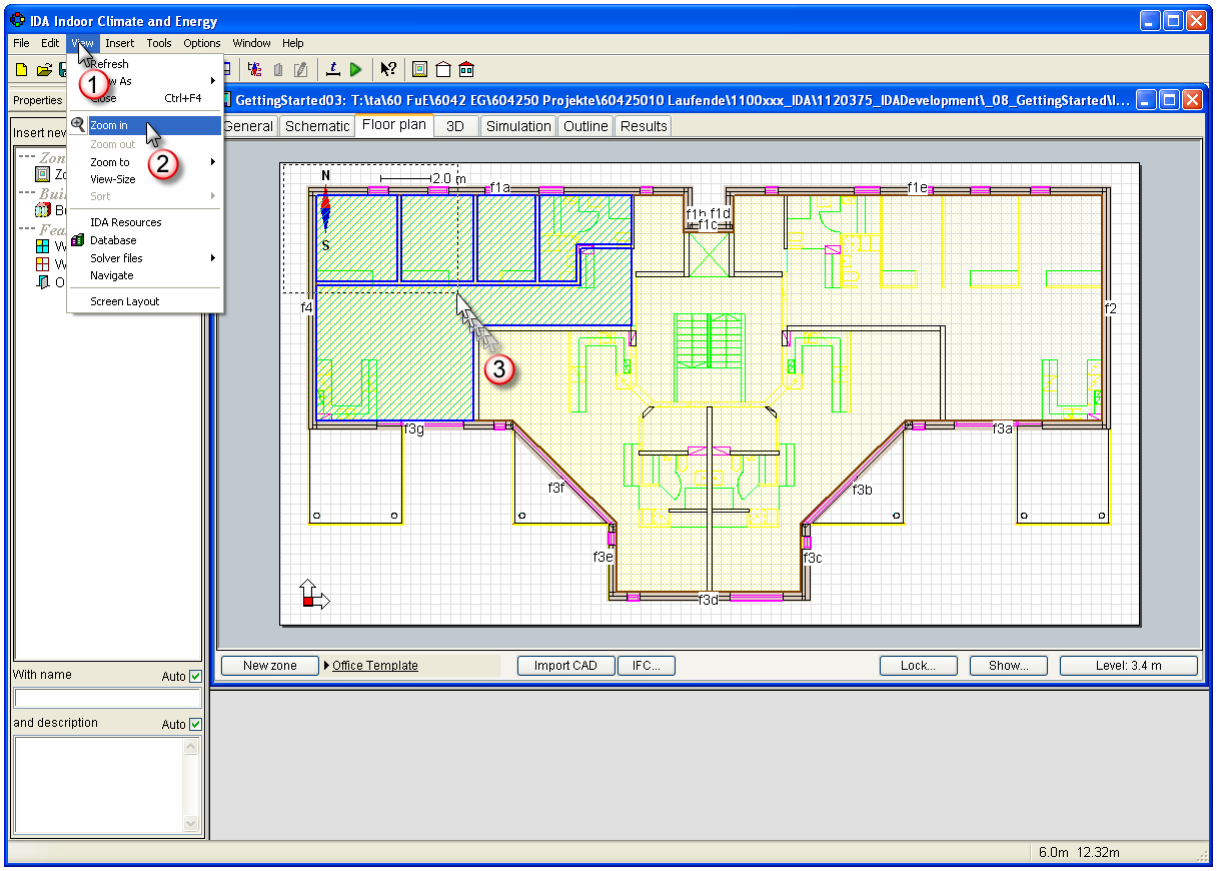
1 Open the wall form

☞ 2 Double-click on the symbols in the ***Palette*** of the side bar to insert zone objects to be positioned on a zone surface (alternatively drag and drop them in the surface editor or right-click on the surface editor and choose “New Object...”).

☞ 3 The surface editor shows the zone surface from inside the zone, indicating wall parts due to different adjacent zones by dashed lines. Inserted objects can be positioned either here or...

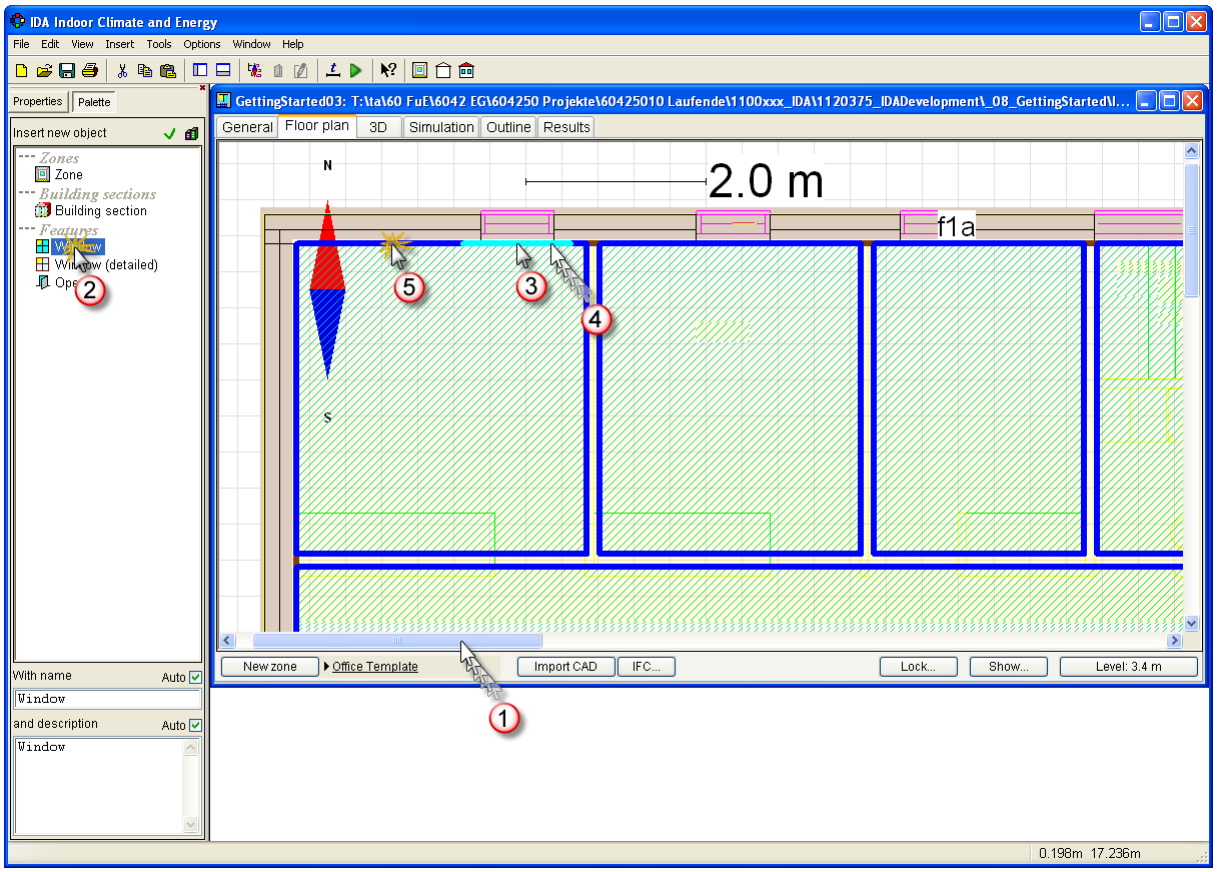
☞ 4 ... through the ***Properties*** tab of the side bar.

7 Inserting Windows and Internal Openings



Screenshot 28

1. Go to the view menu
2. Choose “Zoom in”
3. Indicate the plan section to be zoomed in



Screenshot 29

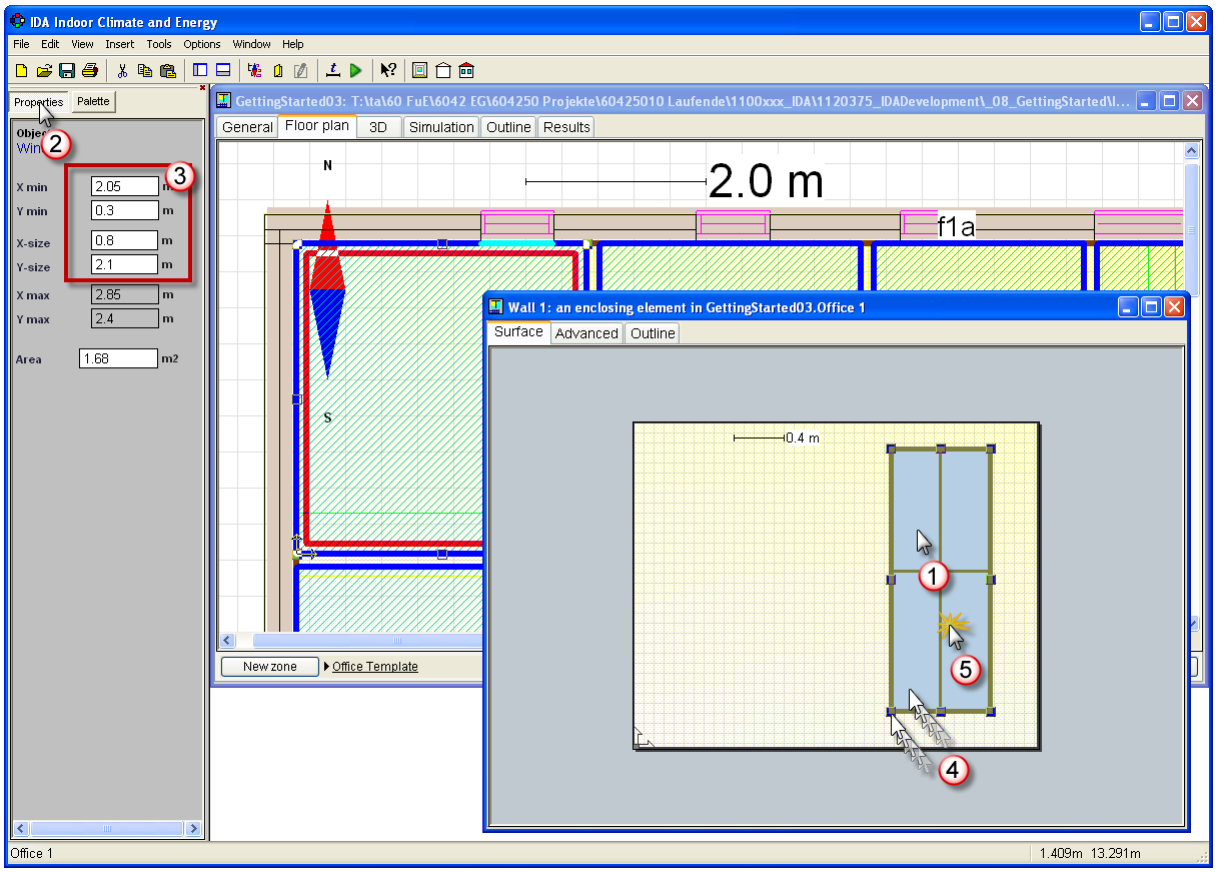
☞ (1) In the zoomed in plan view, use the scroll bars. It is also possible to use the mouse wheel to move up and down in the drawing,

(2) Initiate the insertion of a new window

(3) Place the center of the window on a zone borderline

☞ (4) Shift the window position after insertion

(5) Open the wall form



Screenshot 30

① Mark the window in the wall surface editor

② Go to the ***Properties*** tab in the side bar

③ Change the window size and position

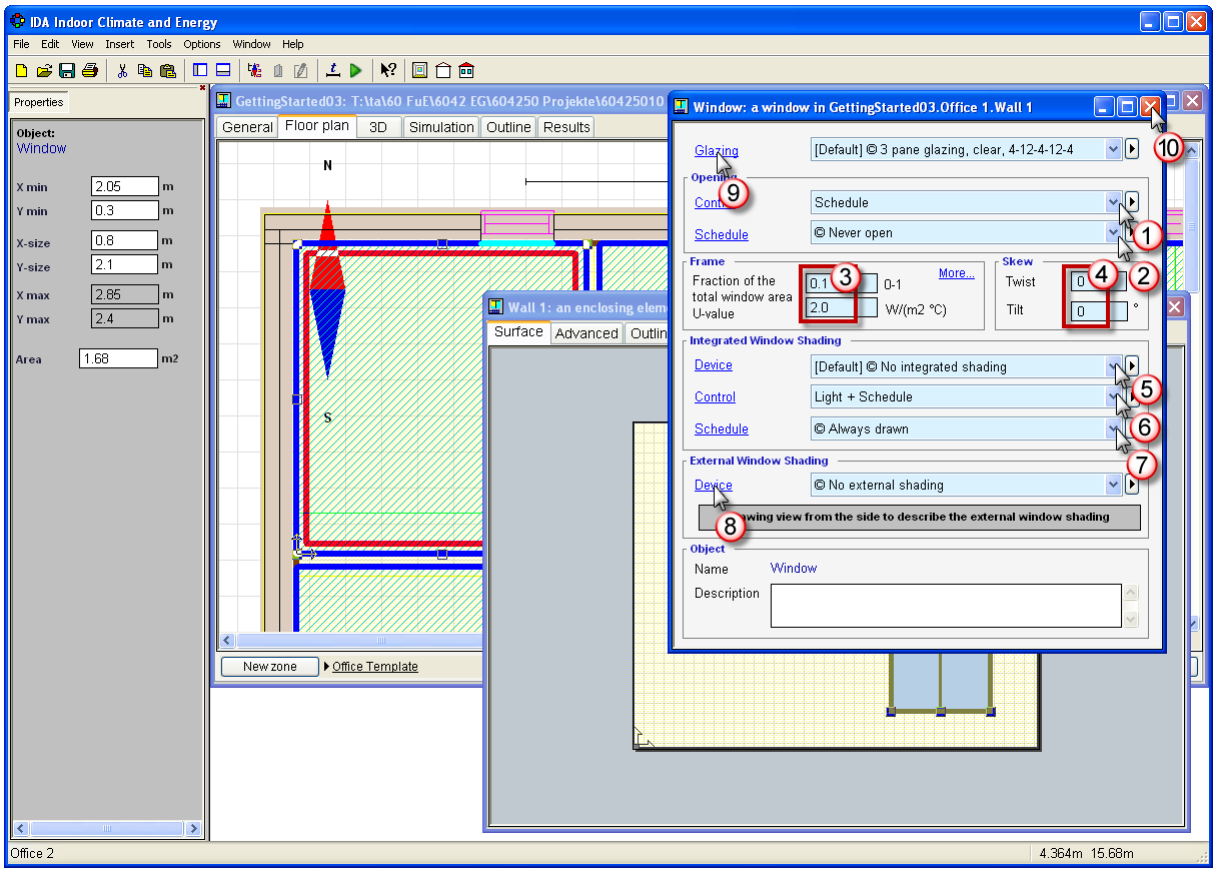
☞ ④ Alternatively change the window size and position in the surface form

⑤ Open the window form

NB You could also have done ①-③ and ⑤ directly in the 2D floor plan or in the 3D view.

NB There are different ways of opening a window form:

- Go to the 3D tab and double-click the window
- Open the zone form and double-click the window on the plan view
- Open the wall form and double-click the window on the surface editor
- Go to the Floor plan tab and double-click the window
- Go to the General tab and double-click on the window name in the Windows table



Screenshot 31

☞ ① Define the window opening control strategy (expert version only)

☞ ② Choose the window opening schedule (expert version only)

☞ ③ Modify the frame area fraction and U-value

☞ ④ Modify the azimuth and slope shift of the window plane relative to the wall plane

☞ ⑤ Choose the integrated window shading device (blinds, shades etc.)

☞ ⑥ Define the integrated window shading control strategy

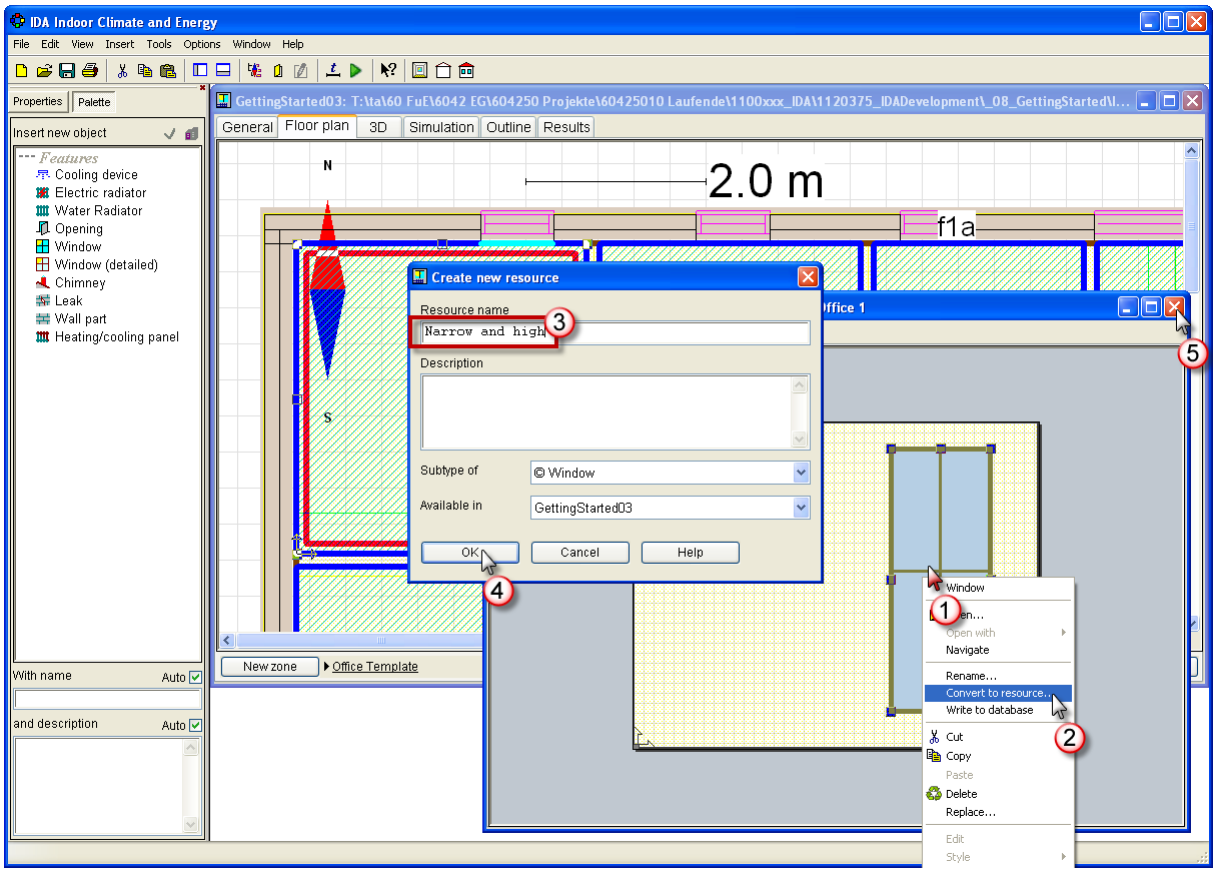
☞ ⑦ Choose the integrated window shading schedule

☞ ⑧ Modify external obstacle window shading (default is “No external shading”) such as glazing recess, balconies, screens, side fins or marquees.

☞ ⑨ Open the glazing form (see chapter 4)

⑩ Close form

NB Integrated shading devices influence the shading coefficients of the glazing, while external shading devices decrease solar radiation due to cutting a part of the solar beam.

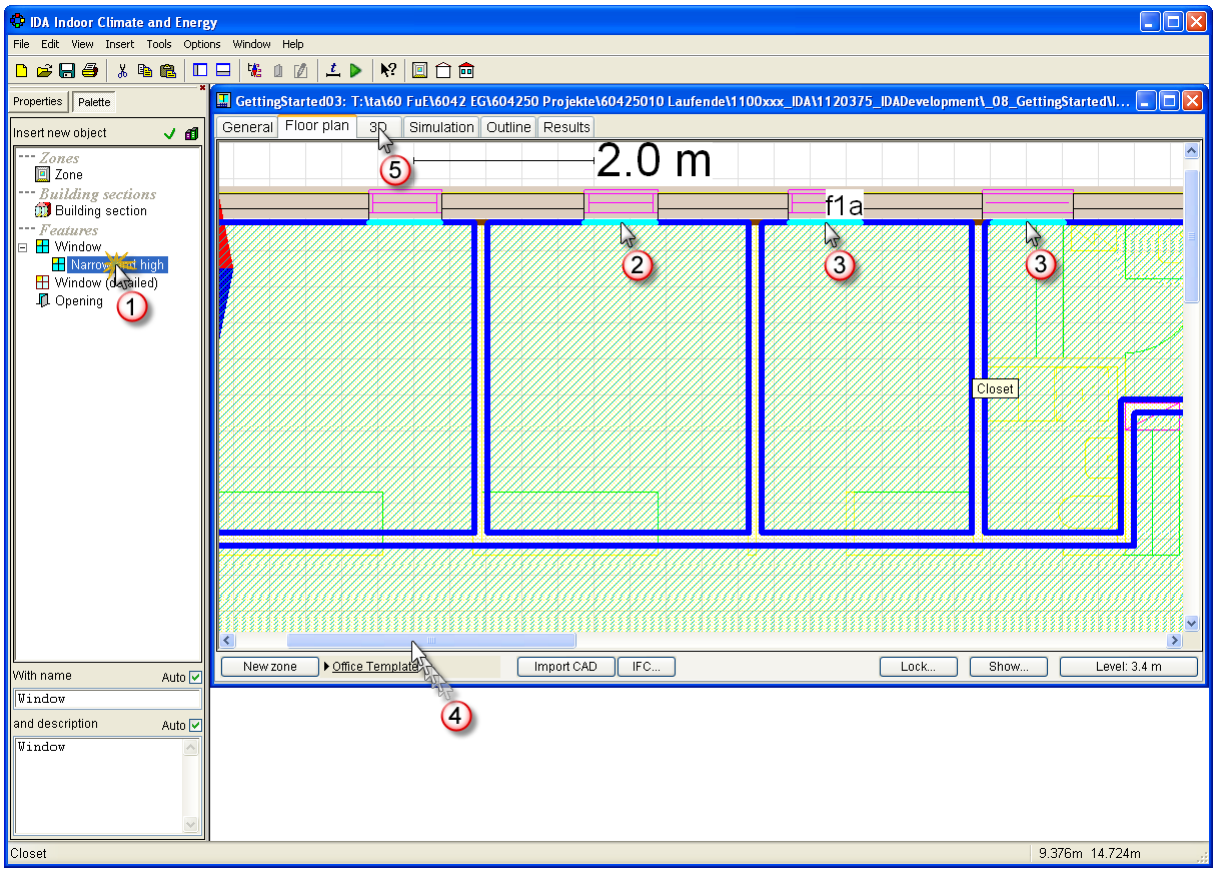


Screenshot 32

1. Open the window menu

NB This action can also be carried out in alternative ways: (a) in the 2D floor plan, (b) in the 3D view or (c) in the windows table of the General tab

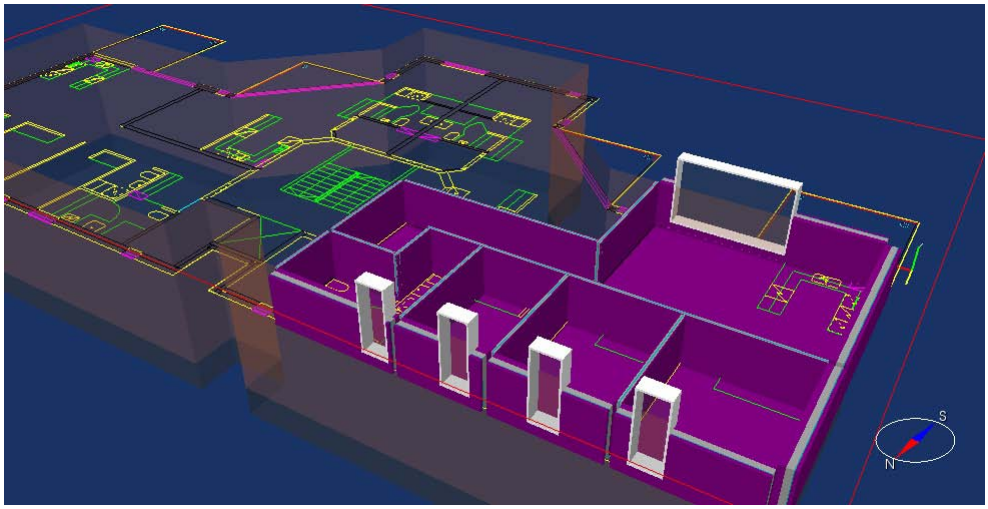
2. Convert window properties to resource
3. Name the new resource
4. Finalize resource creation
5. Close wall form. You will find “Narrow and high” as a new object to insert

