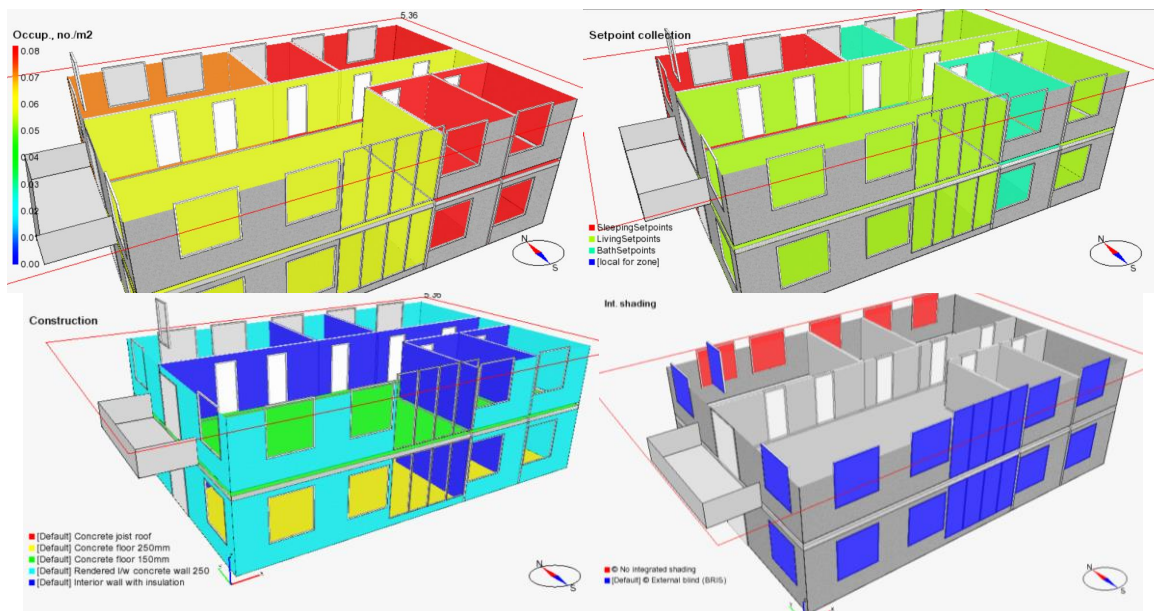


IDA Indoor Climate and Energy

Basic Course

GET MORE EXPERIENCED WITH IDA ICE

Guide



Purpose

This is the first part of the IDA ICE basic course 2, where you get more experienced with the IDA ICE standard level. You learn how to efficiently enter all data of a simulation project and how to quality check your input. During this guided exercise, we go through the following tasks:

- IDA ICE database and project resources
- More use of the input tables
- IDA ICE installation folder, private folder, common folder
- Use your own defaults
- Energy meters

This exercise requires the preceding guided exercises of the IDA ICE basic course 1: "Indoor Climate of a single zone", "Power demand for multiple zones" and "Annual energy simulation of a whole building" step 1-4.

Background

A professional building modeler needs a simulation software which enables him to efficiently setup a building performance simulation model of any required level of detail. Hereby, the manpower time spent has to correspond with the quality of the results. The requirements to the software can be contradictory:

- We want to get accurate results very quickly
- We want to be flexible without risks of wrong input
- It has to be very easy to get detailed models

In order to fulfill these requirements, IDA ICE provides many efficiency features. The better the user knows them, the better they help him. But they do not free him from understanding both the building, its model and the results of it.

Instructions

In this exercise we will reuse a part of the input of some building models of earlier IDA ICE lessons, as well as use a readymade whole building model to go through some of the most important efficiency features of IDA ICE.

Step 1

IDA ICE database and project resources

- a. Open *Energy-guide-04.idm*. Open  [Defaults](#) and then  [Glazing](#). Click “Save as...” and save as “Glazing from basic course”. Click “OK”.

Note: IDA ICE works with data objects (= objects with a set of input data). One object type is “glazing”. Our simulation project had such an object called “Glazing” as project resource. The default glazing was on this resource. By opening and resaving it with the new name “Glazing from basic course” we copied this resource and changed default glazing from “Glazing” to “Glazing from basic course”. Our project has now (at least) two glazing objects in its resources. You can click on  in the shortcut bar to find them in the resource list. This means that any glazing in our project can take its parameters from one of these data objects. If there is a glazing without specified parameters, IDA ICE will take the parameters from the default glazing.