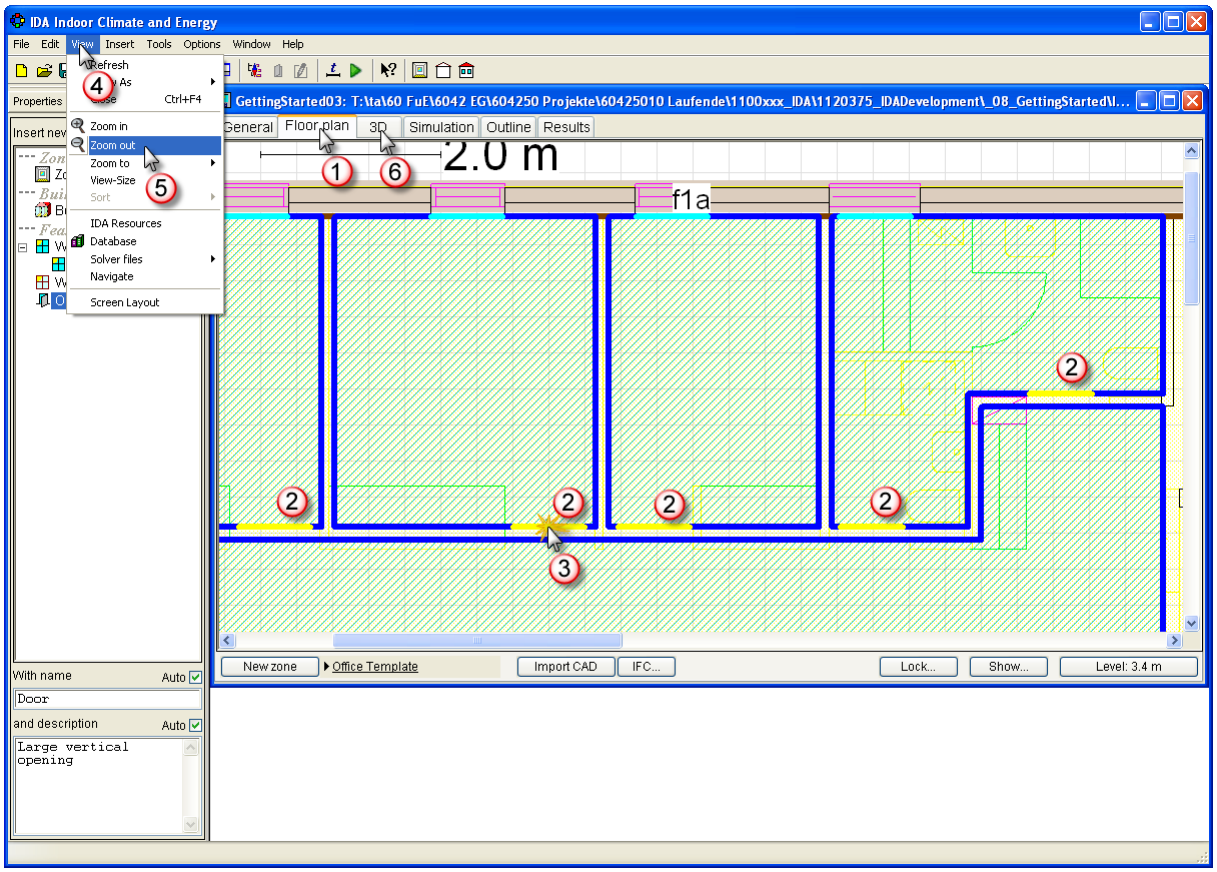


Screenshot 33

1. Start insertion of a new “Narrow and high” window
2. Place the window
3. Repeat ①-②
4. Use view scrolling to get to the window of “BigOffice”. Insert the last window and open the wall form to enlarge it.
5. Go to the 3D tab to have a look at your model

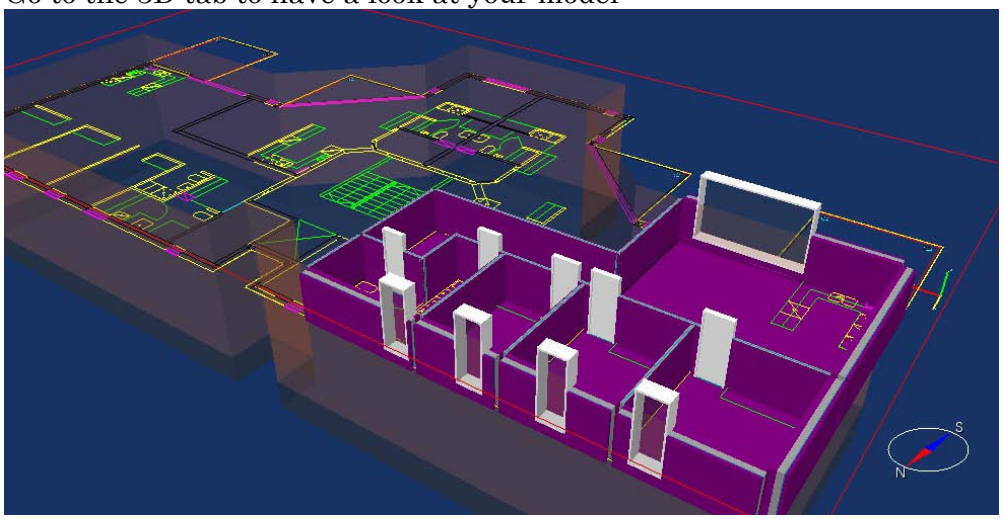
NB The “Narrow and high” resource name is perhaps not the most appropriate for the “Big Office” window. All other properties except the size will still be linked from the resource. The resource acts as defaults for all window properties.





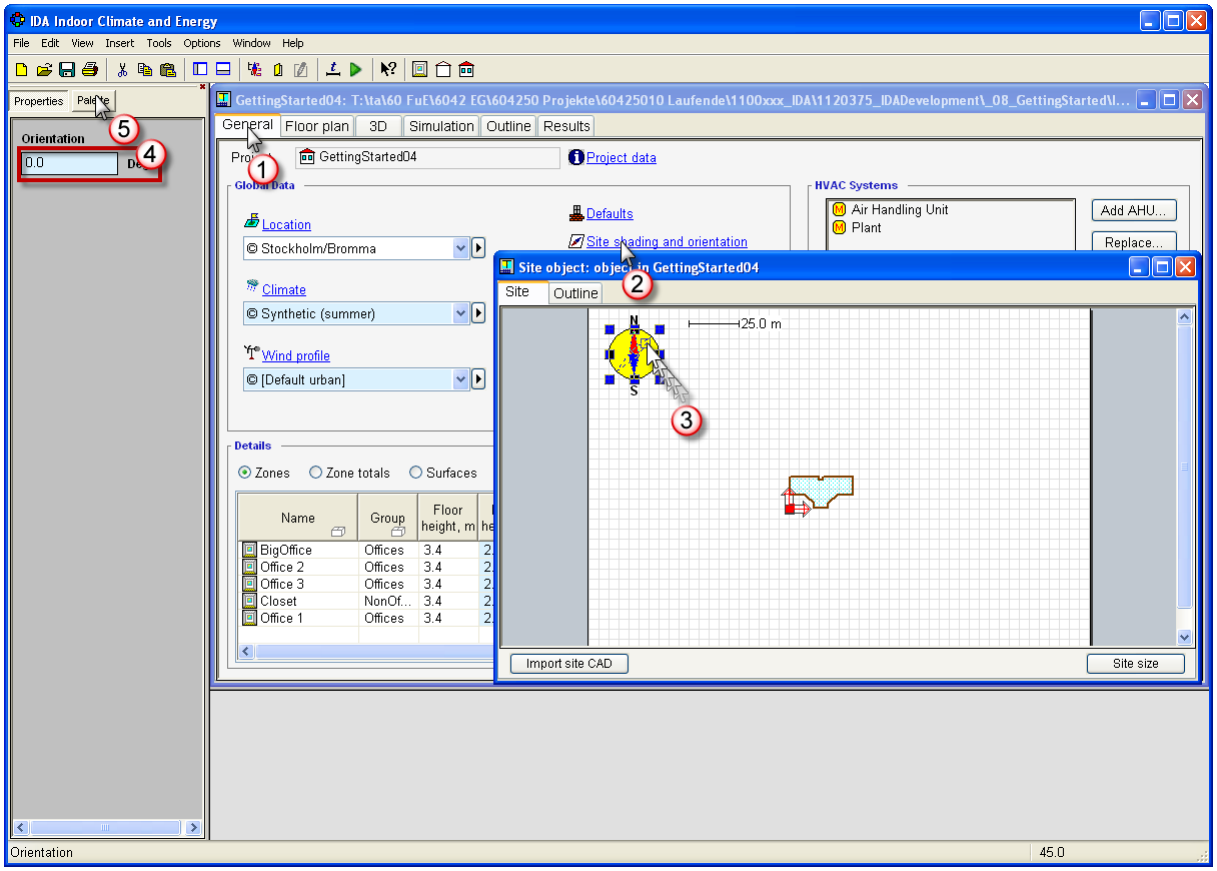
Screenshot 34

1. Go back to Floor plan tab
2. Insert doors as you did with windows before
   ☞ 3. Open the opening form to have a look at it
4. Open the View menu
5. Zoom out the floor plan view
6. Go to the 3D tab to have a look at your model



NB Although doors will always remain closed in the standard edition. They will have an impact to the air leakage path of the building, as they will act as leakage paths between zones. Depending on the pressure difference between either side, air will flow through.

8 Site Shading and Orientation



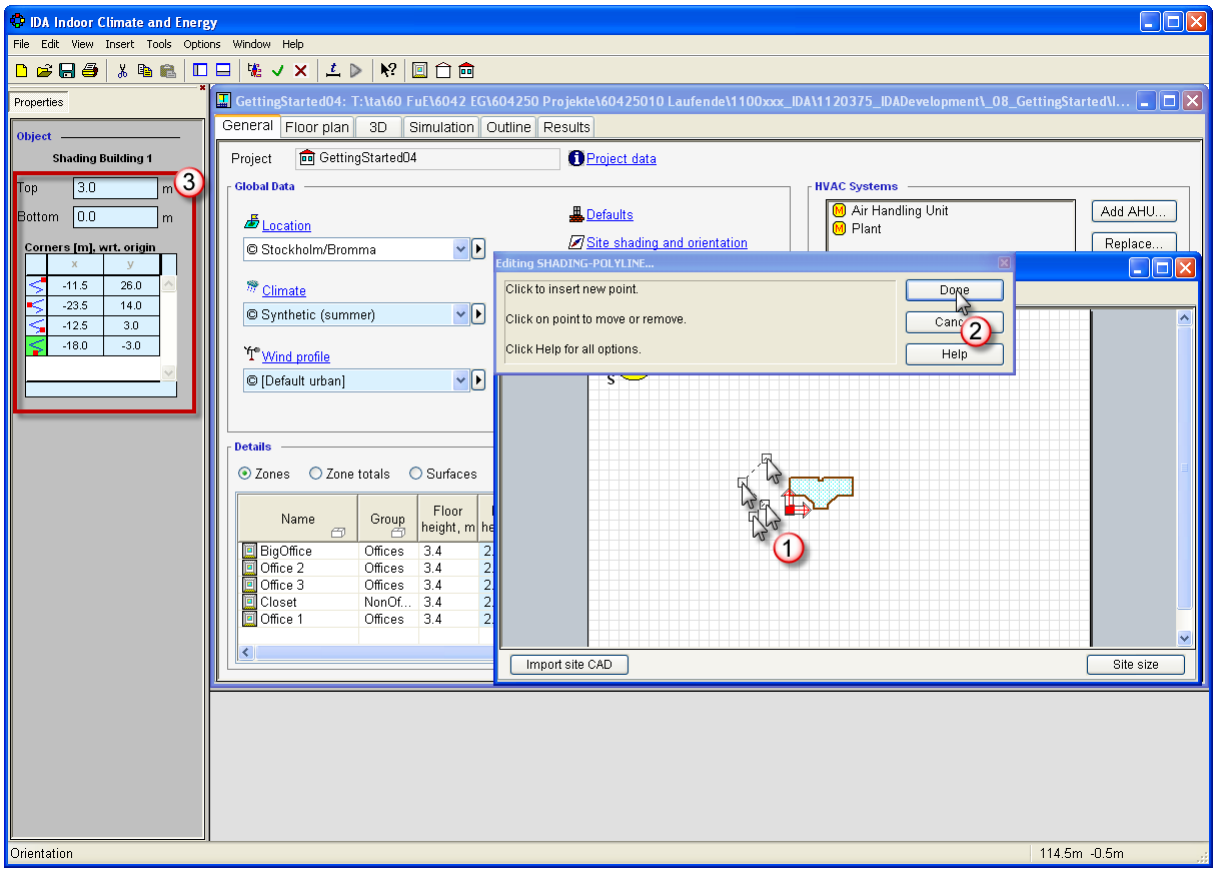
Screenshot 35

1. Go to the ***General*** tab (Building form)
2. Go to the site editor
3. Alter the site orientation by turning the compass needle

NB Make sure you select the reference point in the compass needle.

☞ 4. Alternatively change the orientation in the side bar

5. Go to the ***Palette*** tab in the side bar



Screenshot 36

Shading buildings are inserted as vertical shading plane:

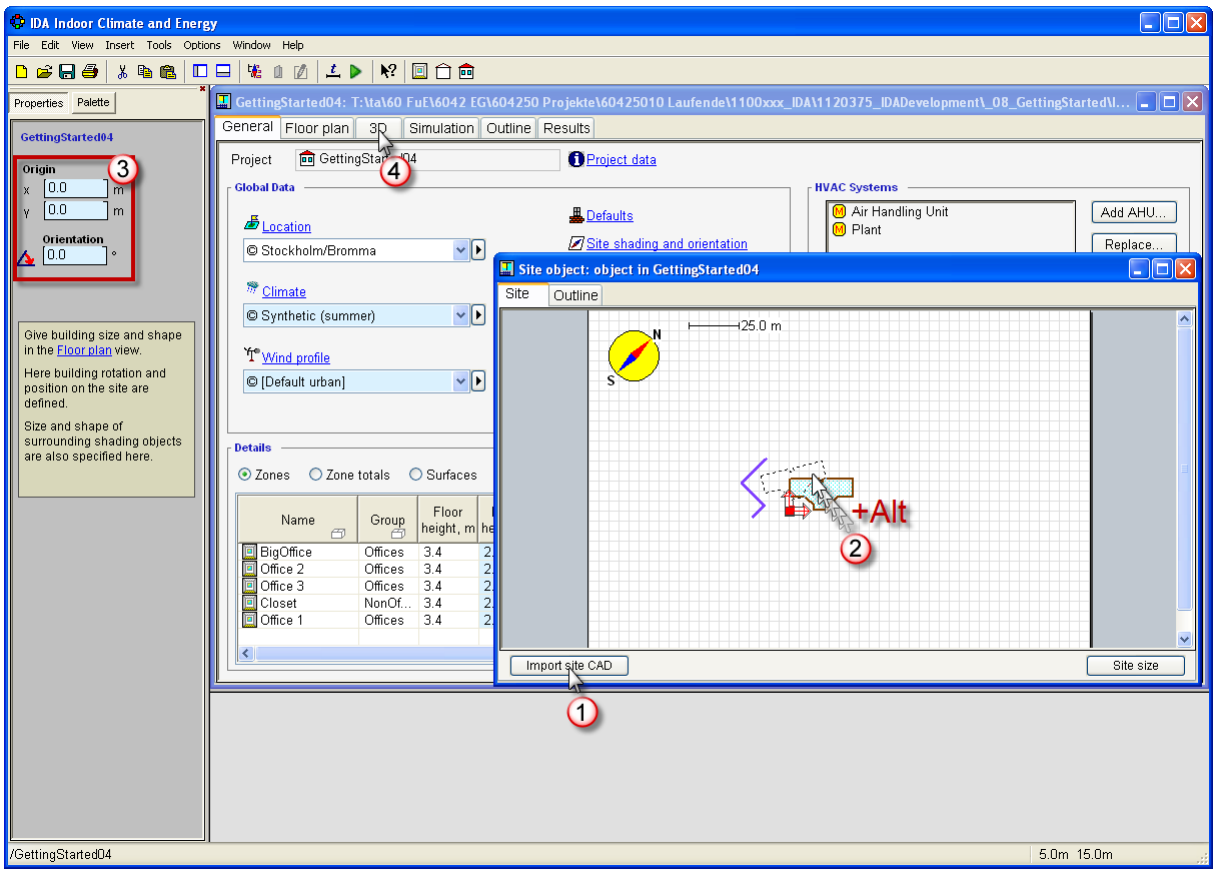
1. After double-clicking “Shading building” in the ***Palette*** of the side bar, set points of the new shading object
2. Finalize insertion of new shading object

☞ 3. Alternatively change the coordinates of the points of the shading object in the side bar. The two values "Bottom" and "Top" define the z-coordinates of the object.

NB A horizontal shading element is defined in the same way as the vertical one. It has however only one z-coordinate – indicating the height of the shading element

NB Site shading objects will be defined relatively to the site and thus stay fixed, while external window shadings are defined relatively to the windows and thus move when moving the building within the site or moving the window within the wall.

NB It is also possible to alter the geometry of shading objects in the same way as the geometry of a zone can be amended: Right-click the shading element, select “Edit”, etc.



Screenshot 37

☞ (1) Import CAD files to the site. These can be either 3D shading objects or site plans serving as background for drawing the shading buildings.

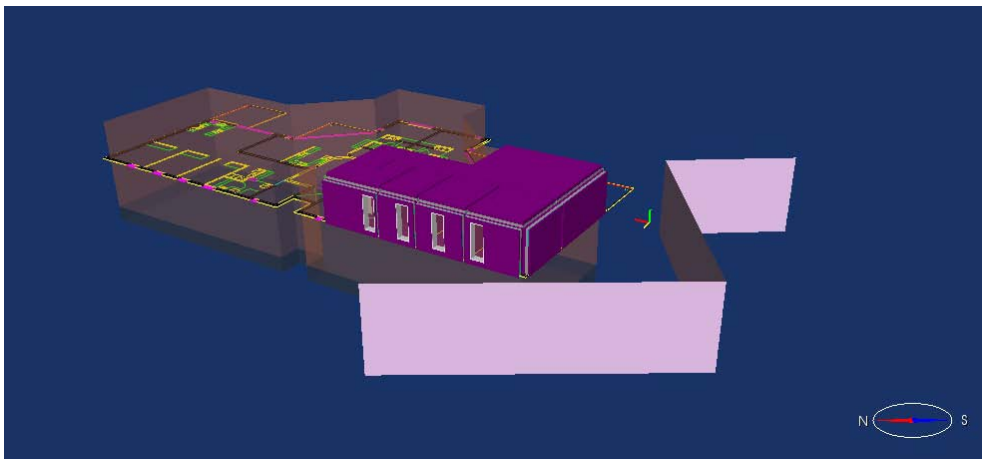
NB CAD files imported into the floor plan will be rotated together with the building, while CAD files imported here will not.

☞ (2) Pan and rotate (Alt-key) the finalized building within the site.

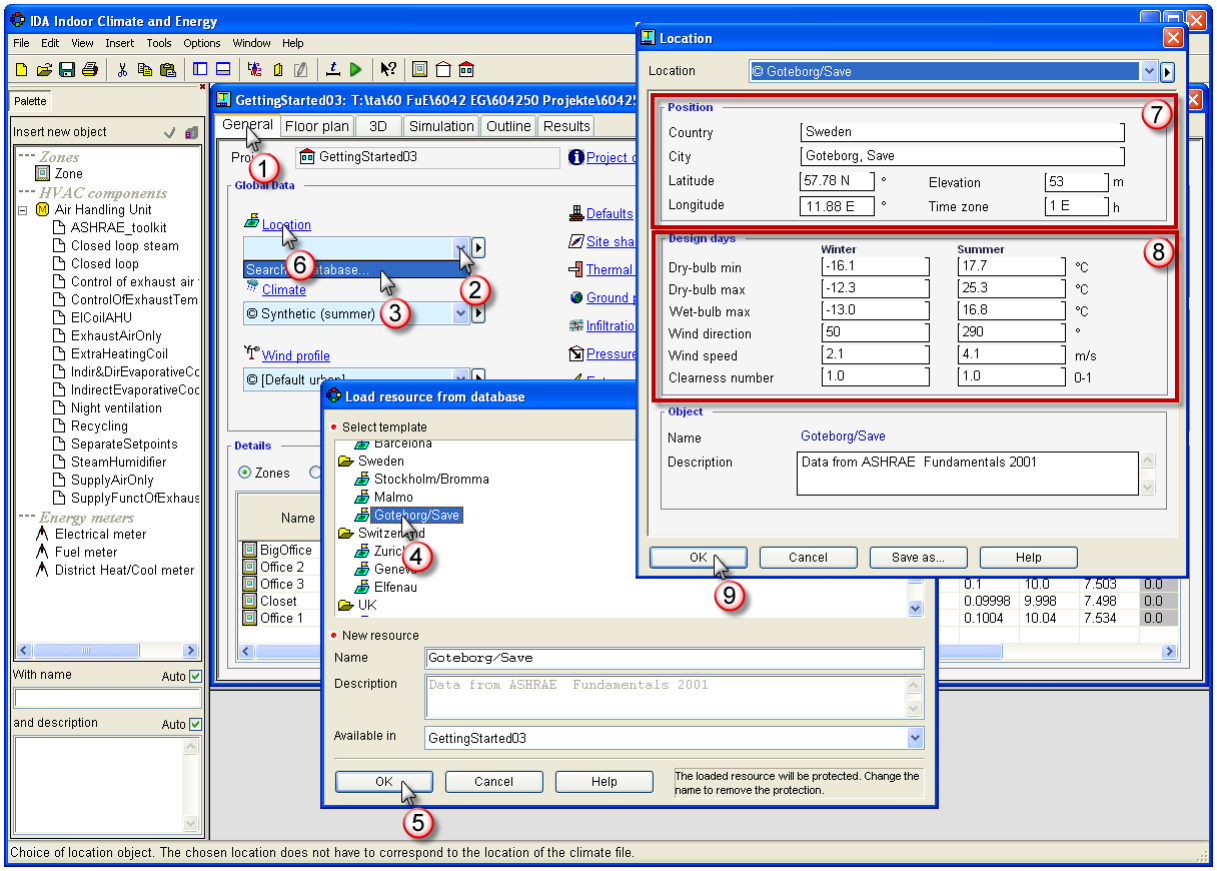
☞ (3) Position and orientation of the building can alternatively be modified in the side bar

NB Changing site orientation (compass) will rotate the building together with the site, whilst changing building orientation will rotate the building within the site keeping the site orientation constant.

(4) Go to the 3D tab to have a look at your model



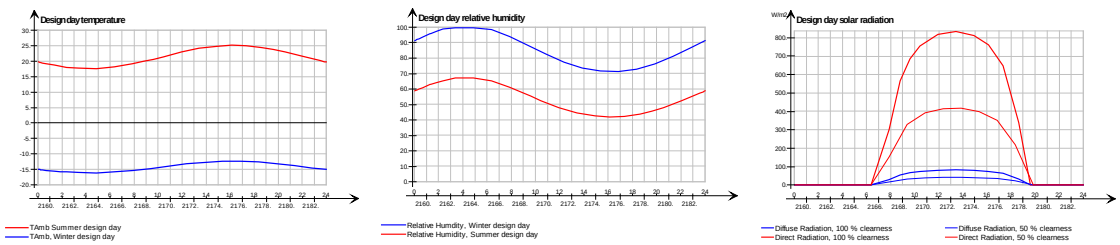
9 Location and Weather

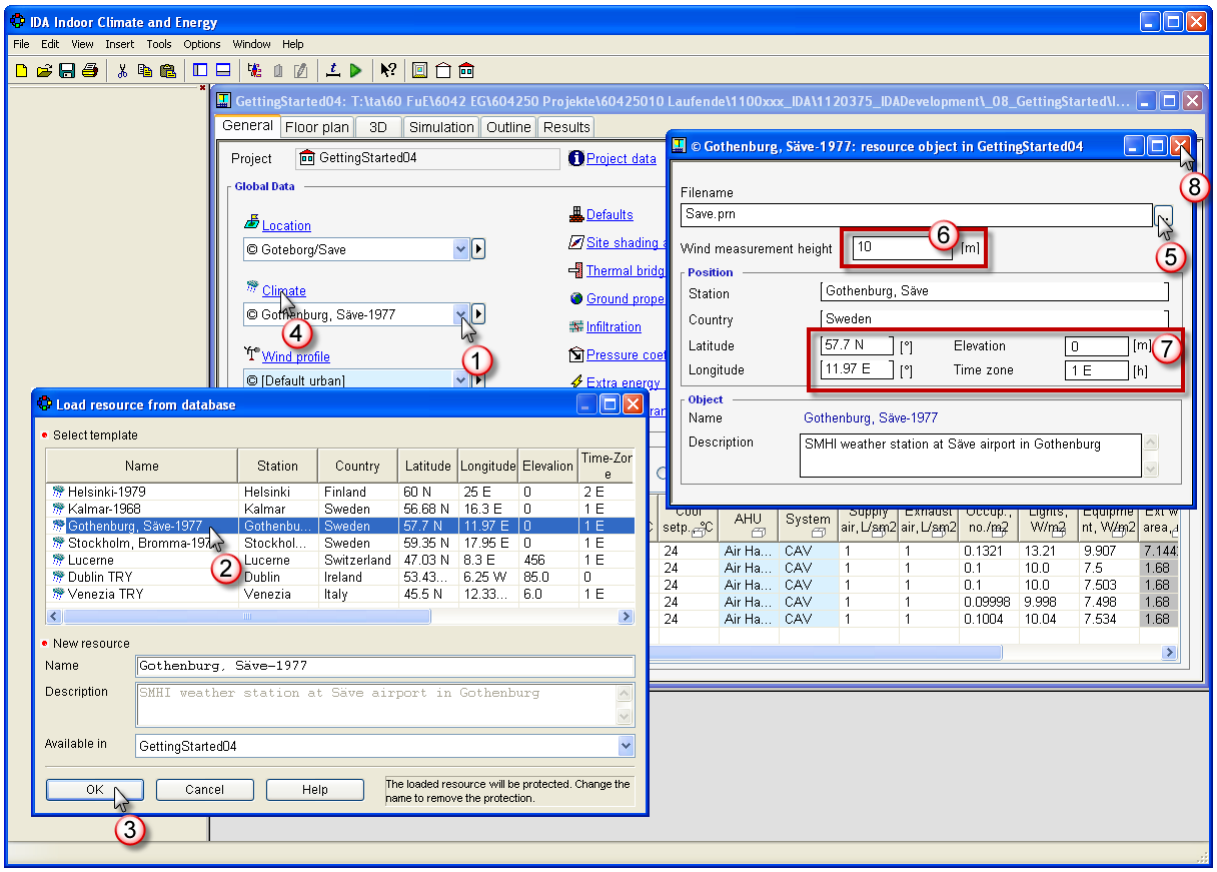


Screenshot 38

1. Go to the General tab
2. Choose how to select location
3. Search in database
4. Choose Gothenburg (Sweden)
5. Finalize location selection
6. Open the location form
   - ☞ 7. Change position and time zone of the location
   - ☞ 8. Change the design day climate parameters. There are two columns for the winter as well as the summer design day.
9. Finalize location definition

NB The design day parameters in the location form will only be used for synthetic climate (see diagrams below). The location position parameters will be used to calculate the position of the sun.



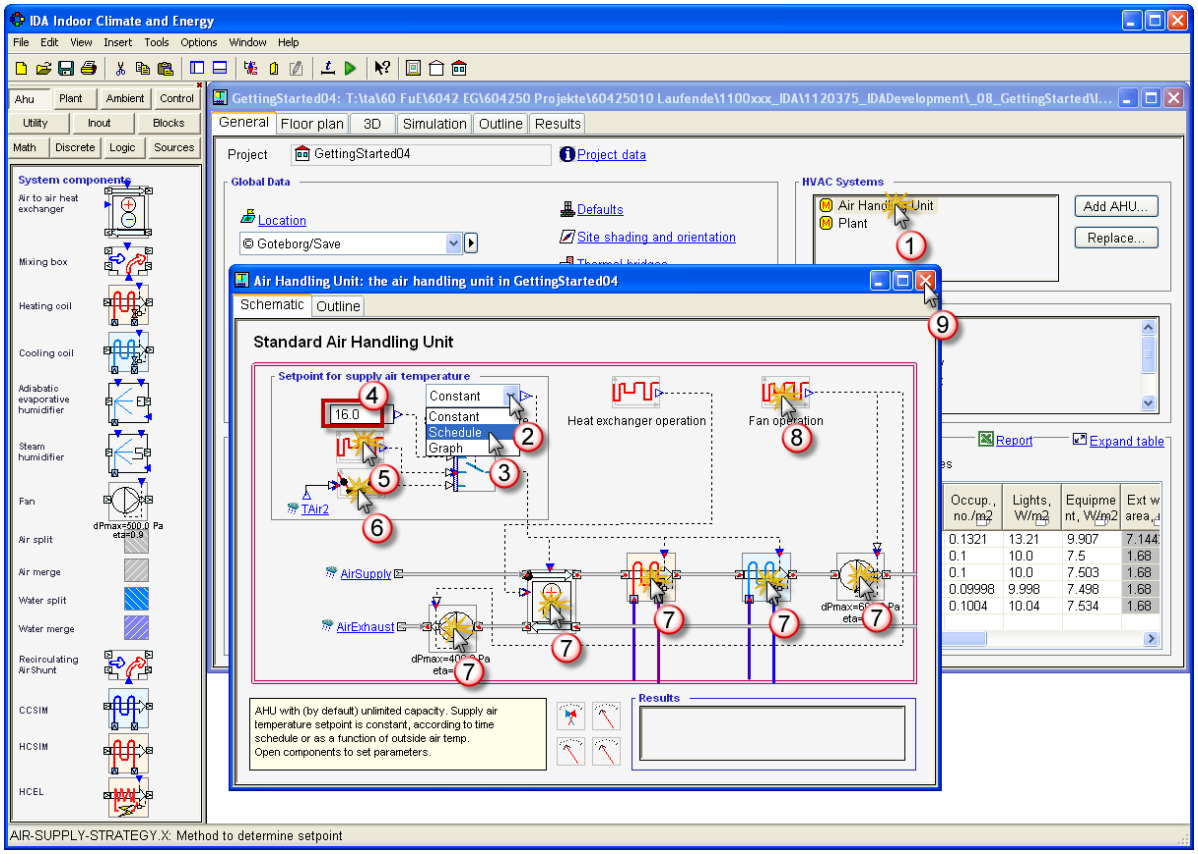


Screenshot 39

1. Search climate in database
2. Choose climate
3. Finalize climate definition
4. Open the climate form
   - ☞ 5 Browse in your folders to link another climate file
   - ☞ 6 Wind measurement height and wind profile will be used to calculate the wind speed at building roof level, based on the measured wind speed.
   - ☞ 7 Change the location and time zone of the climate measurement (if you have linked to your own file).
8. Close the climate form

NB The location of the climate measurement can be somewhat different from the building location. The difference will result in a different solar position and in some errors in solar radiation.

10 Mechanical ventilation



Screenshot 40

1. Open the air handling unit
2. Choose between the different methods for selection of supply air temperature setpoint (constant, schedule or graph)
3. Choose schedule as control for the supply air temperature
   - ☞ 4. In case constant supply air temperature is selected, this value is relevant.
   - ☞ 5. In case the supply air temperature is based on a schedule, related data is defined here.
   - ☞ 6. In case the supply air temperature is based on a graph, related data is defined here.

NB The selected supply temperature setpoint is fed to the heat exchanger as well as to both the heating and cooling coils. To turn off any of these elements, set its effectiveness to 0 (by double-clicking on its symbol and modifying the parameter).

- ☞ 7. Open the AHU component model objects to modify parameters.

  NB The heat exchanger effectiveness represents the percentage of the maximum possible heat which is transmitted from exhaust to supply air.

  NB The cooling coil will often remove humidity

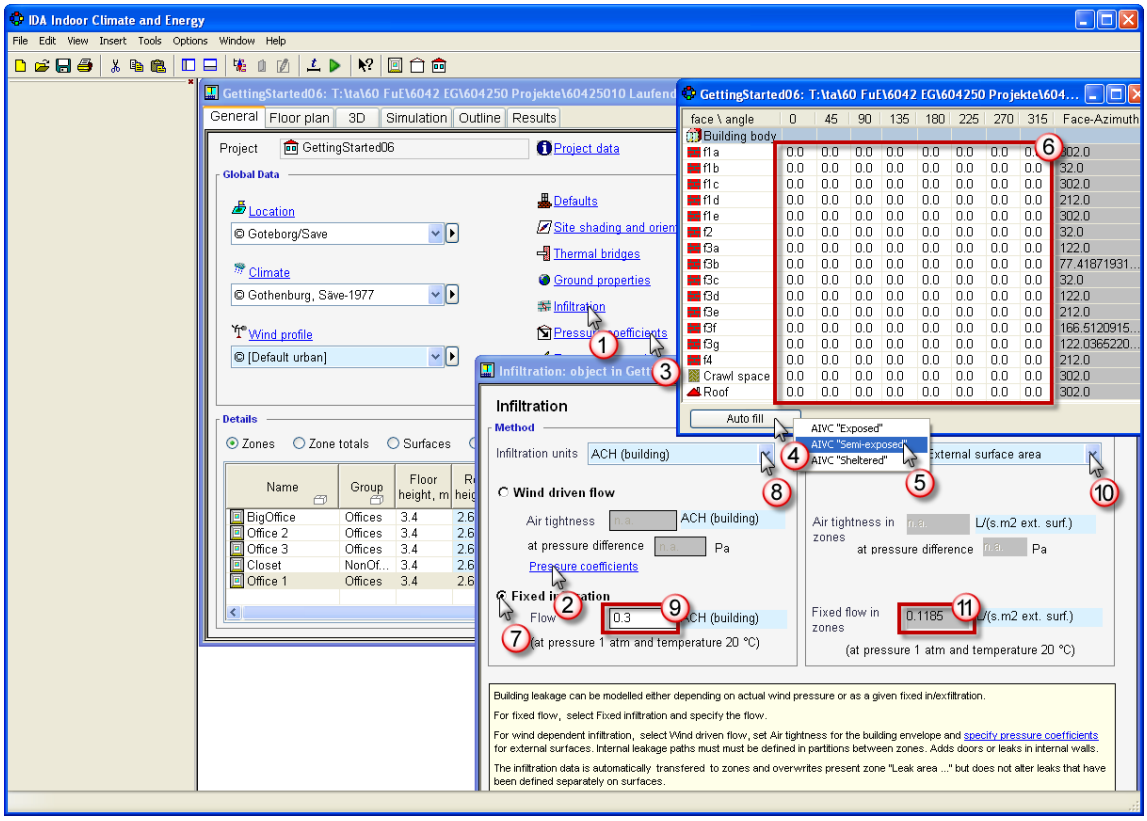
8. Modify the schedule for the operation of the fans (select "06-18 weekdays" from database).

NB The fan operation schedule controls the operation of the central air handling unit (on/off control). The air volume rate in each zone is determined from the zone.

NB The default AHU does not include any parameter that needs to be adapted to the building size. It has a very large capacity; other AHUs may need capacity data.

9. Close the air handling unit

11 Infiltration



Screenshot 41

① Go to the Infiltration form

☞ ② In case of “Wind driven flow” (wind dependent infiltration), open the table for pressure coefficients.

☞ ③ Alternatively, you can open the table for pressure coefficients directly in the General tab

☞ ④ Choose “Auto fill”

☞ ⑤ Select “Semi exposed”

NB Whenever you wish to calculate the wind driven infiltration flow, you need to define both the complete internal leakage paths between the zones and the wind pressure coefficients for all external faces.

☞ ⑥ Alternatively, you can fill in wind pressure coefficients, e.g. results from CFD calculation or wind tunnel measurements. Note that Copy and Paste of rectangular sections of a table, from e.g. Excel, may be used here.

⑦ Here, we will not use pressure coefficient based infiltration but “Fixed infiltration”. The infiltration will then be constant and not wind dependent.

☞ ⑧ You can change the units for the definition of the infiltration flow

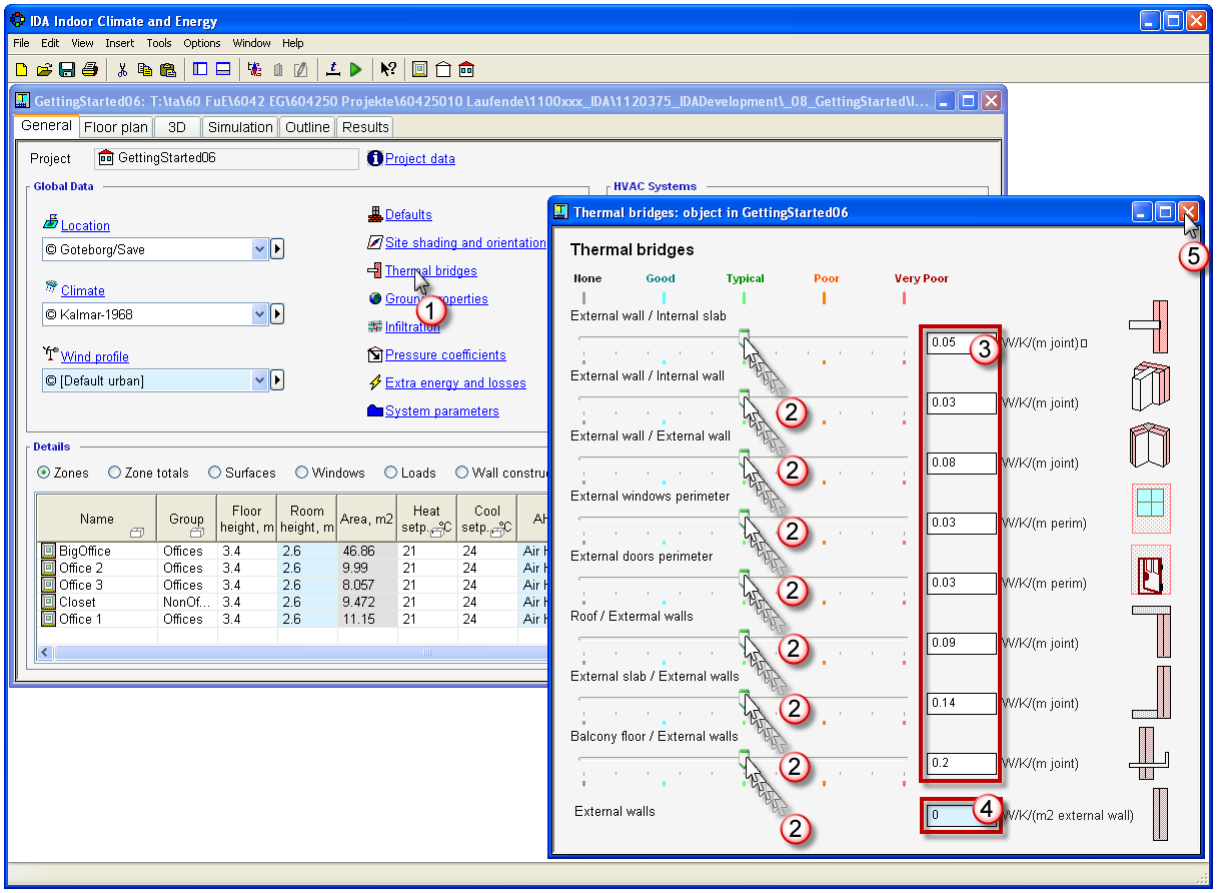
⑨ Set fixed infiltration flow to 0.3 ACH (air changes per hour)

☞ ⑩ You can choose, whether the air tightness and fixed infiltration flow respectively is distributed proportional to (a) the zone volume, (b) the external surface area of the zone or (c) the zone floor area.

☞ ⑪ See calculated fixed flows in zones, depending on the settings at ⑧-⑩.

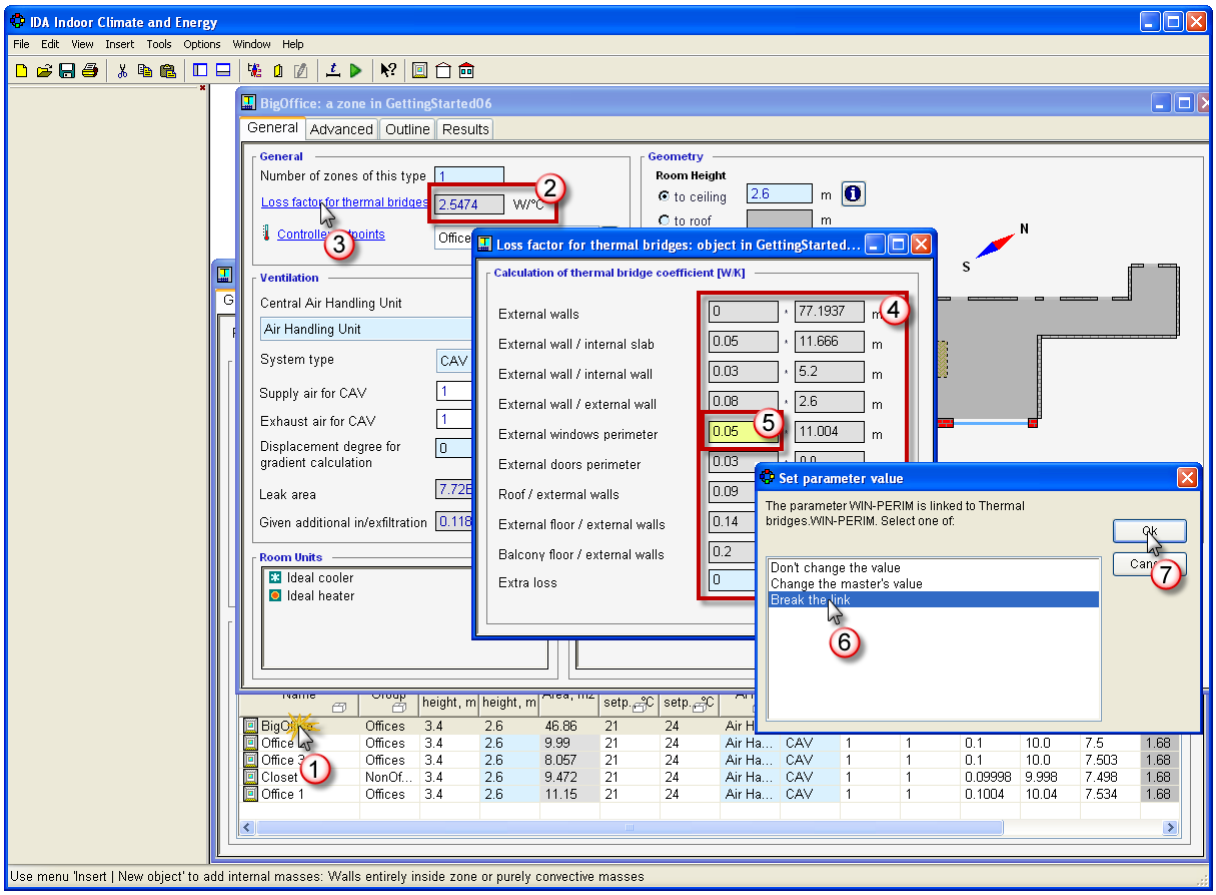
⑫ Close the Infiltration form

12 Thermal Bridges



Screenshot 42

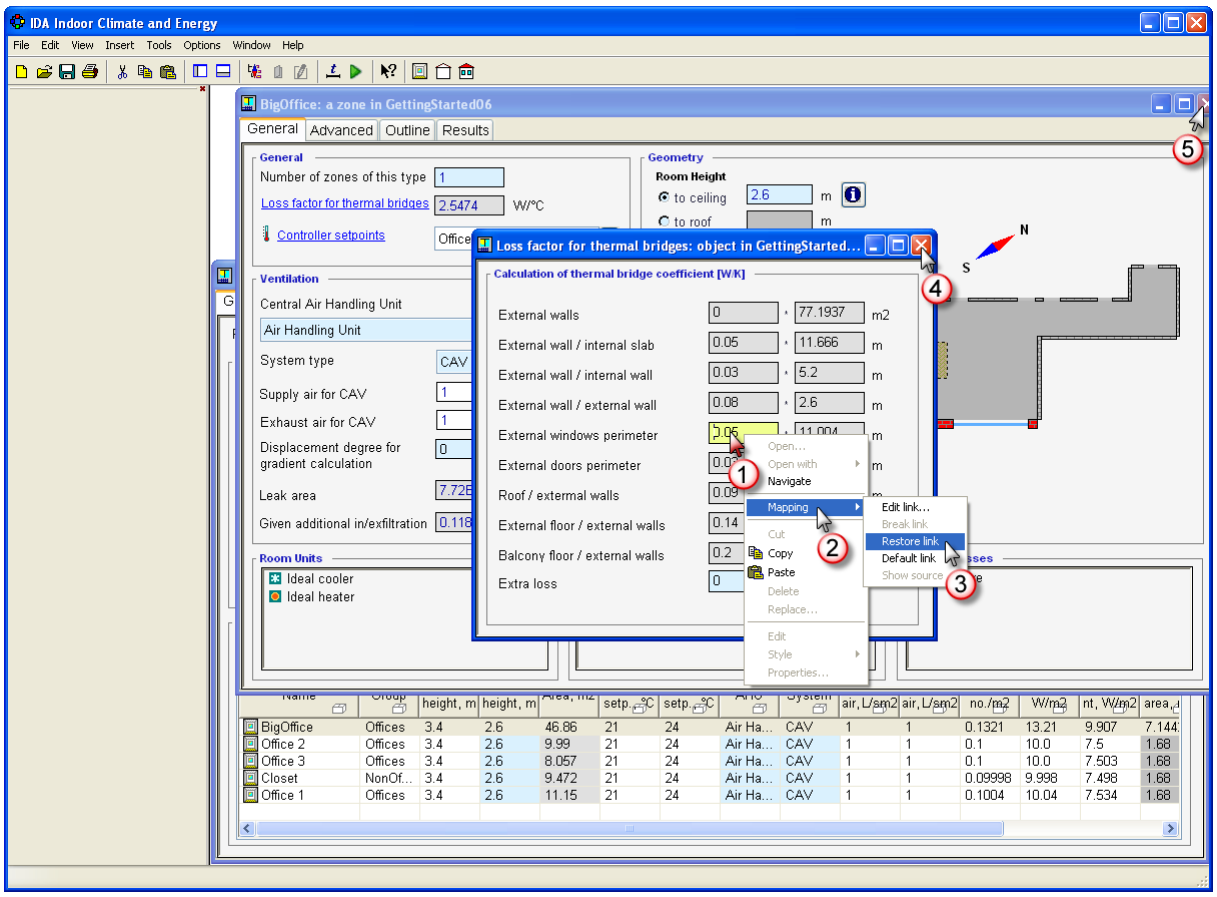
1. Go to the Thermal bridges form
2. Set all length specific thermal bridge coefficients to “Typical”
   - ☞ 3. Alternatively, you can give the thermal bridge coefficients by entering their values into the text boxes
   - ☞ 4. You can also define an area specific thermal bridge coefficient
5. Close the Thermal bridges form



Screenshot 43

1. Open the Zone form of *"BigOffice"* Check the total loss factor for thermal bridges for the whole zone, calculated from the thermal bridge coefficients.
3. Open the Loss factor calculation form
4. Check the contributions of the particular origins of the loss factor
   - ☞ 5. Change any value for this particular zone (e.g. in case it has leakier window frames than the rest of the building)
   - ☞ 6. Choose "Break the link"
   - ☞ 7. Finalize

NB Values highlighted in grey indicate parameters calculated by a link to other parameters. Values highlighted in yellow indicate broken links. Values highlighted in blue indicate values taken from defaults.