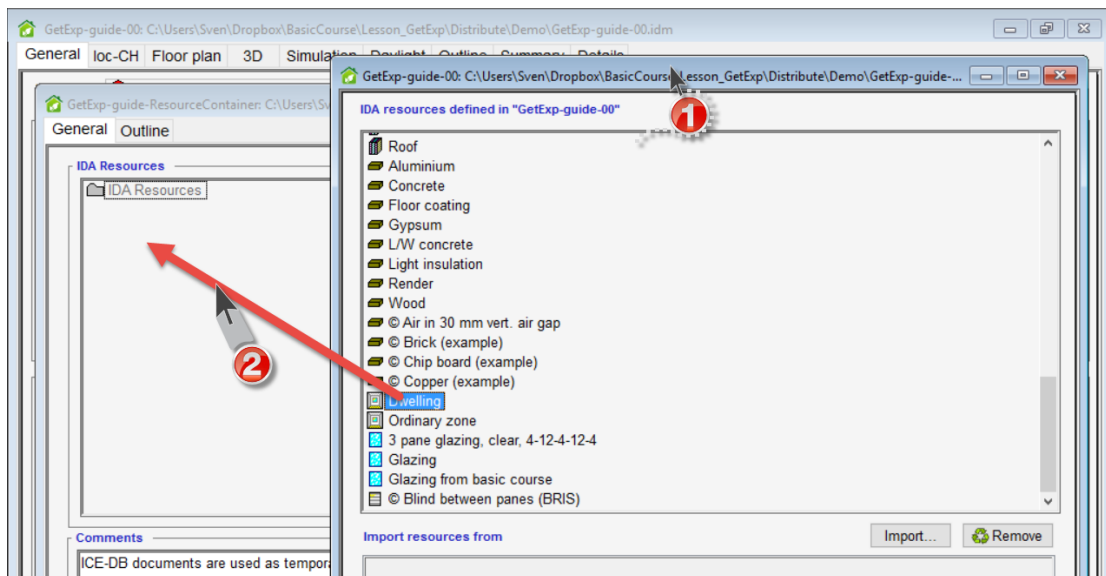
- b. Open  [Door construction](#) and save as “External door from basic course”. Close the defaults form and open the project resources by clicking on . Open “Inner door” by double clicking it and save as “Internal door from basic course”.

Note: We just copied two other data objects in the project resources. This time they were from data object type “construction”.

- c. We stay in the project resources. Right click on “External door from basic course” and select “Write to database”. Do the same with “Internal door from basic course” and with “Glazing from basic course”.

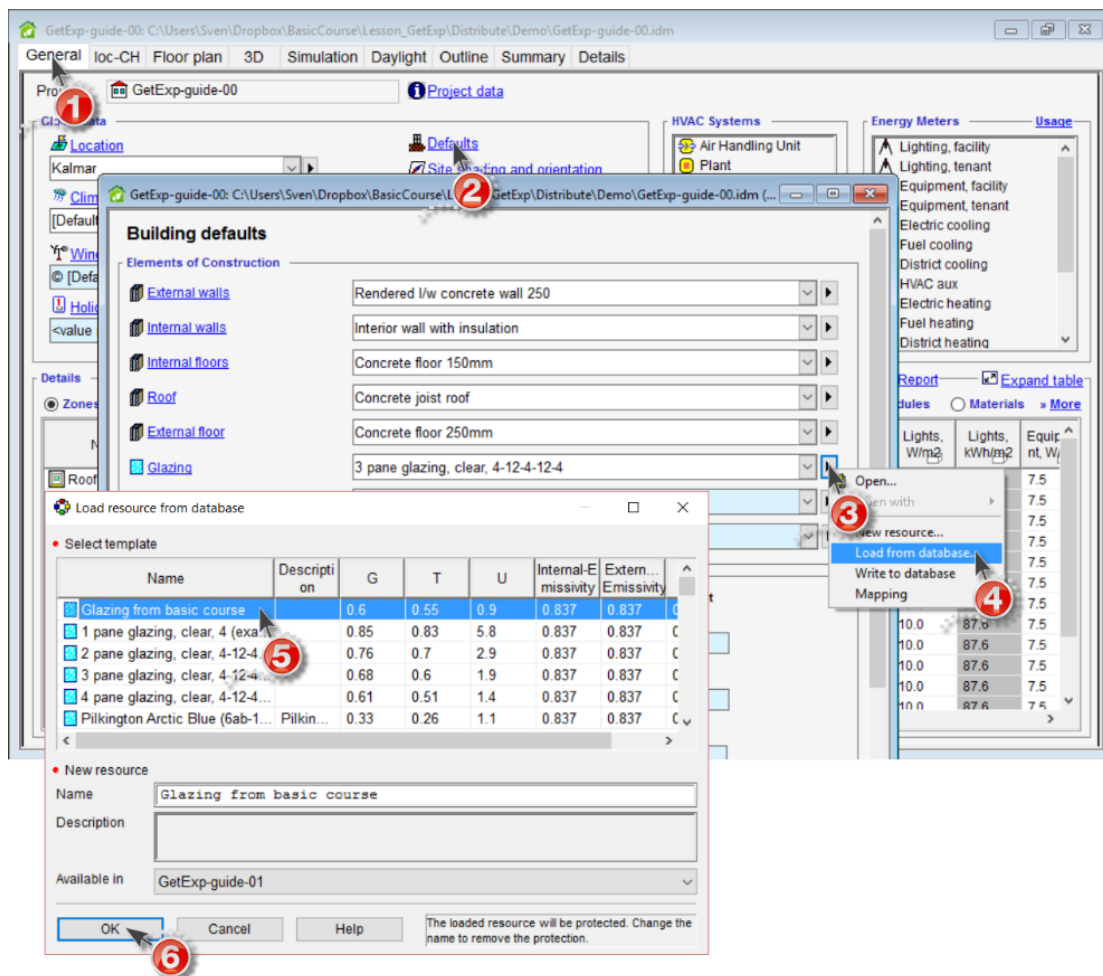
Note: With this interaction we wrote 3 data objects to the IDA ICE database. This means that from now we can always load one of these data objects to the project resource of any new simulation project.