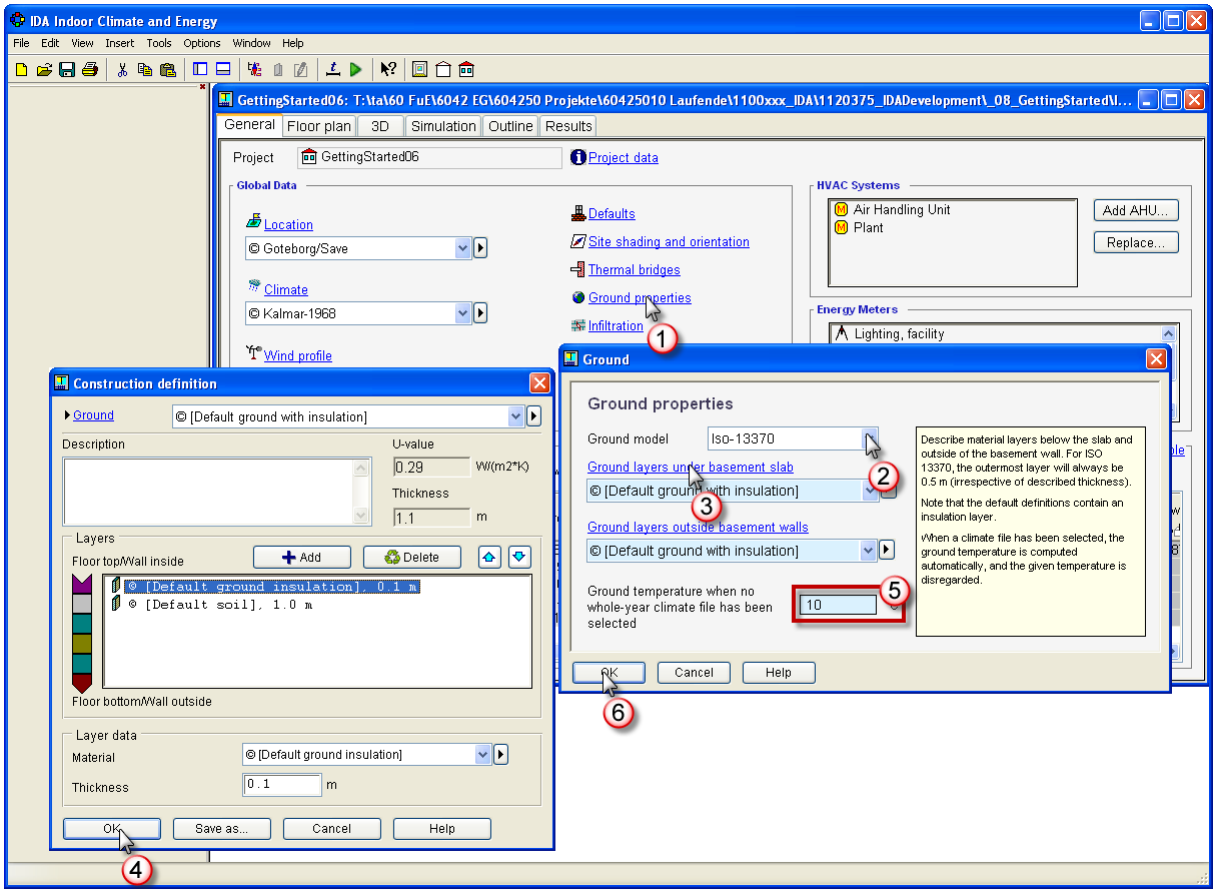
Screenshot 44

- ☞ (1) Open the menu for the parameter with the broken link
- ☞ (2) Choose “Mapping”...
- ☞ (3) ... and “Restore link”

(4) Close the loss factor calculation form

(5) Close the zone form

13 Ground Properties

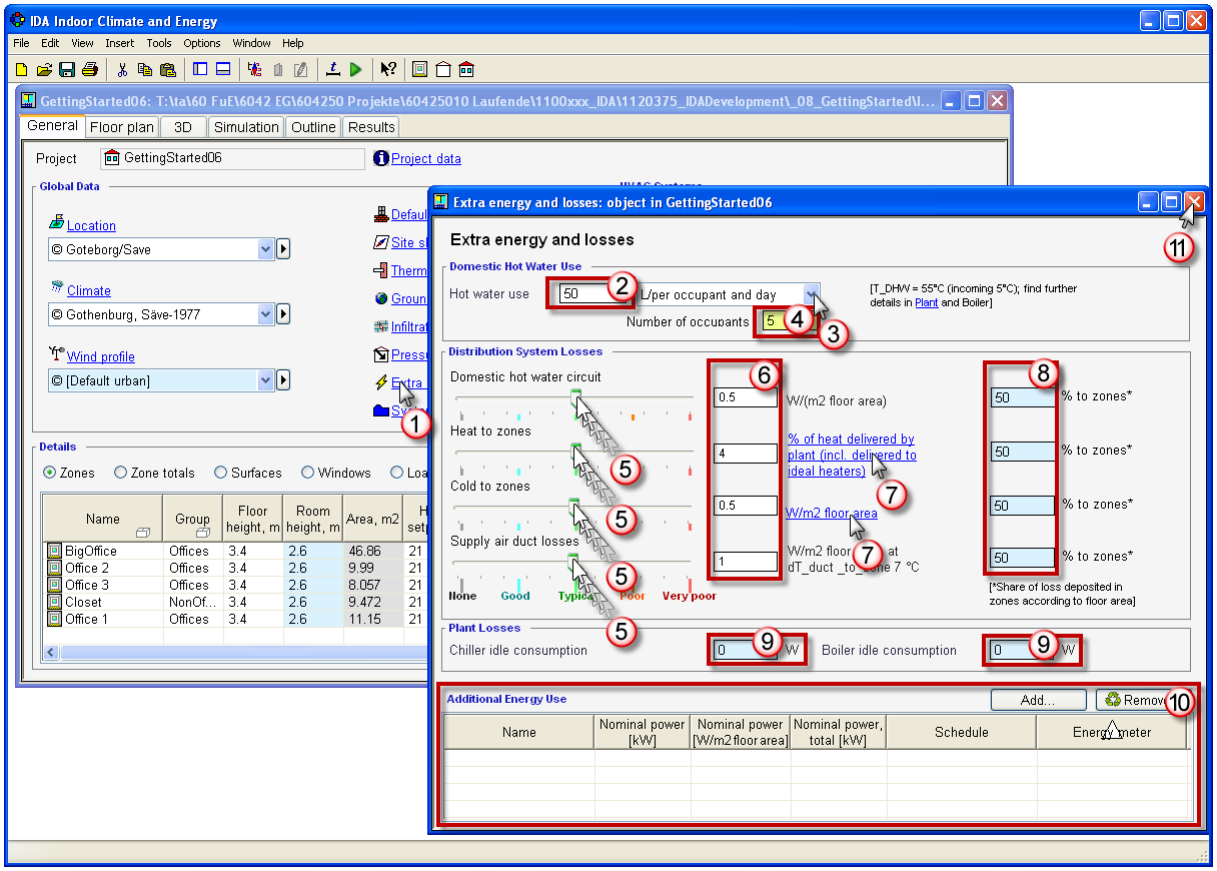


Screenshot 45

1. Open the Ground properties dialog
   - ☞ 2. You can change the model for the heat transport to the ground from ISO 13370 to a simple model used in ICE 3
2. Open Construction dialog for the ground layer
3. Confirm dialog choices
   - ☞ 5. Define the ground temperature

     NB The given ground temperature is only used in the case when no whole-year climate file (allowing the program to calculate the average ground temperature) is defined.
4. Confirm dialog choices

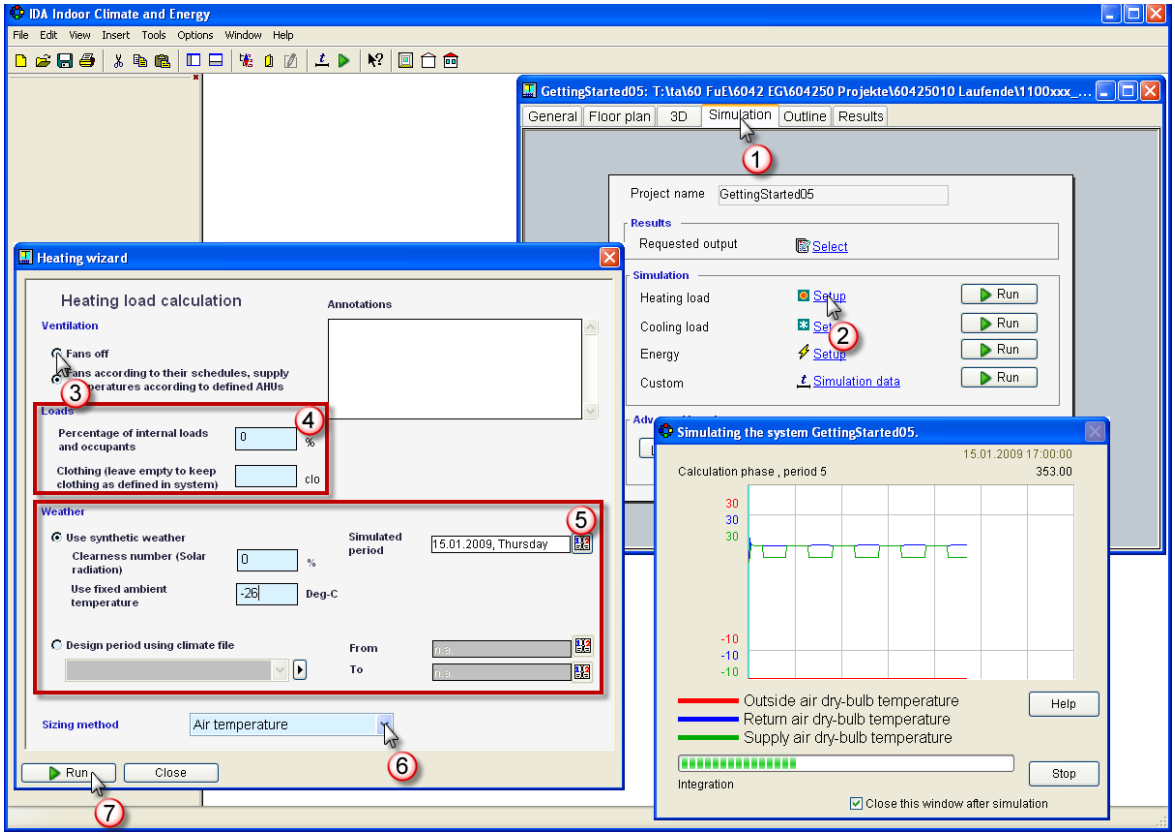
14 System Distribution Losses



Screenshot 46

1. Go to the Extra energy and losses form
2. Set hot water use
   - ☞ 3. You can change the units for hot water use
4. Break the link for number of occupants calculation by defining 5 hot water consuming occupants for the whole building
5. Select “Typical” for all distribution system loss coefficients
   - ☞ 6. Alternatively set the distribution system by writing its coefficients in these text boxes
   - ☞ 7. Note that units can be changed for these
   - ☞ 8. Define what percentage of the lost energy that will enter into zone heat balances (the share of ducts and piping that pass through modeled zones)
   - ☞ 9. Define average plant losses (permanent loss, independent of operation)
   - ☞ 10. Define any additional energy, such as external lighting, ice melting equipment etc., that do not enter into the building heat balance
   - ☞ 11. Close the Extra energy losses form

15 Heat Load Calculation and Results



Screenshot 47

1. Go to the ***Simulation*** tab
2. Open heating load calculation setup to define key parameters to be applied in the calculation
3. Turn off mechanical ventilation to consider worst case heating load (neglect air-borne heating from the AHU)

   ☞ 4. Define percentage of internal load (percentage of all loads as defined in the zone form) that should be active during the heat load calculation (normally zero)
5. Select synthetic weather and constant ambient temperature -26 °C

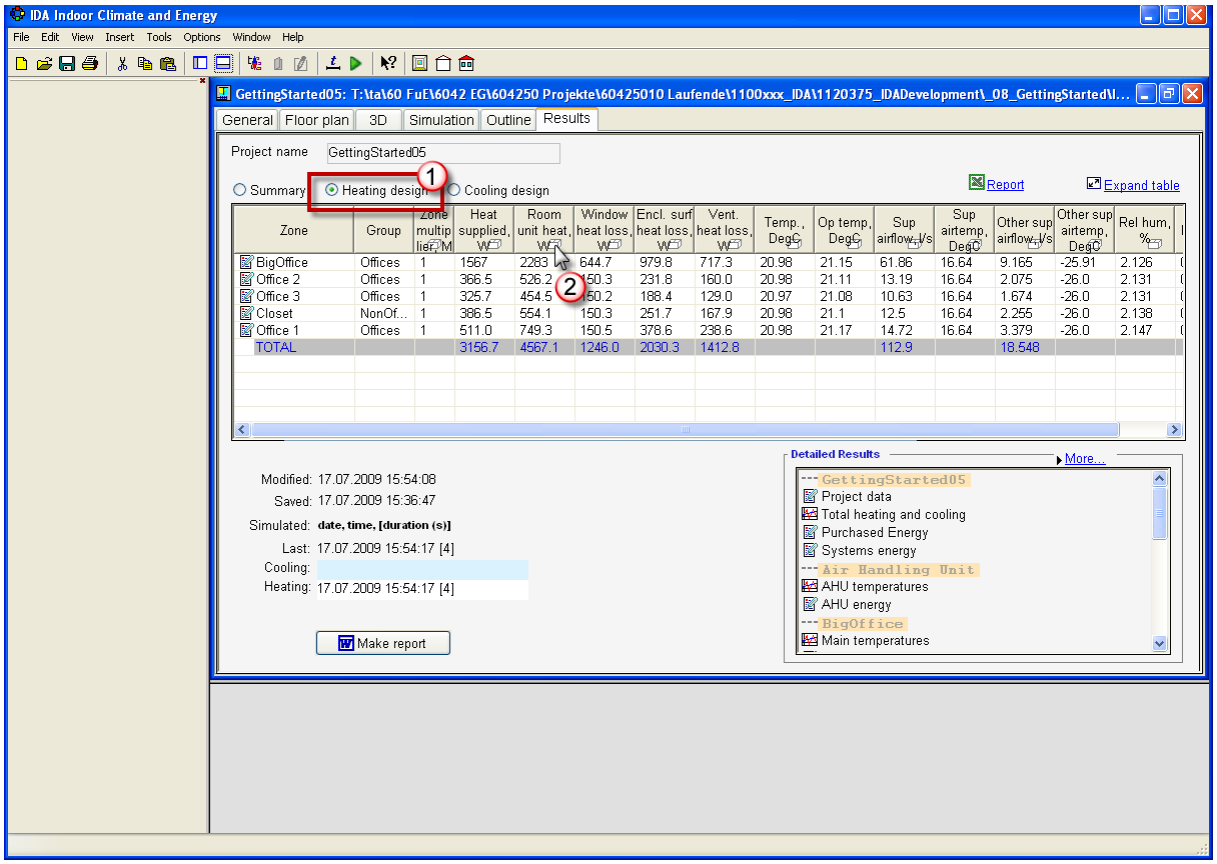
NB With synthetic weather, the date of the simulation as well as the clearness number influences solar radiation: Set clearness number to 0 % to calculate without any solar radiation or to 100 % to calculate with clear sky conditions. (The sky is often clear on cold days.). You can keep the clearness number field empty to take it from the location form instead.

NB You can leave fixed ambient temperature empty to calculate ambient temperature from design day minimum and maximum. Once a fixed ambient temperature is defined, minimum and maximum dry bulb temperatures within the location are no longer used. Together with clearness number of 0 %, this means that we will do a steady state calculation with fixed ambient temperature and no solar radiation.

NB Selection of "Design period using climate file" requires climate data for the period to be calculated.

☞ 6. Select either air temperature or operative temperature as heating setpoint.

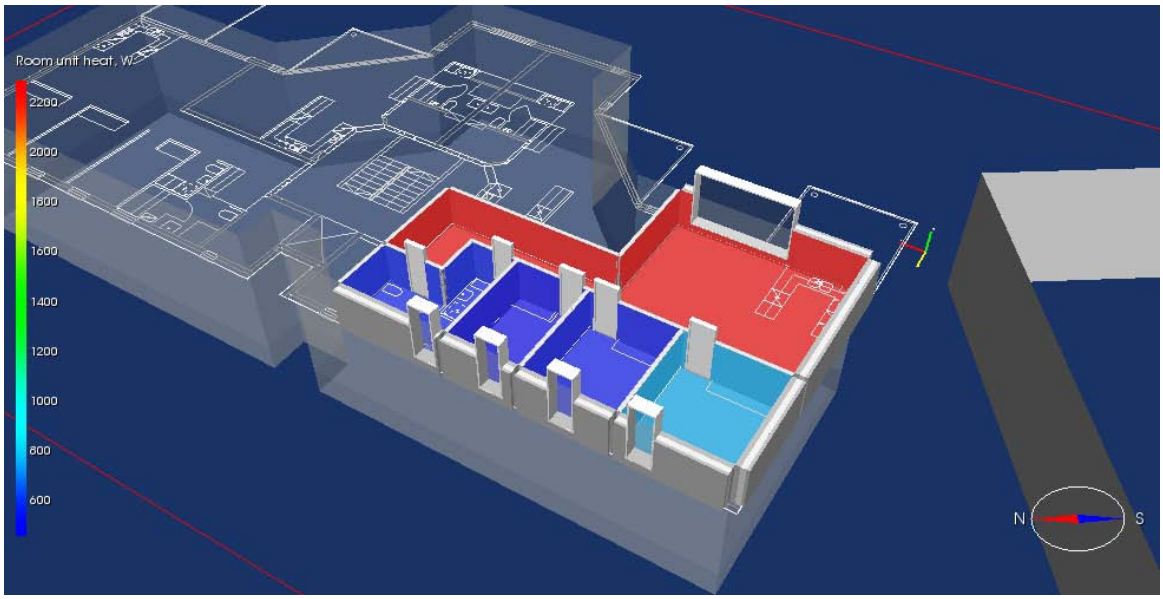
7. Run heat load calculation. The program will automatically switch to the ***Results*** tab after calculation.



Screenshot 48

1. Select "Heating design" within the Results tab
2. Visualize room unit heat

NB When moving the cursor over the box icons in the result column titles, a tooltip appears.



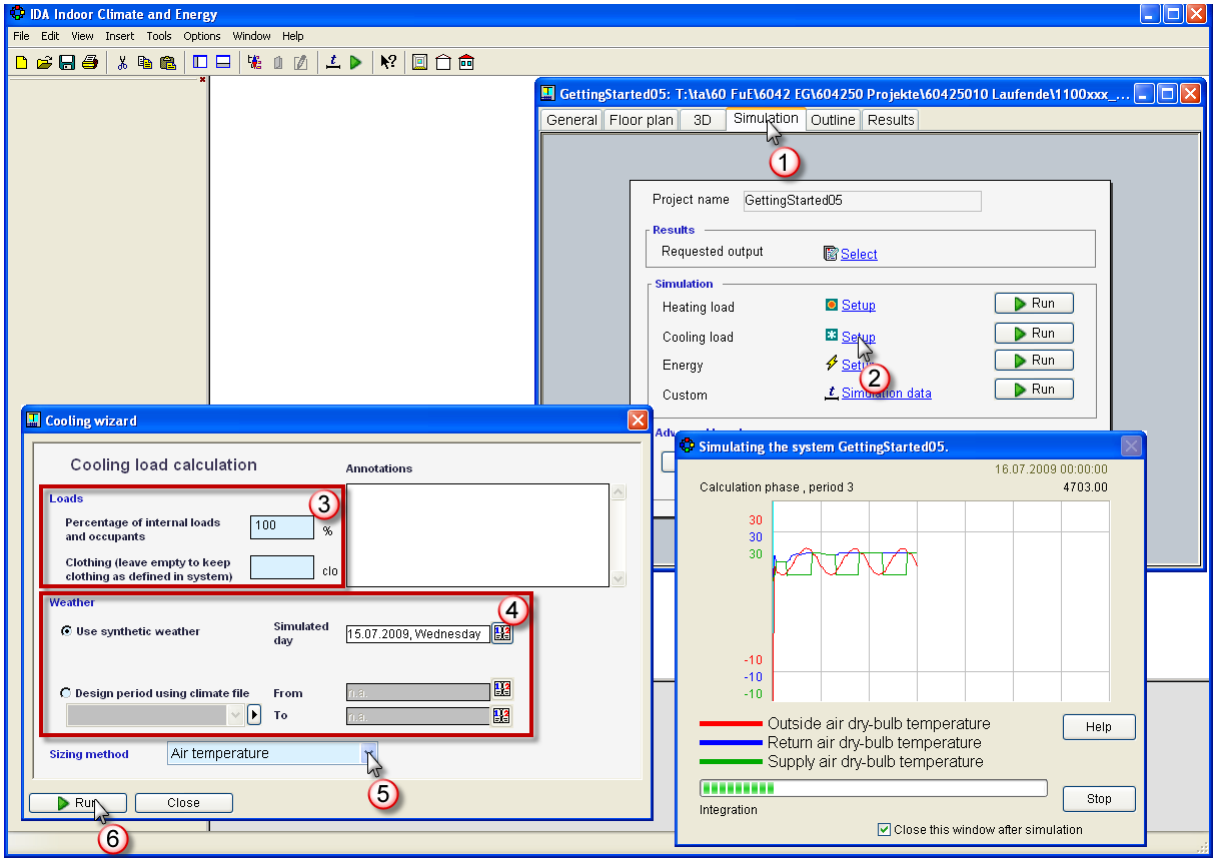
Heating design results:

- Heat supplied: This is – during the heating load calculation period – the maximum heat supplied to the zones by all air flows and room units.

NB The maximum or minimum values in the result tables are not instantaneous values, but 15 minute sliding averages, for example the maximum Temperature is the average during the hottest 15 minutes. The sliding average length can be changed in the ***System parameters*** form, available from the ***General*** tab.

- Room unit heat: This is the maximum heat supplied by all room units to the zone. Often, "Room unit heat" is greater than "Heat supplied", since the ventilation air may cool the room.
- Window heat loss: This is the heat lost at the time of maximum heat supply by transmission into all window surfaces (glazing and frame).
- Encl. surf heat loss: This is the heat lost at the time of maximum heat supply by transmission into all enclosed zone surfaces excluding the window surfaces, but including the thermal bridges.
- Vent. heat loss: This is the heat lost at the time of maximum heat supply by infiltration and ventilation.
- Temp.: This is the dry bulb air temperature at the time of maximum heat supply.
- Op temp: This is the operative temperature at the time of maximum heat supply.
- Sup airflow: This is the mechanical supply air flow rate at the time of maximum heat supply.
- Sup airtemp: This is the mechanical supply air dry bulb temperature at the time of maximum heat supply.
- Other sup airflow: This is the natural supply air flow rate at the time of maximum heat supply.
- Other sup airtemp: This is the natural supply air dry bulb temperature at the time of maximum heat supply.
- Rel hum: This is the zone air relative humidity at the time of maximum heat supply.
- PPD: This is the predicted percentage of dissatisfied people at the time of maximum heat supply.

16 Cooling Load Calculation and Results



Screenshot 49

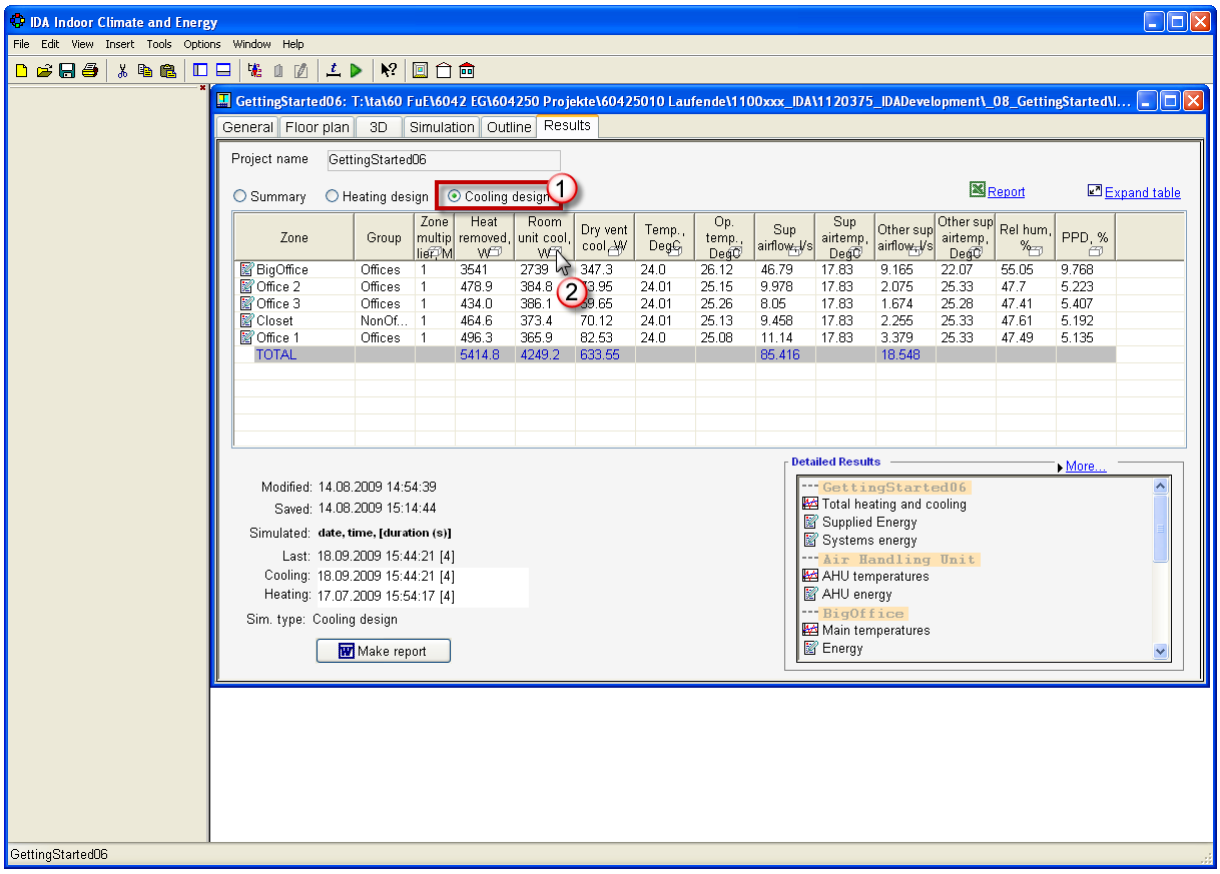
1. Go to the Simulation tab
2. Open cooling load calculation setup
   ☞ 3. Define percentage of internal loads (percentage of all loads as defined) for cooling load calculation (normally 100% should be used)
4. Select synthetic weather

NB With synthetic weather, the time of year as well as the clearness number influences solar radiation. The clearness number for cooling load calculation is always taken from the location form.

NB Selection of "Design period using climate file" requires a climate data file for the period to be calculated.

   ☞ 5. Select either air temperature or operative temperature as cooling setpoint.

6. Run cooling load calculation. The program will automatically switch to the ***Results*** tab after calculation.

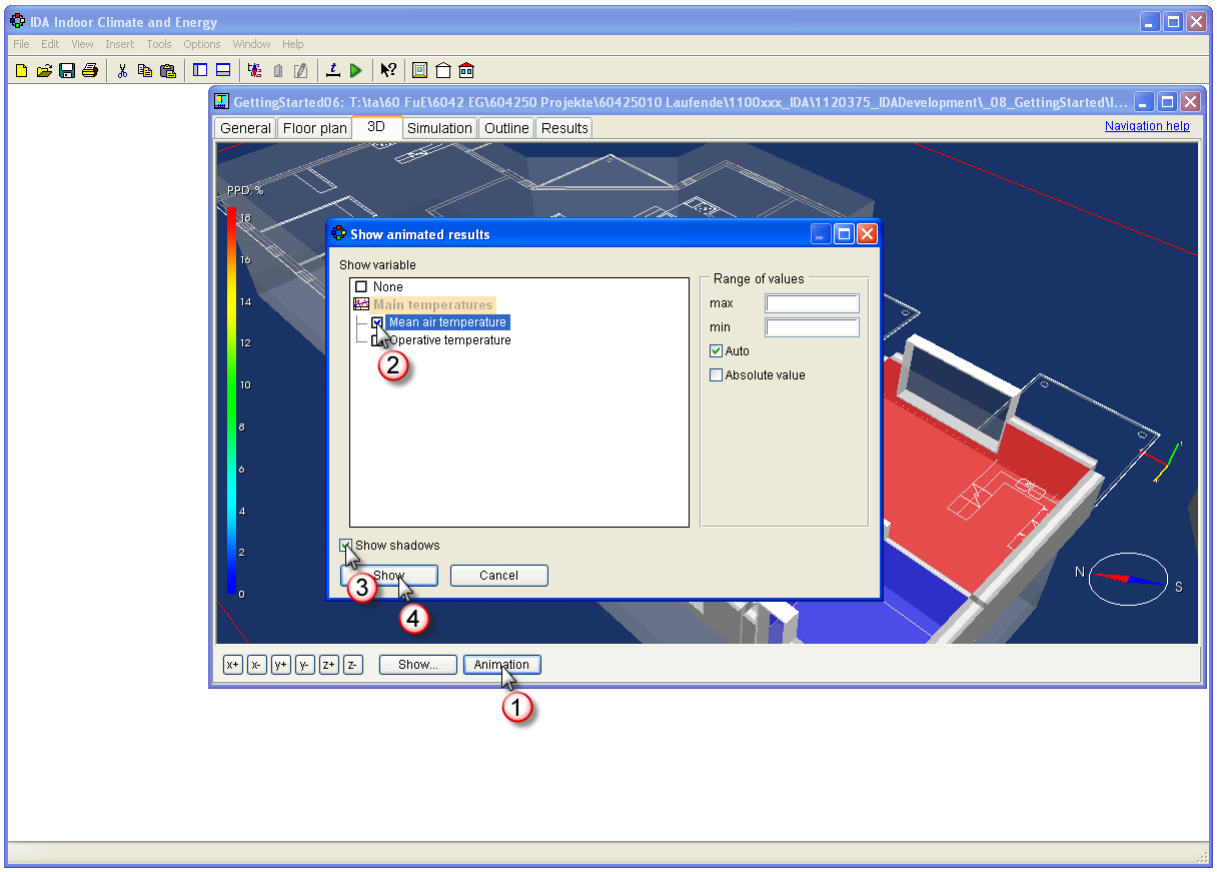


Screenshot 50

1. Select "Cooling design" within the Results tab
2. Visualize Room unit cool

Cooling design results:

- Heat removed: This is – during the cooling load calculation period – the maximum sensible and latent heat removed from the zones by all air flows and room units.
- Room unit cool: This is the maximum sensible and latent heat removed from the zones by all room units.
- Dry vent cool: This is the maximum sensible heat removed by the mechanical ventilation. The sum of "Room unit cool" and "Dry vent cool" is not equal to "Heat removed", since both the heat load due to infiltration and the latent heat removed by the mechanical ventilation are not included in "Dry vent cool".
- Temp.: This is the dry bulb air temperature at the time of maximum heat removal.
- Op temp: This is the operative temperature at the time of maximum heat removal.
- Sup airflow: This is the mechanical supply air flow rate at the time of maximum heat removal.
- Sup airtemp: This is the mechanical supply air dry bulb temperature at the time of maximum heat removal..
- Other sup airflow: This is the natural supply air flow rate at the time of maximum heat removal.
- Other sup airtemp: This is the natural supply air dry bulb temperature at the time of maximum heat removal. The total sensible heat removed or supplied by infiltration and natural ventilation can be calculated from "Temp", "Other sup airflow" and "Other sup airtemp".
- Rel hum: This is the zone air relative humidity at the time of maximum heat removal.
- PPD: This is the predicted percentage of dissatisfied people at the time of maximum heat removal.

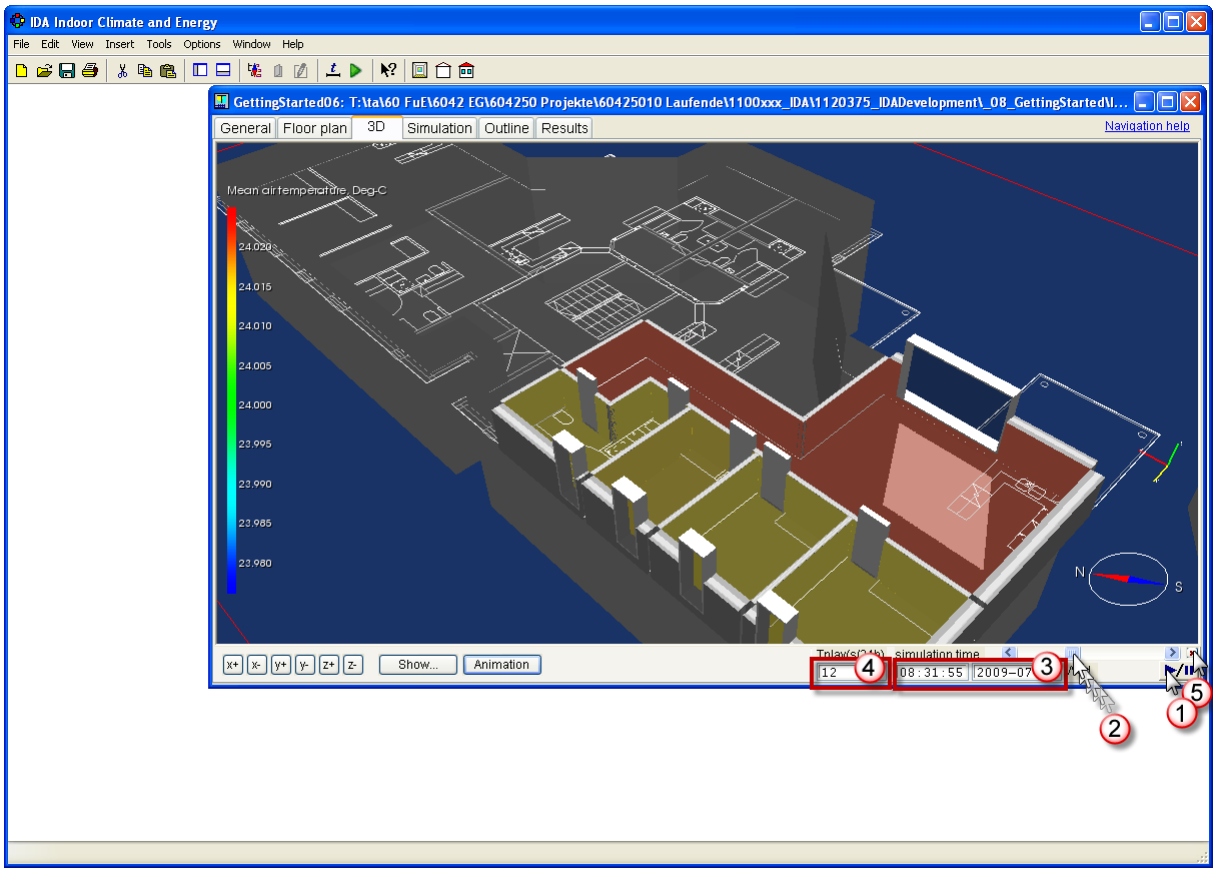


Screenshot 51

1. Go to result animation
2. Choose mean air temperature

NB You will get a selection of more variables as soon as you select more result output (see “Energy calculation” below)

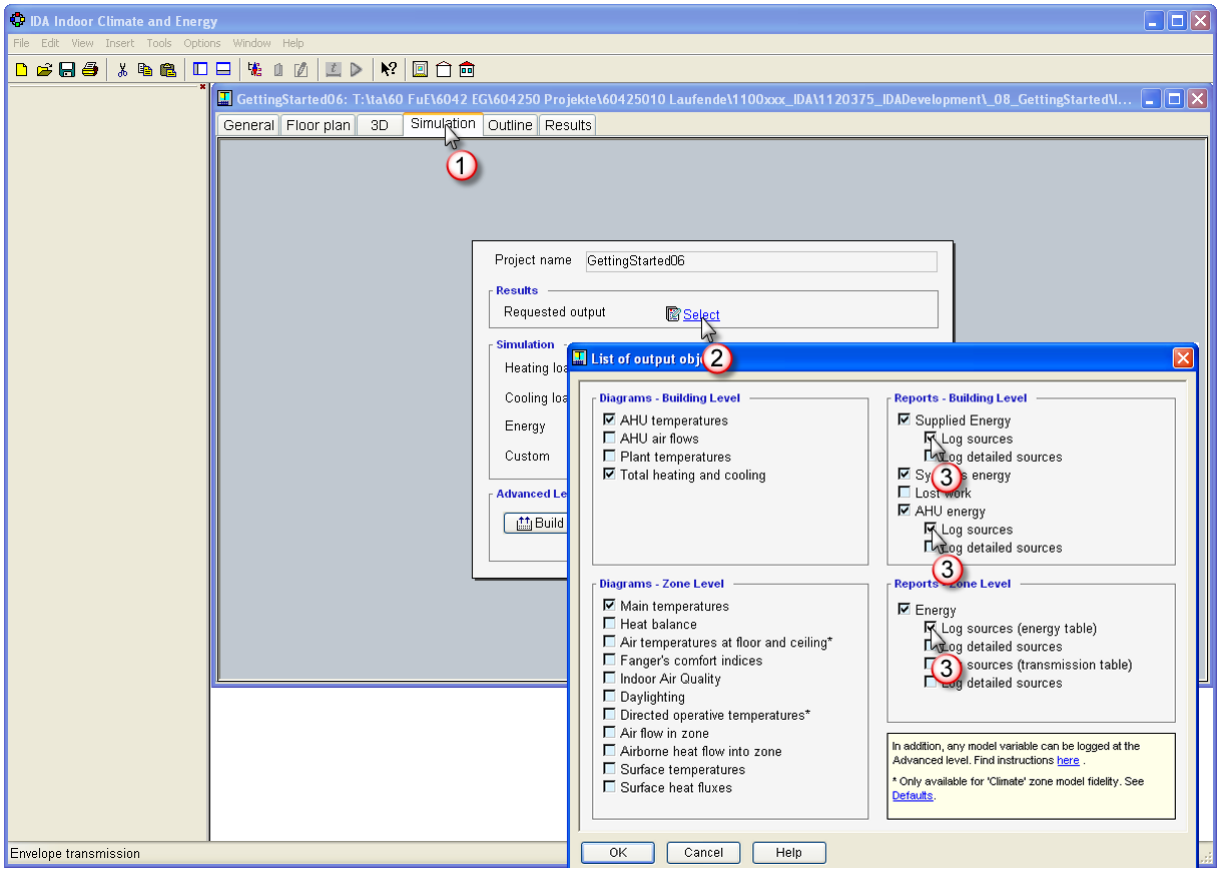
3. Activate shadow animation
4. Open animation



Screenshot 52

1. Start animation / pause animation
2. Move within animation by dragging the scroll bar
   ☞ 3. Alternatively change simulation time by typing time and day
4. Change animation speed
5. Leave result animation

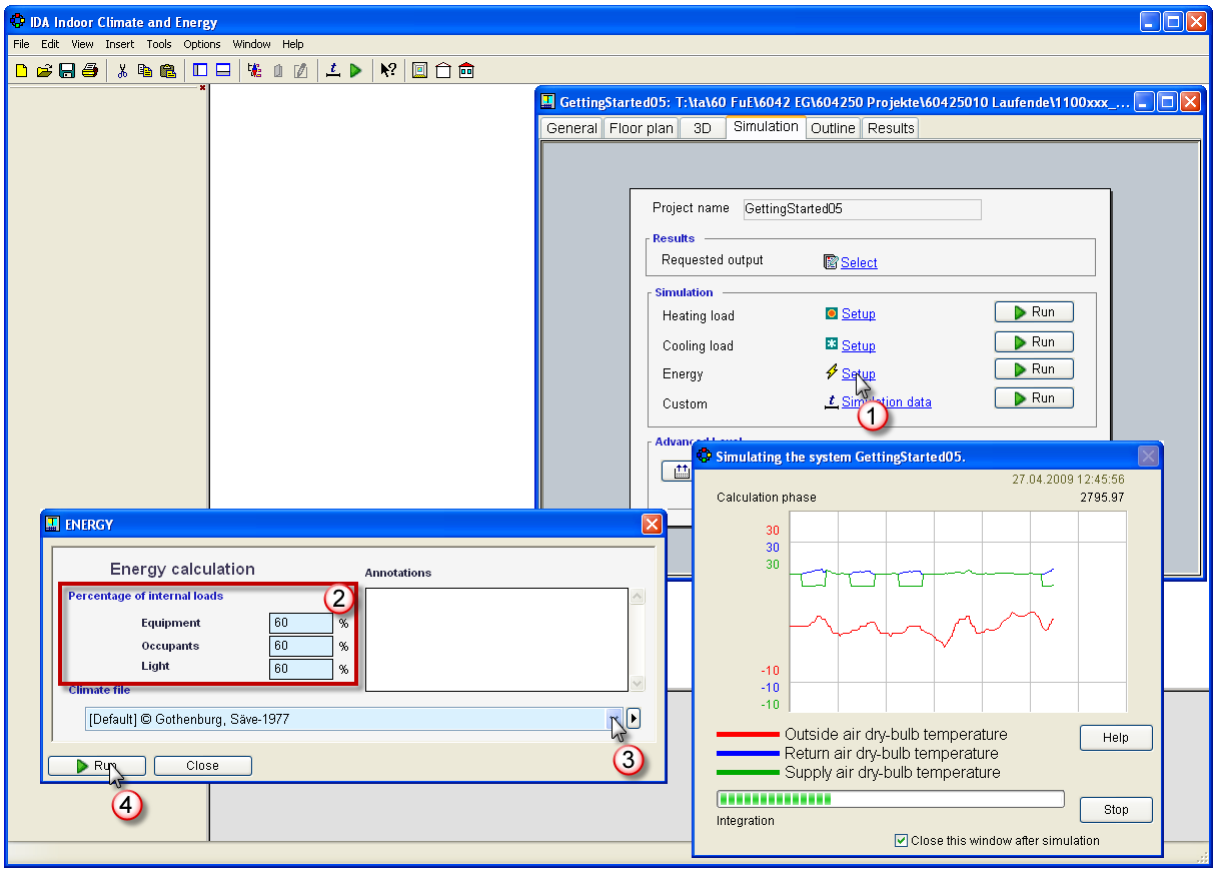
17 Energy Calculation



Screenshot 53

1. Go to the Simulation tab
2. Open list for output objects selection
3. Add Log sources to the requested outputs

NB For large models, logging the sources of reports may occupy significant disk space.



Screenshot 54

1. Open energy calculation setup

   ☞ 2. Define percentage of internal loads that should be active for the energy calculation.

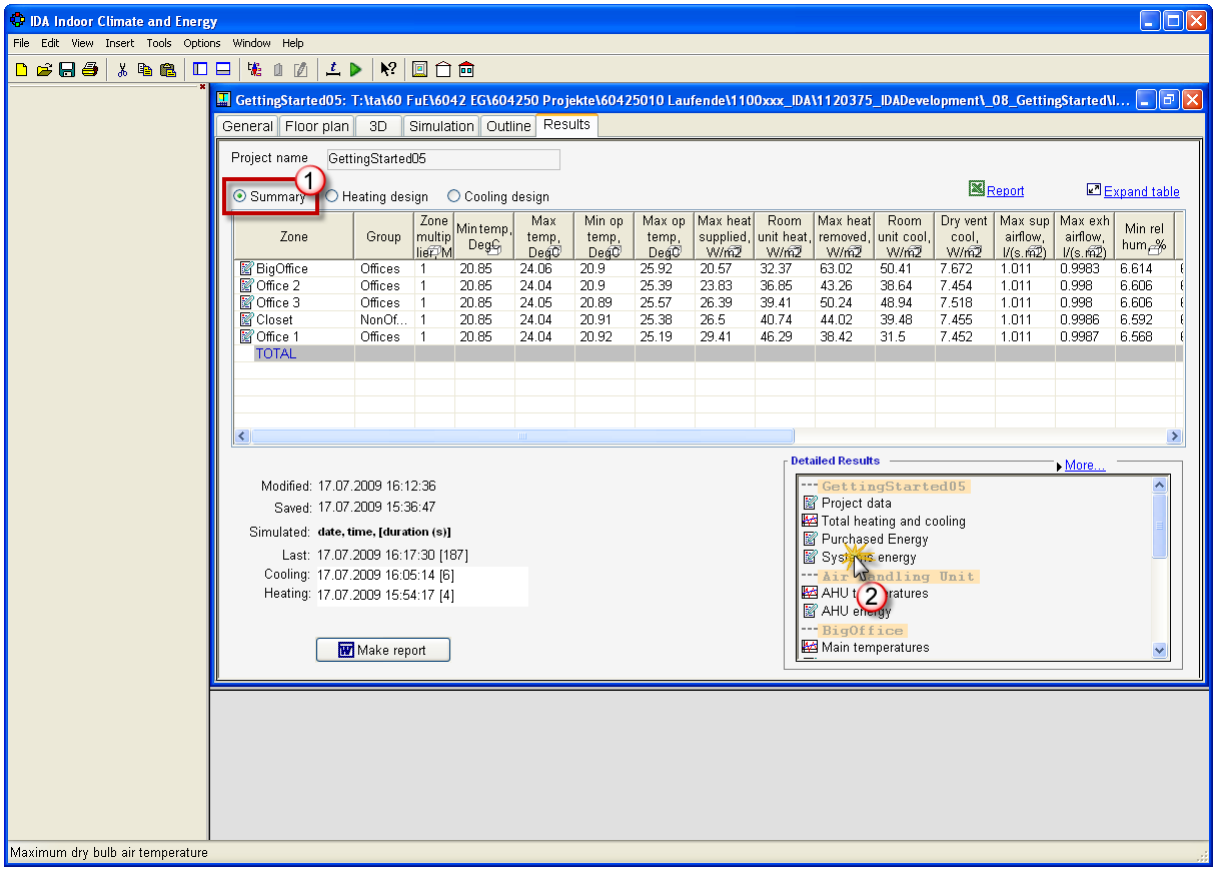
   NB Full loads are normally not relevant for a reasonable energy computation.

3. Select Gothenburg climate data from database

NB Use of synthetic weather data for energy calculation is not possible. Energy calculation always requires annual climate data.

4. Run an annual energy calculation. The program will automatically switch to the ***Results*** tab after calculation.

18 Simulation Summary



Screenshot 55

1 Select "Summary" within the Results tab

NB The summary result table shows minimum and maximum values from the most recent simulation, also when a cooling or heating load calculation has been done. The measures are defined slightly differently:

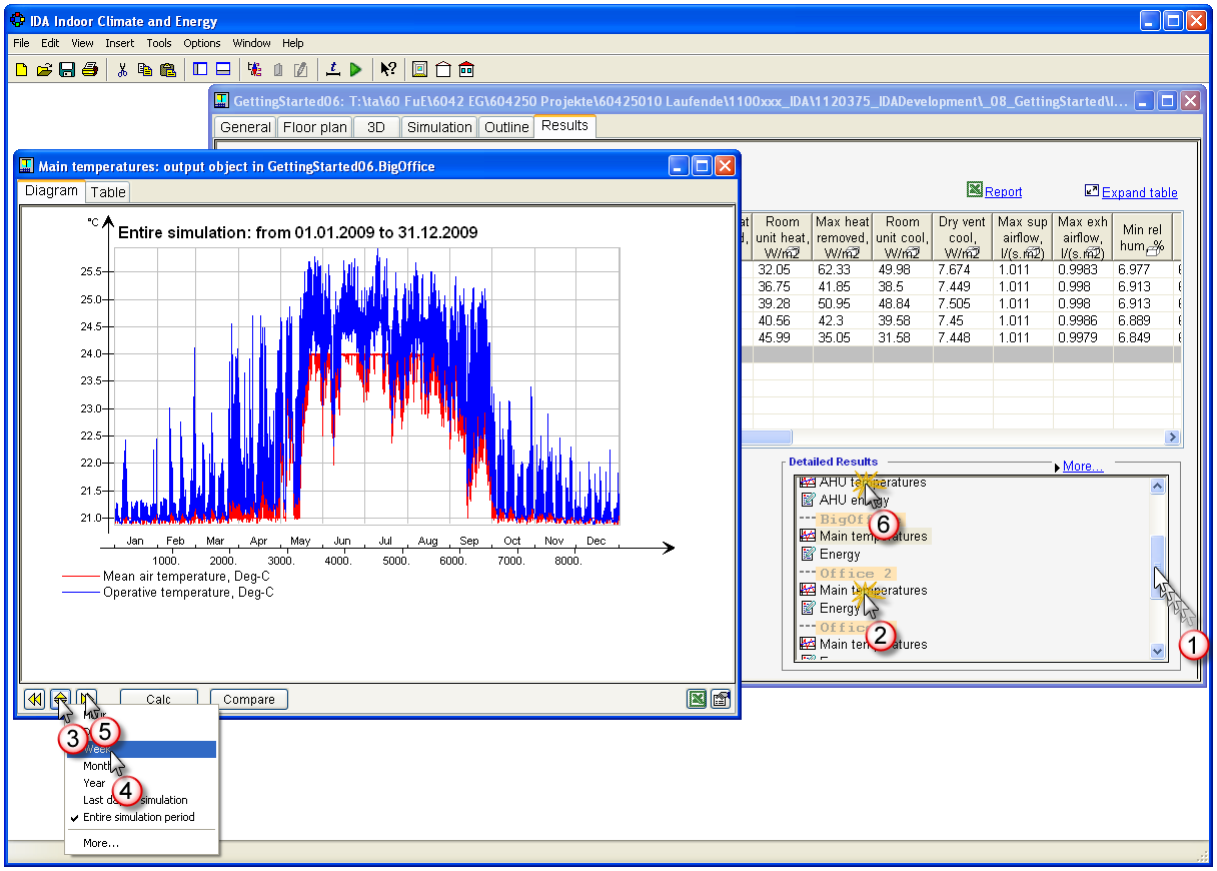
Summary results:

- Min temp: The minimum dry bulb air temperature.
- Max temp: The maximum dry bulb air temperature.
- Min op temp: The minimum operative temperature.
- Max op temp: The maximum operative temperature.
- Max heat supplied: The maximum heat supplied by all air and room units. Note that the unit is relative to floor area.
- Room unit heat: The maximum heat supplied by all room units. Note that the time of this maximum may not coincide with the maximum heating load (The coincident room unit heat load is reported in the Heating design table).
- Max heat removed: The maximum sensible and latent heat removed by all air and room units.
- Room unit cool: The maximum heat removed by all room units.
- Max Dry vent cool: The maximum sensible heat removed by mechanical ventilation.
- Max sup airflow: The maximum mechanical supply air flow rate.
- Max rtn airflow: The maximum mechanical return air flow rate.
- Min rel hum: The minimum relative humidity of the zone air.
- Max rel hum: The maximum relative humidity of the zone air.
- Max CO2: The maximum level of CO_2 concentration of the zone air.

- Max PPD: The maximum percentage of people dissatisfied in the zone (during occupancy.)
- Max age of air: The maximum age of air in the zone (In a steady state situation this equals 1/(fresh air changes per hour).
- Occupancy: The total number of hours with occupancy, i.e. the hours the zone is used irrespective of the number of people in it.
- h of T_op>25: The total number of hours with occupancy and operative temperature > 25°C.
- Occ hours: The total number of occupancy hours (integral of number of occupants, e.g. one hour with 2 occupants is counted as 2 hours).
- PDH: The total hours of people dissatisfied in the zone (integral of number of occupants times PPD), e.g. one hour with 2 occupants and 0.25 % PPDe is counted as 0.5 hours).

NB PDH divided by Occ. hours is a good measure of overall indoor comfort quality for the whole building. It is reported in result reports.

Time Series Diagrams

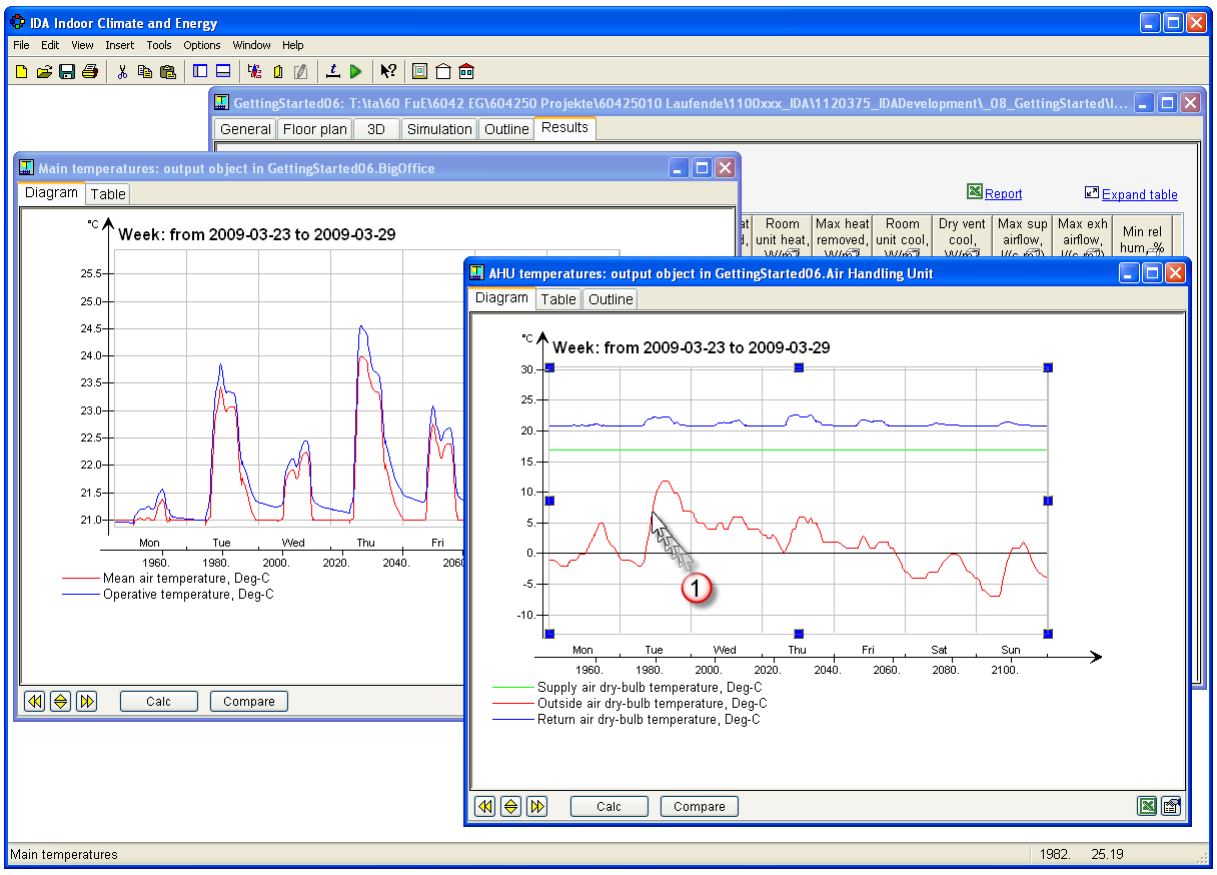


Screenshot 56

1. Scroll down to Office 2 in the list of detailed results
2. Open the main temperatures diagram

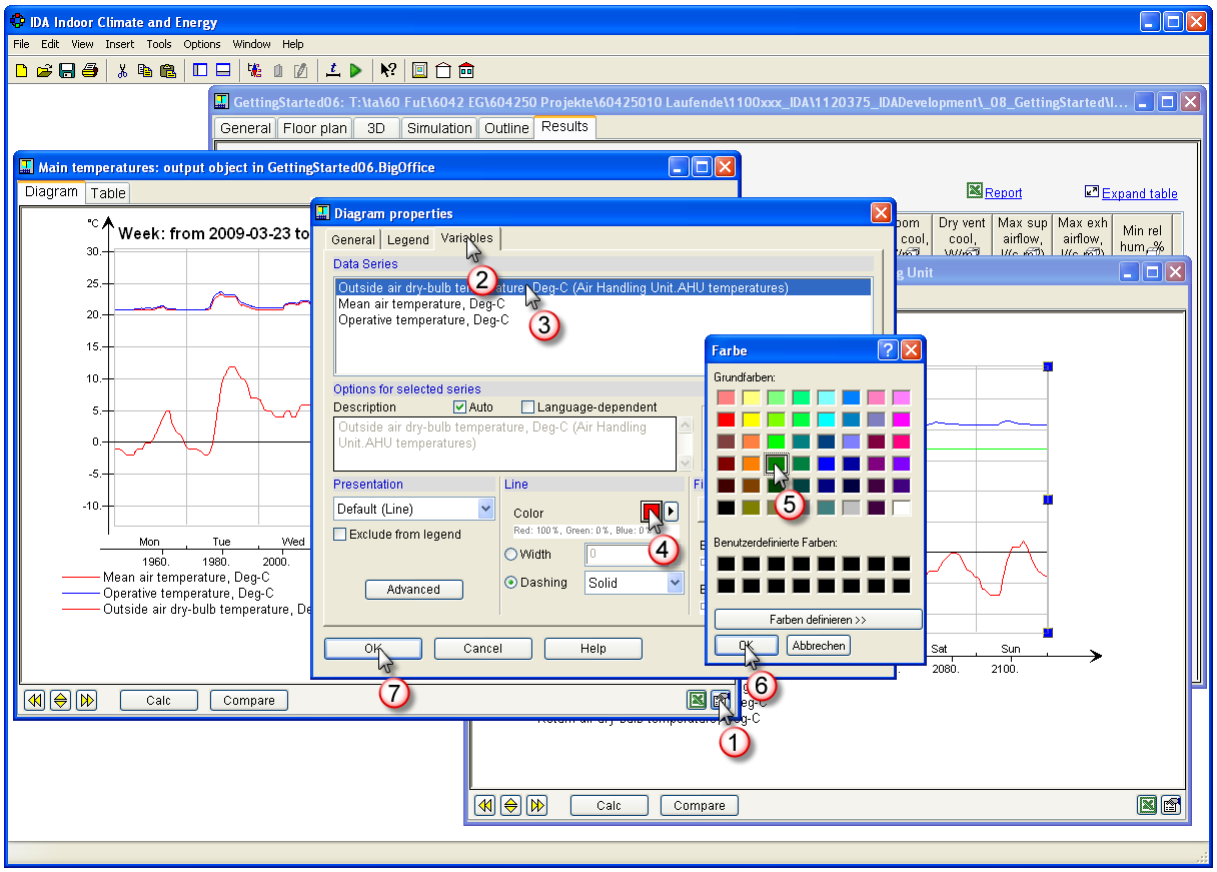
NB The “mean air temperature” is the room air dry bulb temperature of either the well mixed zone or (in case of displacement ventilation) half way between the floor and the ceiling. The “operative temperature” is the average of the air temperature and a radiation temperature. This temperature definition is closer to the human temperature sensation. For the Climate zone model, the operative temperature is measured at the location of the occupant.

3. Change time slice
4. Choose “Week”
5. Step forward from week to week
6. Open the AHU temperatures diagram



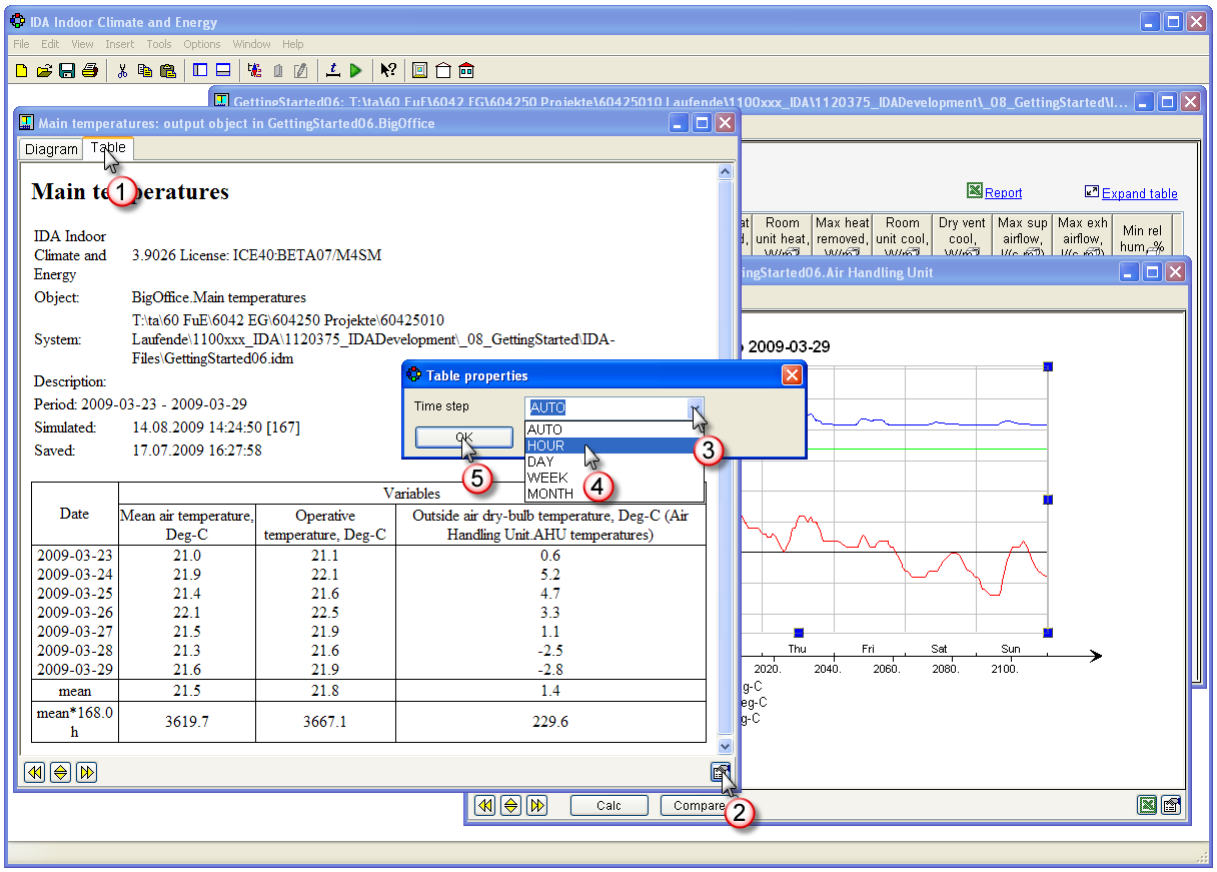
Screenshot 57

1. Drag the outside air temperature curve from the AHU temperature diagram into the room temperature diagram.



Screenshot 58

1. Open diagram properties
2. Go to the Variables tab
3. Choose outside air dry-bulb temperature
4. Change color
5. Choose a new color for the curve
6. Finalize color selection
7. Finalize diagram properties



Date	Variables		
	Mean air temperature, Deg-C	Operative temperature, Deg-C	Outside air dry-bulb temperature, Deg-C (Air Handling Unit.AHU temperatures)
2009-03-23	21.0	21.1	0.6
2009-03-24	21.9	22.1	5.2
2009-03-25	21.4	21.6	4.7
2009-03-26	22.1	22.5	3.3
2009-03-27	21.5	21.9	1.1
2009-03-28	21.3	21.6	-2.5
2009-03-29	21.6	21.9	-2.8
mean	21.5	21.8	1.4
mean*168.0 h	3619.7	3667.1	229.6

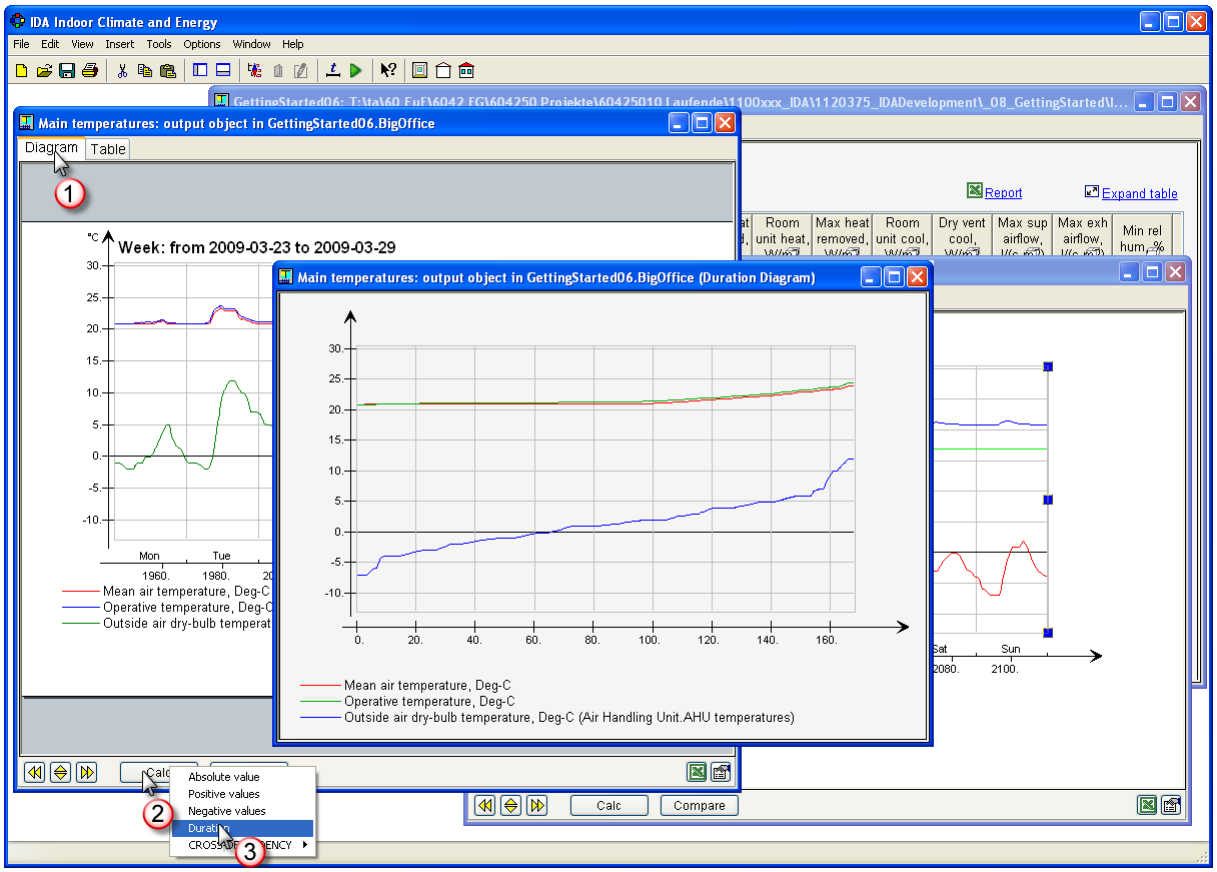
Screenshot 59

1. Go to the table view of the result object
2. Open the table properties
3. Change time resolution
4. Choose “HOUR”

NB The table view of result objects is in html format and therefore can easily be exported as a table e.g. by means of the clipboard.

NB The measured values are integrated over the preceding hour, i.e. they are *not* instantaneous values.

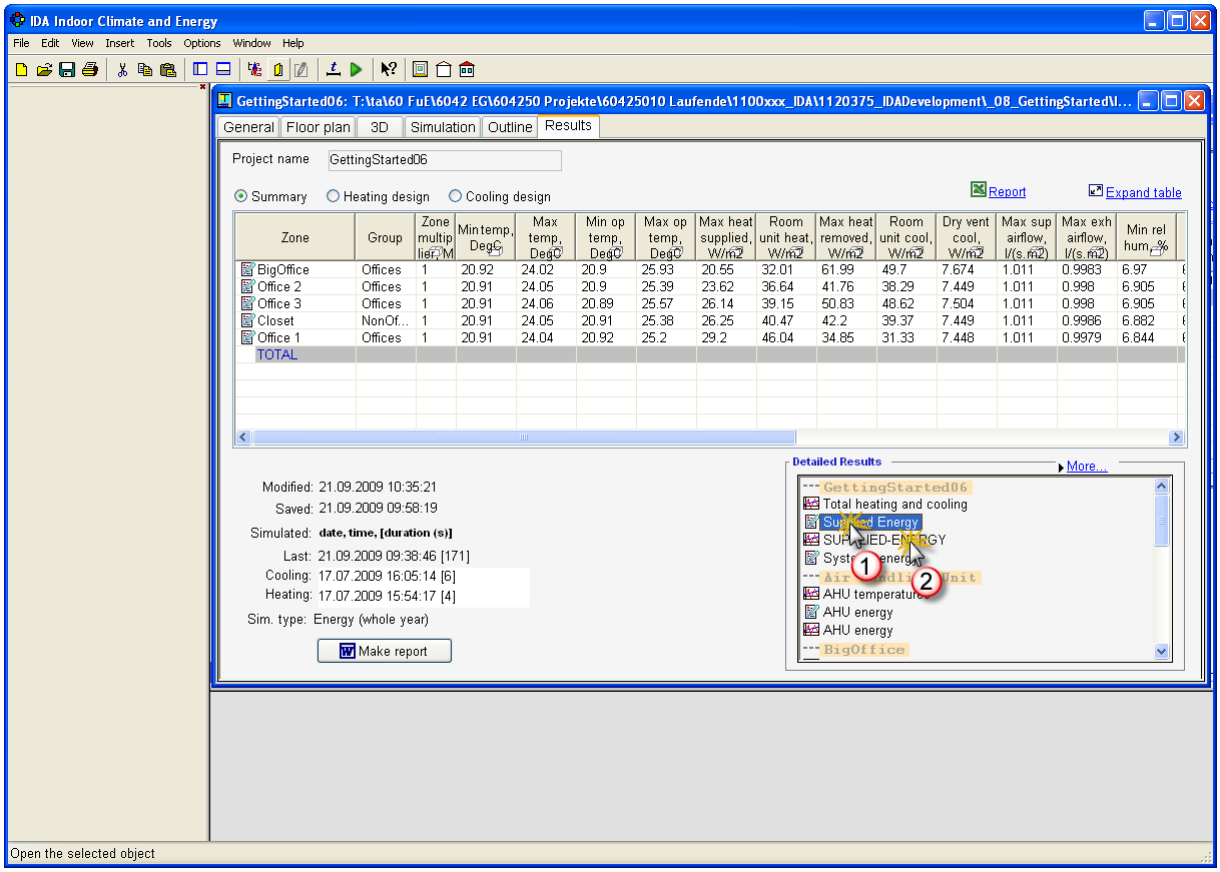
5. Finalize table properties



Screenshot 60

1. Go back to the ***Diagram*** view of the result object
2. Change diagram type
3. Choose duration diagram

19 Supplied Energy Report



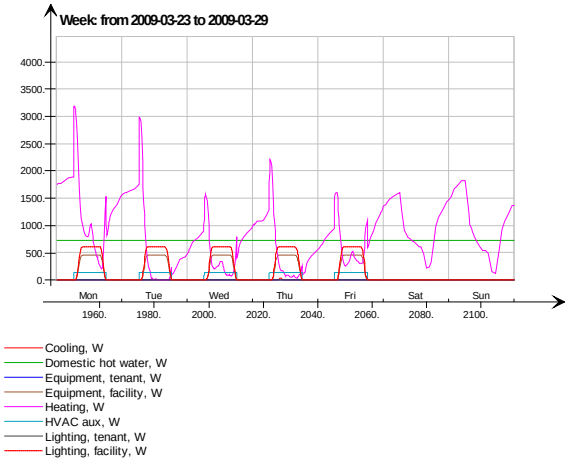
Screenshot 61

① Open the Supplied energy report (report see next page)

NB The structure of the supplied energy report matches defined energy meters. Energy meters can be defined and named by the user. Each energy consuming object such as a piece of office equipment is then tied to an energy meter. In the energy meters, factors for cost, CO_2 emission and primary energy can be defined. Results for these will then be additionally presented in the supplied energy report (not shown in this example).

NB The supplied energy report is in html format and therefore can easily be exported as a table e.g. to Excel by means of the clipboard.

☞ ② Open diagram with logged sources of the supplied energy to see the time evolution of reported quantities:



Supplied Energy Report

EQUA SIMULATION TECHNOLOGY GROUP		Supplied Energy Report	
Project		**Building**	
		Model floor area	85.5 m^2
Customer		Model volume	222.4 m^3
Created by	Sven Moosberger	Model ground area	0.0 m^2
Location	Goteborg/Save	Model external wall area	57.0 m^2
Climate file	Gothenburg, Säve-1977	Window/Wall	24.3 %
Case	GettingStarted06	Average U-value	0.3883 W/(K·m^2)
Simulated	21.09.2009 09:38:46	Envelope area per Volume	0.7032 m^2/m^3

Building Comfort Reference

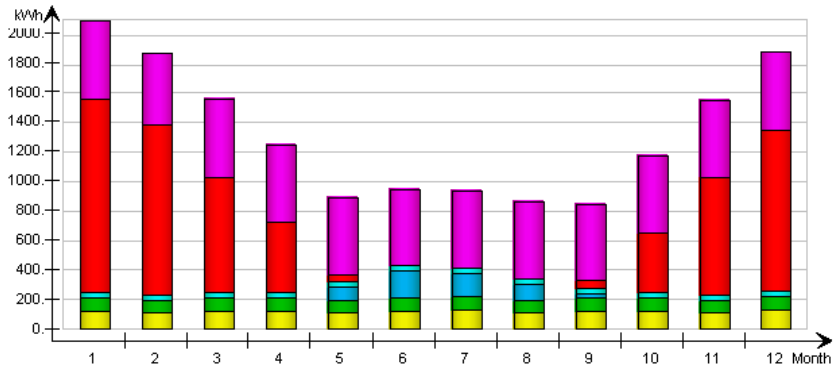
Percentage of hours when operative temperature is above 27°C in worst zone	0 %
Percentage of hours when operative temperature is above 27°C in average zone	0 %
Percentage of total occupant hours with thermal dissatisfaction	26 %

Supplied Energy Overview

		Meter energy	
		kWh	kWh / m^2
	Lighting, facility	1418	16.6
	Equipment, facility	1063	12.4
	Cooling	579	6.8
	HVAC aux	441	5.2
	Total, Facility electric	3501	40.9
	Heating	6158	72.0
	Domestic hot water	6313	73.8
	Total, Facility fuel*	12471	145.8
	Total	15972	186.7

*heating value

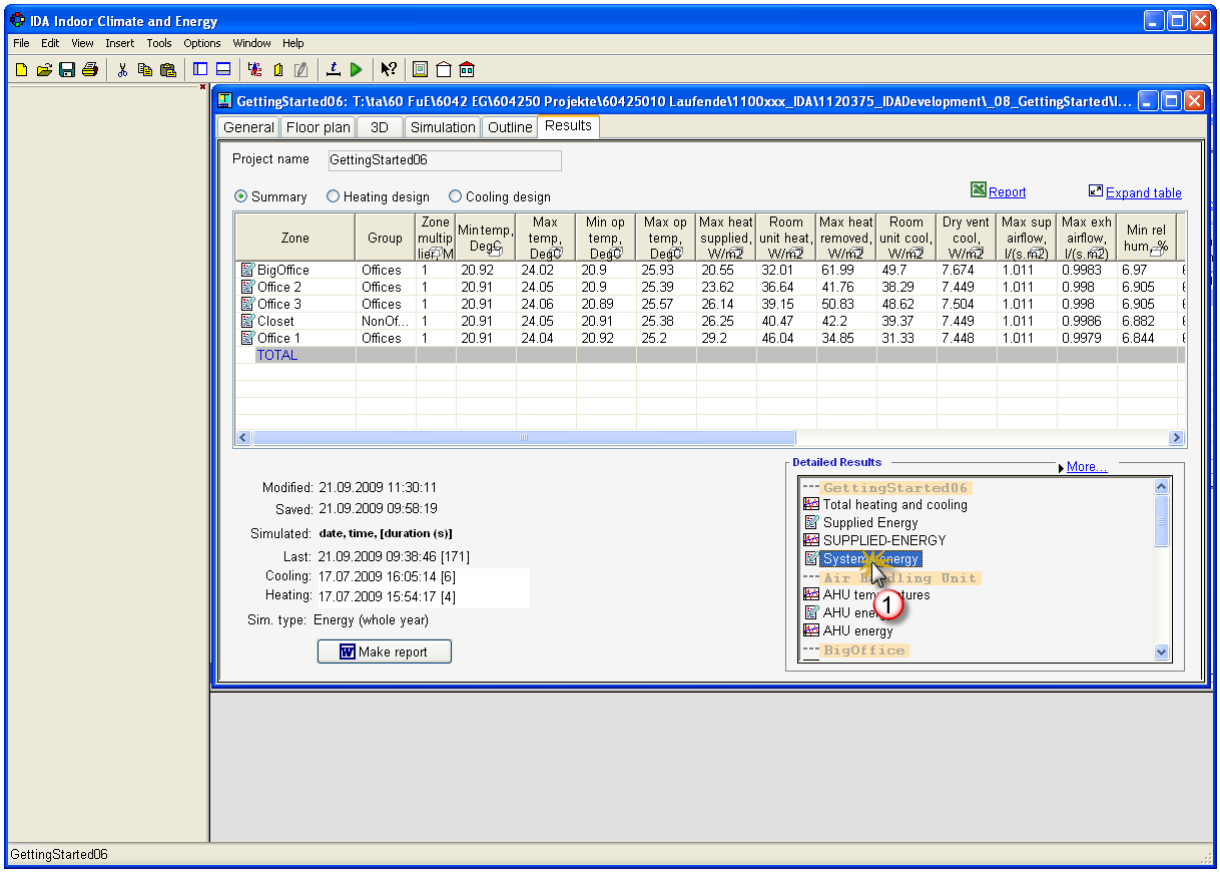
Monthly Meter Energy



Month	Facility electric				Facility fuel (heating value)	
	Lighting, facility	Equipment, facility	Cooling	HVAC aux	Heating	Domestic hot water
	(kWh)	(kWh)	(kWh)	(kWh)	(kWh)	(kWh)
1	119.5	89.6	0.0	36.8	1317.0	536.2
2	108.6	81.5	0.0	33.5	1161.0	484.3
3	119.5	89.6	0.0	37.0	788.1	536.2
4	119.5	89.6	0.9	37.0	481.4	518.9
5	114.1	85.5	95.4	35.6	47.1	536.2
6	119.5	89.6	183.5	37.7	0.0	518.9
7	124.9	93.7	156.9	39.3	0.0	536.2
8	114.1	85.6	109.9	35.9	0.0	536.2
9	119.5	89.6	31.9	37.3	52.0	518.9
10	119.5	89.6	0.0	37.1	404.1	536.2
11	114.0	85.5	0.0	35.3	810.0	518.9
12	124.9	93.7	0.0	38.6	1097.0	536.2
Total	1417.6	1063.2	578.5	440.9	6157.7	6313.3

20 System, AHU Energy Report and Zone Energy Reports

Systems Energy Report



Screenshot 62

1 Open Systems energy report (report see next page)

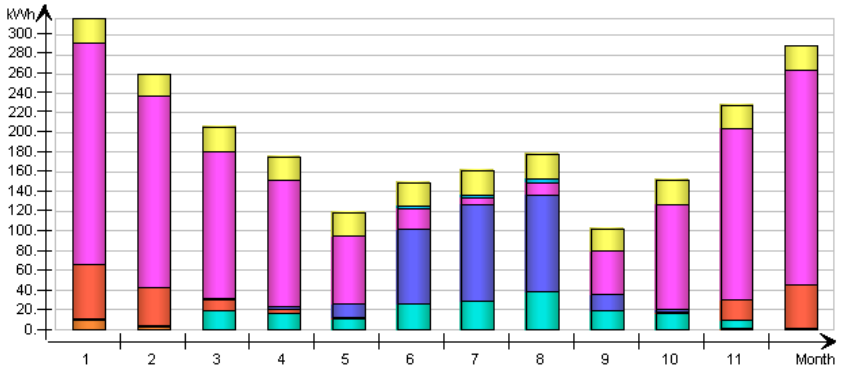
NB The system energy report provides an overview of all HVAC systems. This report also shows distribution losses from the various systems. As we did not define distribution losses, they are all set to zero in this example. Press F1 to read more about the details in the report in the help texts.

NB A user defined part of the distribution losses will count as heat loads to the zones and appear in the zone energy balance under net losses.

Systems energy report

EQUA SIMULATION TECHNOLOGY GROUP		Systems energy (sensible and latent)	
Project		**Building**	
		Model floor area	10.0 m^2
Customer		Model volume	26.0 m^3
Created by	Moosberger Sven HSLU T&A	Model ground area	0.0 m^2
Location	Kalmar	Model external wall area	5.0 m^2
Climate file	Lucerne	Window/Wall	30.0 %
Case	building2	Average U-value	0.8748 W/(K·m^2)
Simulated	21.09.2009 10:40:47	Envelope area per Volume	0.25 m^2/m^3

Month	Zone heating	Zone cooling	AHU heating	AHU cooling	Heat re-covery	Cold re-covery	Humidi-fication	Fans	Pumps	Dom. hot water
1	9.2	1.0	54.6	0.0	226.3	0.0	0.0	24.3	0.0	0.0
2	2.5	1.1	39.1	0.0	195.8	0.0	0.0	22.0	0.0	0.0
3	0.0	19.5	10.7	0.9	149.8	0.1	0.0	24.5	0.0	0.0
4	0.0	16.6	3.6	2.9	129.9	0.1	0.0	23.7	0.0	0.0
5	0.0	11.3	1.6	14.4	69.4	0.2	0.0	24.6	0.1	0.0
6	0.0	26.4	0.0	76.0	21.6	2.3	0.0	23.9	0.2	0.0
7	0.0	29.6	0.0	99.0	6.8	3.1	0.0	24.7	0.3	0.0
8	0.0	38.1	0.0	99.5	12.9	4.6	0.0	24.7	0.3	0.0
9	0.0	19.6	0.0	17.1	43.7	0.2	0.0	23.9	0.1	0.0
10	0.0	16.4	0.7	2.4	107.7	0.1	0.0	24.6	0.0	0.0
11	1.0	8.3	21.4	0.0	174.8	0.0	0.0	23.6	0.0	0.0
12	1.4	0.0	44.2	0.0	219.2	0.0	0.0	24.3	0.0	0.0
Total	**14.0**	**187.9**	**175.8**	**312.1**	**1357.8**	**10.7**	**0.0**	**288.9**	**1.1**	**0.0**



Distribution losses

Month	Domestic hot water circuit	Heating	Cooling*	Air ducts*
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**

*positive loss when conduit is cooler than building

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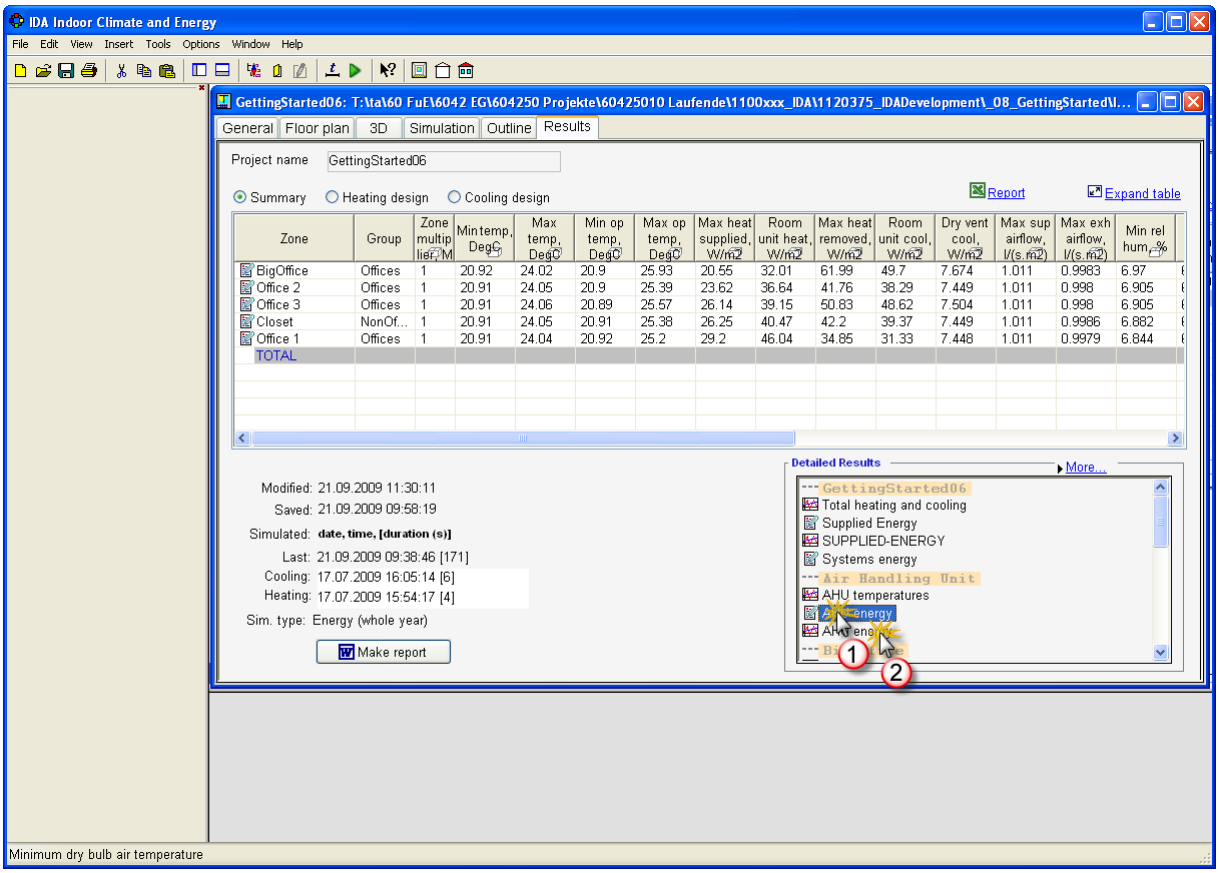
AHU Energy Report

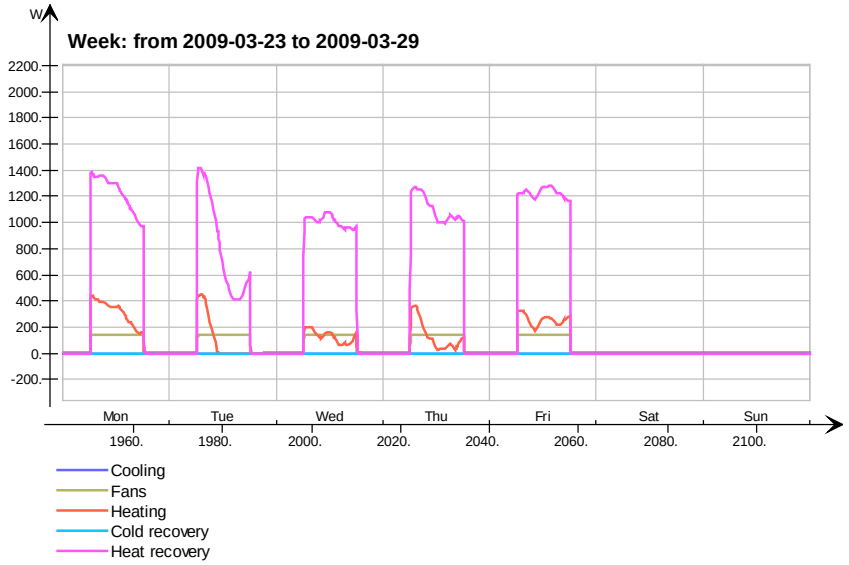


Screenshot 63

1 Open AHU energy report (report see next page)

NB These reports show the energy flows of each AHU.

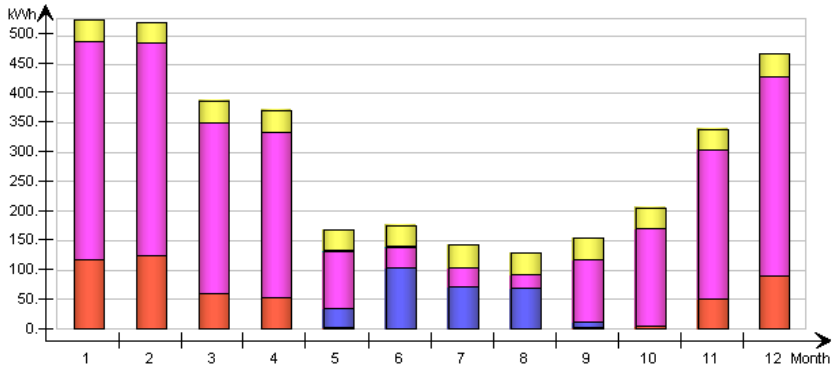
☞ 2 Open diagram with logged sources of AHU energy to see more details:



AHU energy report

EQUA SIMULATION TECHNOLOGY GROUP		Energy report for "Air Handling Unit"	
Project		**Building**	
		Model floor area	85.5 m^2
Customer		Model volume	222.4 m^3
Created by	Sven Moosberger	Model ground area	0.0 m^2
Location	Goteborg/Save	Model external wall area	57.0 m^2
Climate file	Gothenburg, Säve-1977	Window/Wall	24.3 %
Case	GettingStarted06	Average U-value	0.3883 W/(K·m^2)
Simulated	21.09.2009 09:38:46	Envelope area per Volume	0.7032 m^2/m^3

Month	Heating	Cooling	Heat re-covery	Cold recovery	Humidi-fication	Fans
1	118.2	0.0	371.7	0.0	0.0	36.8
2	123.2	0.0	362.5	0.0	0.0	33.4
3	58.7	0.0	291.4	0.0	0.0	36.9
4	51.8	0.0	282.0	0.0	0.0	36.9
5	2.8	33.1	97.4	1.7	0.0	35.5
6	0.0	104.2	35.5	1.9	0.0	37.4
7	0.0	70.2	31.3	0.9	0.0	39.1
8	0.0	69.0	22.1	0.1	0.0	35.7
9	3.1	9.6	105.0	0.0	0.0	37.2
10	4.8	0.0	165.6	0.0	0.0	37.1
11	50.2	0.0	256.4	0.0	0.0	35.3
12	90.0	0.0	340.2	0.0	0.0	38.5
Total	**502.8**	**286.2**	**2361.1**	**4.6**	**0.0**	**439.7**



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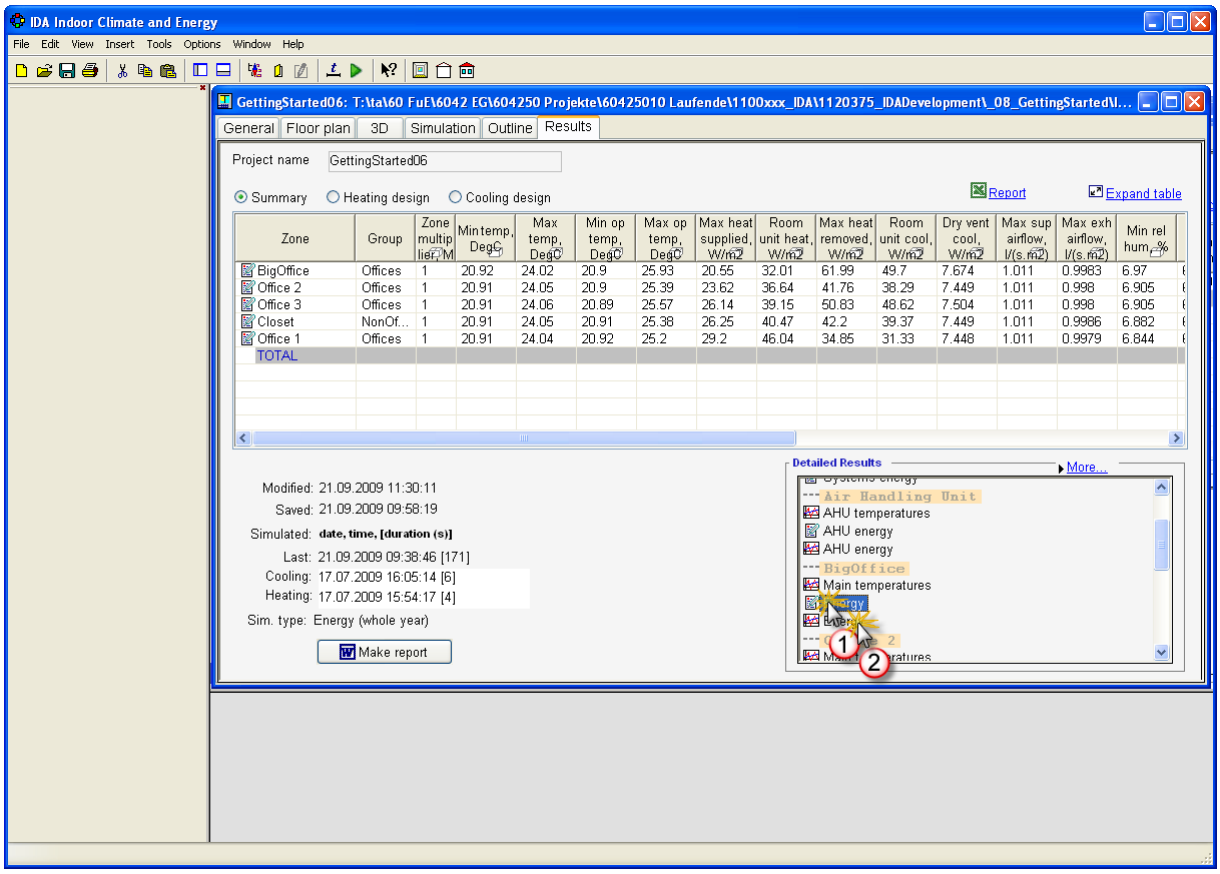
Zone Energy Report



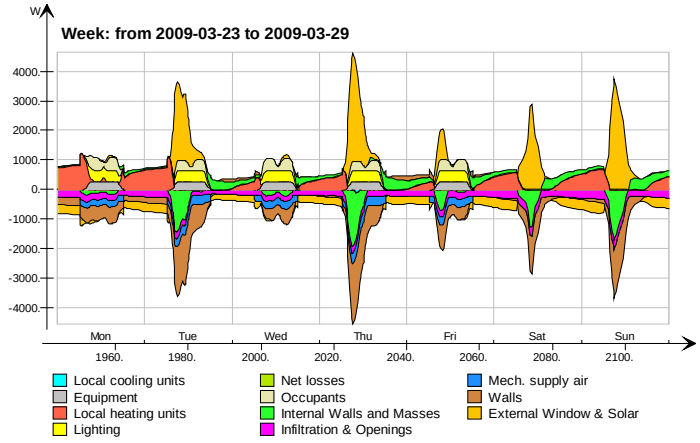
Screenshot 64

1 Open zone energy report (report see next page)

NB These reports show the sensible heat balance of each zone. The solar contribution from windows is combined with window transmission losses ("External Window & Solar").

NB The "during heating" and "during cooling" categories (information about *when* a heat flux occurs) are determined on a zone by zone basis. Press F1 to read more about this in the help texts.

☞ 2 Open diagram with logged sources of zone energy to see more details:

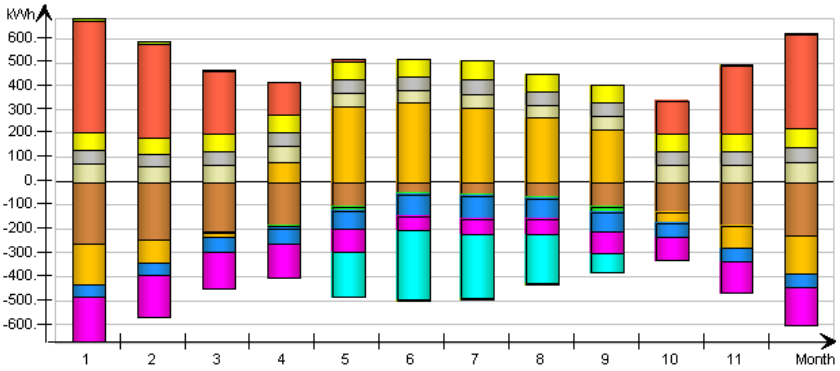


NB Only sensible heat is reported here. The heat balance diagram reports total (wet and dry) heat.

Zone energy report

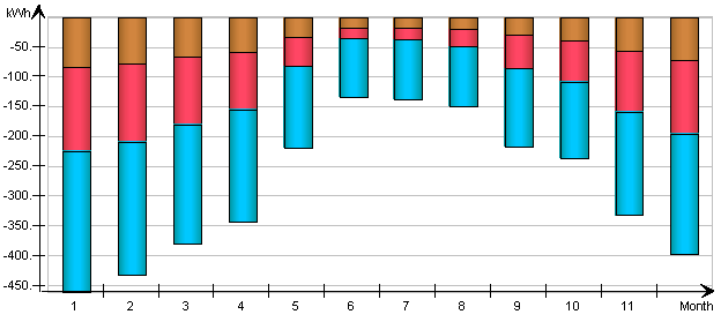
EQUA SIMULATION TECHNOLOGY GROUP		Energy for "BigOffice" (sensible only)	
Project		**Building**	
		Model floor area	85.5 m^2
Customer		Model volume	222.4 m^3
Created by	Sven Moosberger	Model ground area	0.0 m^2
Location	Goteborg/Save	Model external wall area	57.0 m^2
Climate file	Gothenburg, Säve-1977	Window/Wall	24.3 %
Case	GettingStarted06	Average U-value	0.3883 W/(K·m^2)
Simulated	21.09.2009 09:38:46	Envelope area per Volume	0.7032 m^2/m^3

Month	Envelope & Cold bridges	Internal Walls and Masses	External Window & Solar	Mech. supply air	Infiltration & Openings	Occu-pants	Equip-ment	Lighting	Local heating units	Local cooling units	Net losses
1	-263.9	-0.9	-170.8	-54.7	-188.6	77.6	55.1	73.5	465.5	0.0	8.5
2	-245.2	-3.7	-100.3	-51.8	-177.6	68.7	50.1	66.8	387.7	0.0	7.1
3	-212.4	-7.7	-21.3	-62.4	-156.6	72.7	55.1	73.5	258.0	-0.1	3.5
4	-184.1	-11.5	85.1	-69.2	-144.4	68.4	55.1	73.5	132.9	-2.7	0.1
5	-102.6	-17.6	317.3	-83.3	-98.3	52.0	52.6	70.2	8.6	-189.4	-4.9
6	-47.3	-6.5	333.9	-92.7	-65.0	50.2	55.1	73.5	-0.0	-293.9	-6.2
7	-51.7	-5.2	312.2	-96.4	-67.7	53.2	57.6	76.8	0.0	-269.6	-6.4
8	-62.1	-9.3	269.1	-87.6	-68.6	49.8	52.6	70.2	0.0	-206.6	-5.8
9	-103.8	-22.8	217.1	-88.0	-95.8	56.4	55.1	73.5	0.1	-83.7	-4.8
10	-128.1	-1.7	-45.9	-63.4	-97.8	73.1	55.1	73.5	136.7	-0.0	0.1
11	-186.6	-3.0	-96.6	-56.3	-135.0	71.8	52.6	70.2	280.2	0.0	4.1
12	-229.9	-1.2	-160.0	-57.3	-160.1	81.4	57.6	76.8	387.6	0.0	6.3
Total	-1817.7	-91.0	939.8	-863.1	-1455.5	775.3	654.1	872.0	2057.3	-1045.9	1.5
During heating	-1073.3	141.6	-844.2	-294.2	-991.4	366.7	260.4	346.9	2057.2	0.0	36.8
During cooling	-520.3	-203.6	1629.4	-424.7	-291.1	259.0	274.3	365.8	0.0	-1045.8	-27.4
Rest of time	-224.1	-29.0	154.6	-144.2	-173.0	149.6	119.4	159.3	0.1	-0.1	-7.9



Envelope transmission

Month	Walls	Roof	Floor	Windows
1	-82.8	-141.3	0.0	-237.3
2	-76.6	-131.1	0.0	-223.7
3	-66.3	-113.1	0.0	-200.4
4	-57.3	-96.4	0.0	-188.7
5	-33.4	-48.6	0.0	-136.1
6	-17.2	-16.5	0.0	-98.2
7	-17.5	-20.0	0.0	-100.8
8	-19.1	-28.7	0.0	-99.9
9	-28.6	-55.2	0.0	-131.5
10	-39.1	-68.5	0.0	-128.2
11	-56.7	-101.4	0.0	-172.9
12	-72.0	-124.3	0.0	-202.3
Total	-566.5	-945.2	0.0	-1920.0
During heating	-332.8	0.0	0.5	-1261.9
During cooling	-169.9	0.0	0.3	-428.6
Rest of time	-63.8	-945.2	-0.8	-229.5



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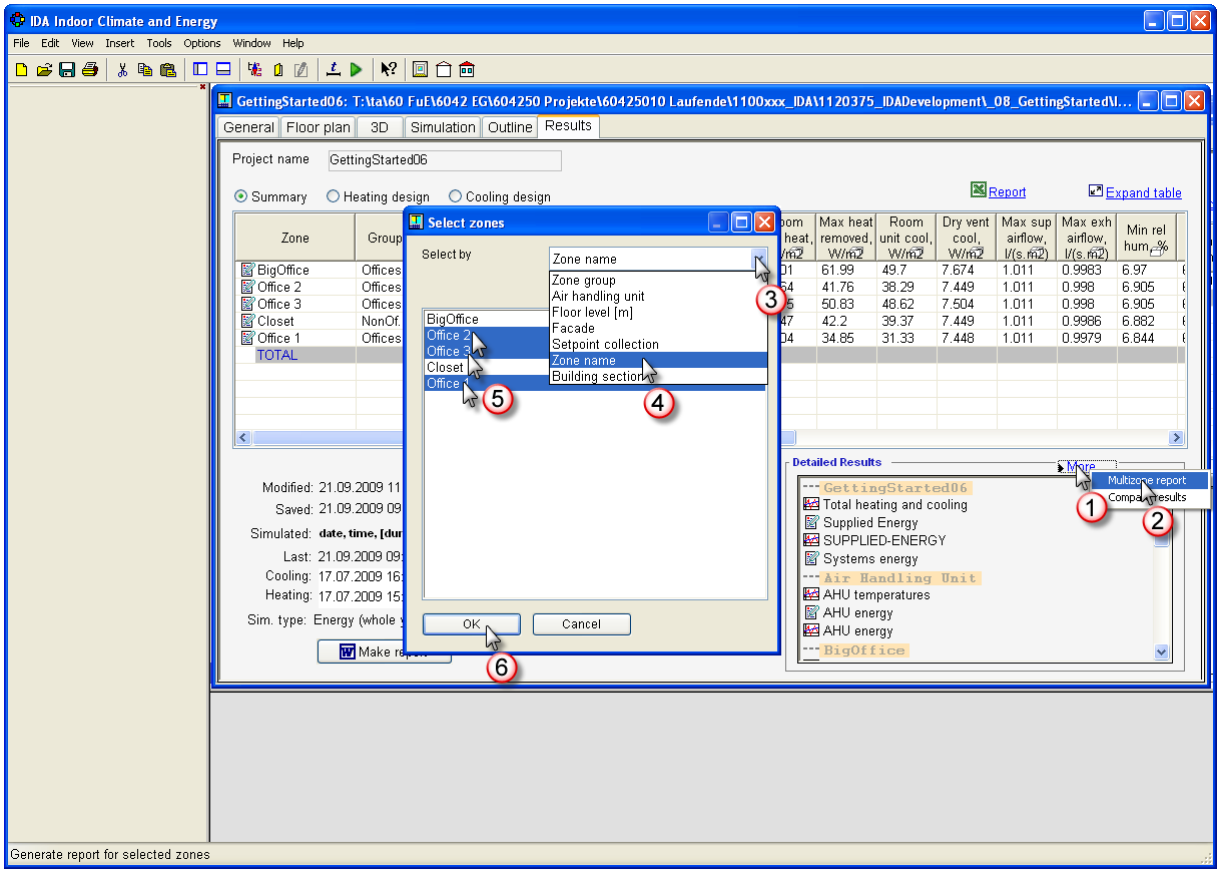
21 More... reports

Multizone Report



Screenshot 65

1. Go to “More...” reports
2. Choose “Multizone report”
3. Select criterion for zone selection
4. Choose “Zone name”
5. Select zones to be included
6. Generate the multizone report (report see next page)

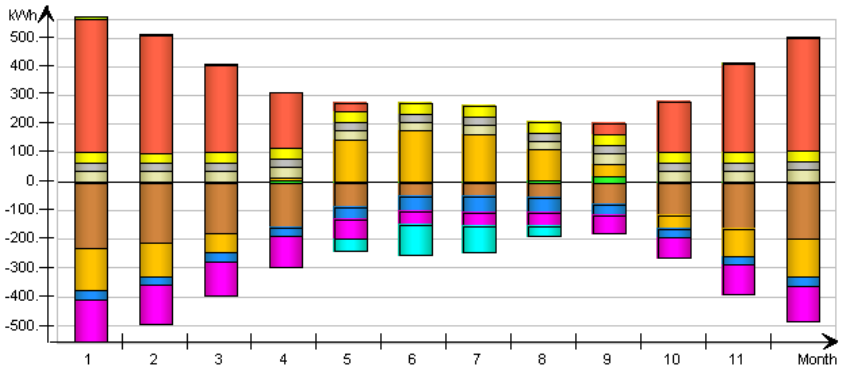
NB The multizone report shows the combined zone energy report for an arbitrary collection of zones (including the whole building if all zones are selected).

Multizone report

EQUA SIMULATION TECHNOLOGY GROUP		Energy for multiple zones (sensible only)	
Project		**Building**	
		Model floor area	85.5 m^2
Customer		Model volume	222.4 m^3
Created by	Sven Moosberger	Model ground area	0.0 m^2
Location	Goteborg/Save	Model external wall area	57.0 m^2
Climate file	Gothenburg, Säve-1977	Window/Wall	24.3 %
Case	GettingStarted06	Average U-value	0.3883 W/(K·m^2)
Simulated	21.09.2009 09:38:46	Envelope area per Volume	0.7032 m^2/m^3

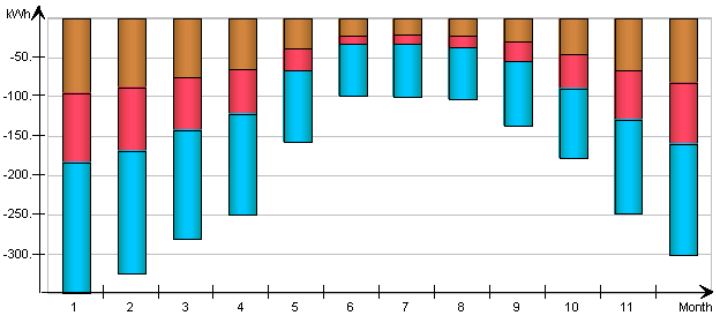
Zone(s) Office 2, Office 3, Office 1

Month	Envelope & Cold bridges	Internal Walls and Masses	External Window & Solar	Mech. supply air	Infiltration & Openings	Occu-pants	Equip-ment	Lighting	Local heating units	Local cooling units	Net losses
1	-231.0	1.4	-150.1	-33.2	-146.8	37.4	26.0	34.7	456.6	0.0	5.3
2	-213.3	2.0	-119.7	-30.1	-137.9	33.8	23.7	31.6	405.9	0.0	4.4
3	-181.9	4.0	-67.6	-33.3	-120.4	36.9	26.0	34.7	299.8	0.0	2.2
4	-156.6	5.4	6.9	-34.4	-109.8	36.2	26.1	34.7	192.1	-0.0	0.1
5	-88.5	3.6	141.1	-45.5	-72.8	29.2	24.9	33.2	25.2	-46.3	-3.0
6	-48.5	2.6	177.8	-55.6	-49.2	27.2	26.0	34.7	0.0	-111.7	-3.9
7	-48.4	4.2	161.2	-57.6	-51.1	28.8	27.2	36.3	-0.0	-96.1	-4.0
8	-53.4	7.5	106.2	-51.7	-50.8	27.0	24.9	33.2	-0.0	-38.7	-3.6
9	-76.2	20.1	37.9	-41.2	-66.1	33.3	26.1	34.7	36.7	-1.8	-3.0
10	-113.9	4.4	-49.5	-33.7	-74.7	36.9	26.1	34.7	169.9	0.0	0.1
11	-162.9	2.5	-102.4	-31.6	-104.3	35.6	24.9	33.1	302.9	0.0	2.5
12	-200.1	1.1	-134.8	-34.7	-124.5	39.1	27.2	36.3	386.7	0.0	4.0
Total	-1574.6	58.8	7.2	-482.5	-1108.4	401.5	309.1	412.0	2275.8	-294.6	0.9
During heating	-1270.6	80.9	-678.7	-249.0	-887.6	270.5	190.4	253.9	2275.9	0.0	17.6
During cooling	-231.4	-50.1	595.3	-167.8	-124.9	88.7	84.7	113.1	0.0	-294.7	-11.5
Rest of time	-72.6	28.0	90.6	-65.7	-95.9	42.3	34.0	45.0	-0.1	0.1	-5.2



Envelope transmission

Month	Walls	Roof	Floor	Windows
1	-94.2	-87.8	0.0	-167.1
2	-87.3	-80.1	0.0	-156.8
3	-74.4	-67.5	0.0	-138.9
4	-63.7	-56.4	0.0	-129.2
5	-37.3	-27.1	0.0	-90.6
6	-21.6	-10.6	0.0	-66.1
7	-20.6	-11.0	0.0	-67.8
8	-21.7	-15.0	0.0	-66.0
9	-29.0	-25.3	0.0	-81.5
10	-45.8	-43.4	0.0	-88.1
11	-65.5	-62.8	0.0	-120.4
12	-81.6	-77.1	0.0	-142.3
Total	-642.6	-564.1	0.0	-1314.6
During heating	-514.0	0.0	0.5	-1018.6
During cooling	-103.8	0.0	0.0	-180.9
Rest of time	-24.8	-564.1	-0.5	-115.1



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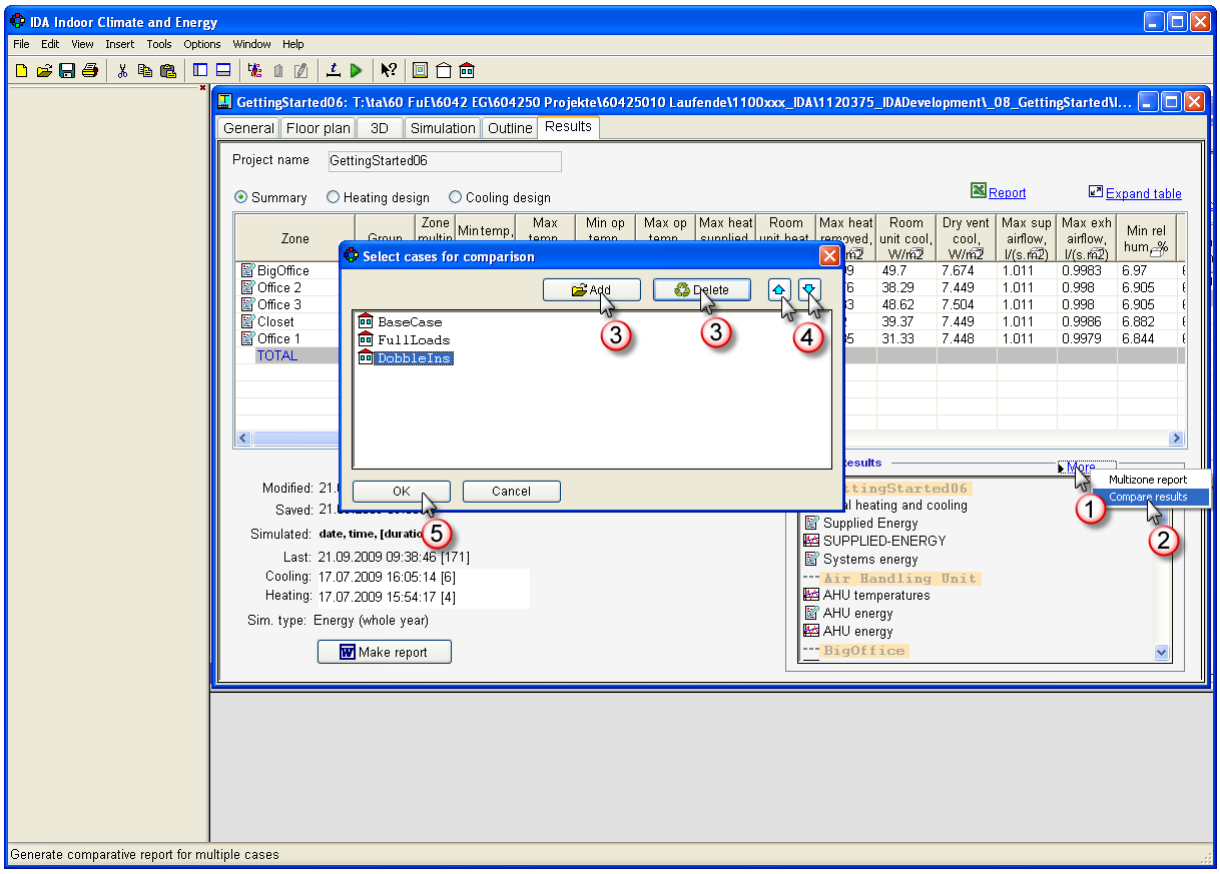
Compare Results Report



Screenshot 66

NB For this report, first make changes in your model and save as separate IDA project files. Use short file names which preferably display your model version in the first 9 characters, as only the first 9 characters of the file names are shown in the report. If needed, the program will add some characters to the file names to make them unique.

1. Go to “More...” reports
2. Choose “Compare results”
3. Add cases to be compared and delete cases out of your interest
4. Sort your cases in the order you want to have them in the report
5. Release the compare results report (report see next page)

Compare results report

EQUA SIMULATION TECHNOLOGY GROUP		Comparative Report	
Project			
Customer		Simulated	21.09.2009 15:25:11

Simulated cases

BaseCase	
FullLoads	
DobbleIns	

Comfort Reference

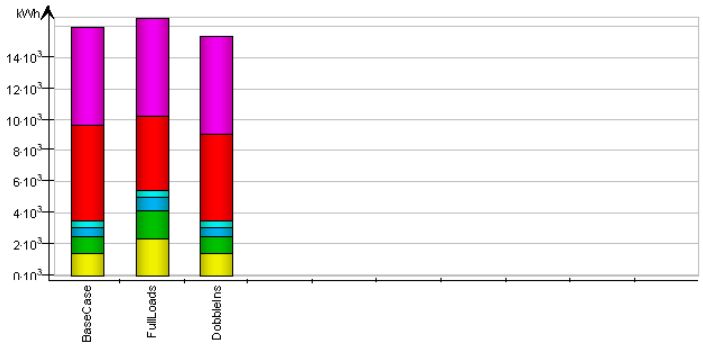
	BaseCase	FullLoads	DobbleIns
Percentage of hours when operative temperature is above 27°C in worst zone	0	0	0
Percentage of hours when operative temperature is above 27°C in average zone	0	0	0
Percentage of total occupant hours with thermal dissatisfaction	23	17	23

Best comfort per metered energy: FullLoads

Supplied Energy: Meter Energy

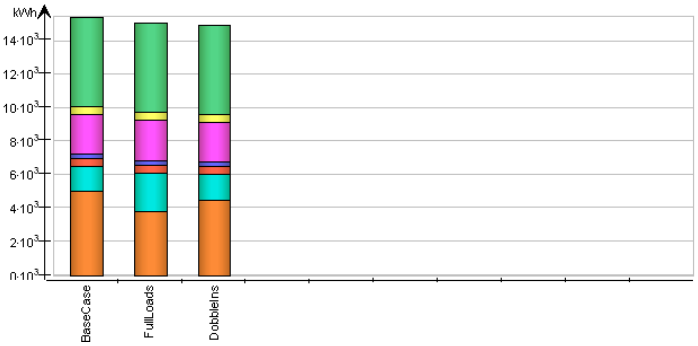
		BaseCase		FullLoads		DobbleIns	
		kWh	kWh / m²	kWh	kWh / m²	kWh	kWh / m²
	Lighting, facility	1418	16.6	2362	27.6	1417	16.6
	Equipment, facility	1063	12.4	1771	20.7	1063	12.4
	Cooling	579	6.8	858	10.0	604	7.1
	HVAC aux	441	5.2	441	5.2	441	5.2
	Total, Facility electric	3501	40.9	5432	63.5	3525	41.2
	Heating	6158	72.0	4779	55.9	5587	65.3
	Domestic hot water	6313	73.8	6313	73.8	6313	73.8
	Total, Facility fuel*	12471	145.8	11092	129.7	11900	139.1
	Total	15972	186.7	16524	193.2	15425	180.3

*heating value



Systems energy (sensible and latent)

Case	Zone heating	Zone cooling	AHU heating	AHU cooling	Heat re-covery	Cold recovery	Humidi-fication	Fans	Pumps	Dom. hot water
BaseCase	5038.9	1449.5	502.8	286.2	2361.1	4.6	0.0	439.7	1.3	5307.5
FullLoads	3849.9	2286.9	451.2	286.8	2411.5	4.5	0.0	439.6	1.2	5307.5
DobbleIns	4528.7	1527.0	499.7	285.9	2363.8	4.6	0.0	439.7	1.2	5307.5

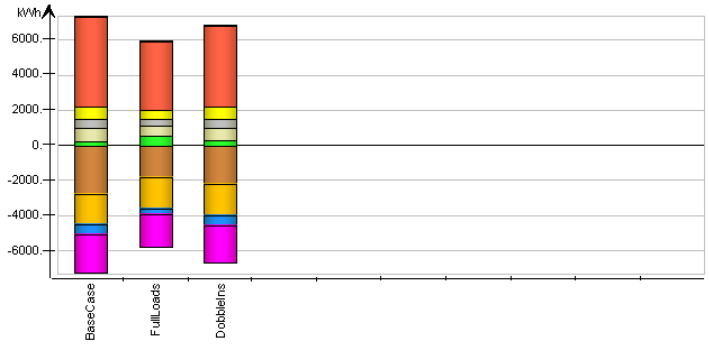


Energy for all zones (sensible only)

During heating

kWh

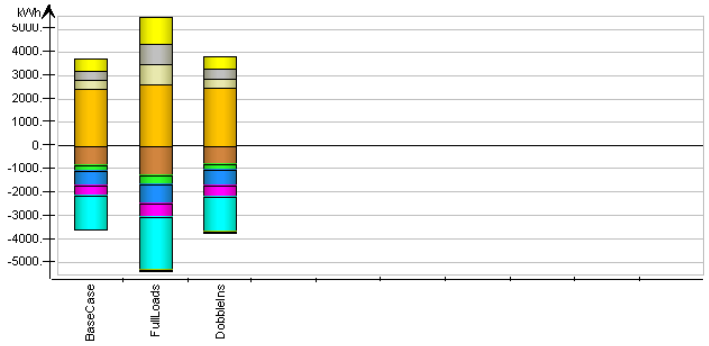
Case	Envelope & Cold bridg.	Int. Walls & Masses	Ext Wind & Solar	Mech. supply air	Infiltr. & Openings	Occupants	Equipment	Lighting	Local heating units	Local cooling units	Net losses
BaseCase	-2735.8	256.0	-1747.1	-622.6	-2155.6	723.7	511.5	681.8	5038.9	0.0	60.2
FullLoads	-1812.1	552.1	-1798.9	-372.0	-1865.4	529.2	372.8	496.9	3849.9	0.0	51.4
DobbleIns	-2165.2	261.9	-1776.9	-603.5	-2124.6	692.1	491.2	654.8	4528.6	0.0	51.2



During cooling

kWh

Case	Envelope & Cold bridg.	Int. Walls & Masses	Ext Wind & Solar	Mech. supply air	Infiltr. & Openings	Occupants	Equipment	Lighting	Local heating units	Local cooling units	Net losses
BaseCase	-832.8	-262.2	2435.6	-652.5	-464.4	378.9	388.9	518.8	0.0	-1449.5	-43.0
FullLoads	-1285.4	-413.5	2646.9	-854.5	-607.4	843.7	866.2	1154.8	0.0	-2286.7	-55.9
DobbleIns	-772.2	-244.2	2459.6	-674.1	-498.4	387.4	399.2	532.3	0.0	-1527.0	-44.6



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