- d. Right click on “Dwelling” and observe that “Write to database” is not in the context menu this time. Leave the resources open and go to “File” >> “New” >> “IDA Indoor Climate and Energy”. Select “Resource container” on the Template list and click “OK”. Create a resource container and copy “Dwelling” (zone template) to it. This will open an empty so called “resource container”. Save it as *GetExp-guide-ResourceContainer.idm*. Now you drag and drop “Dwelling” from the project resources to this resource container:



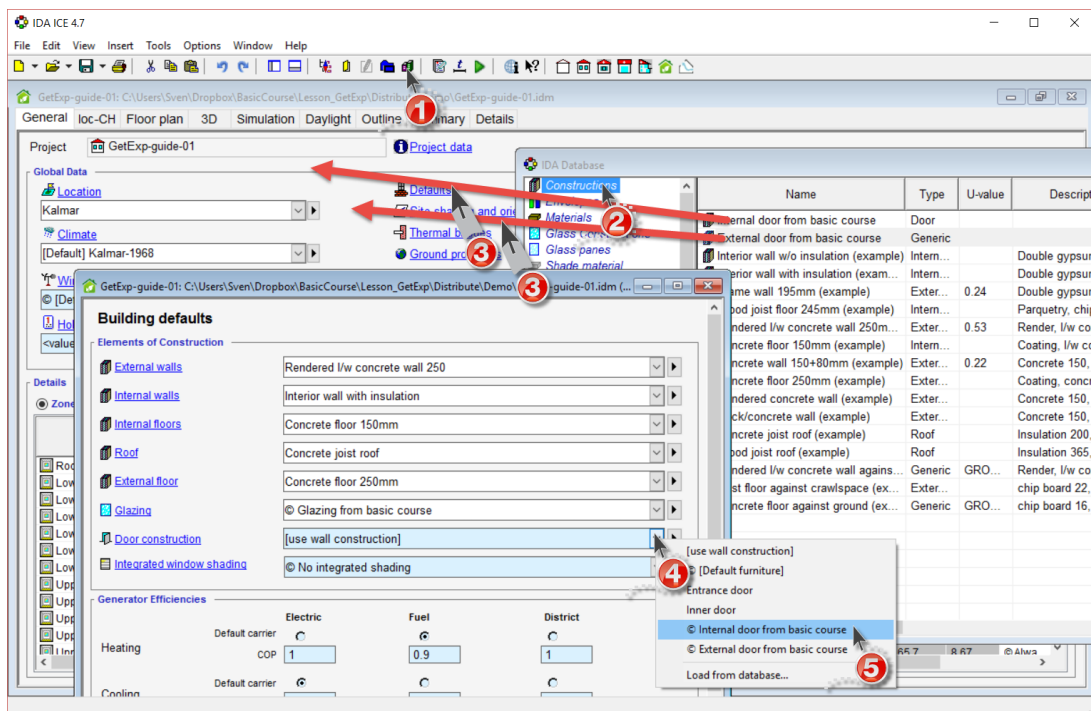
Note: Data objects of some type cannot be written to the IDA ICE database, even if they occur in the project resources. But they can always be copied to other resource lists, as here to a resource container.

- e. Close *Energy-guide-04.imd* and open *GetExp-guide-00.idm* instead. Save this project with any reasonable name. Open defaults and load the default glazing from the IDA ICE database. Select “Glazing from basic course”.



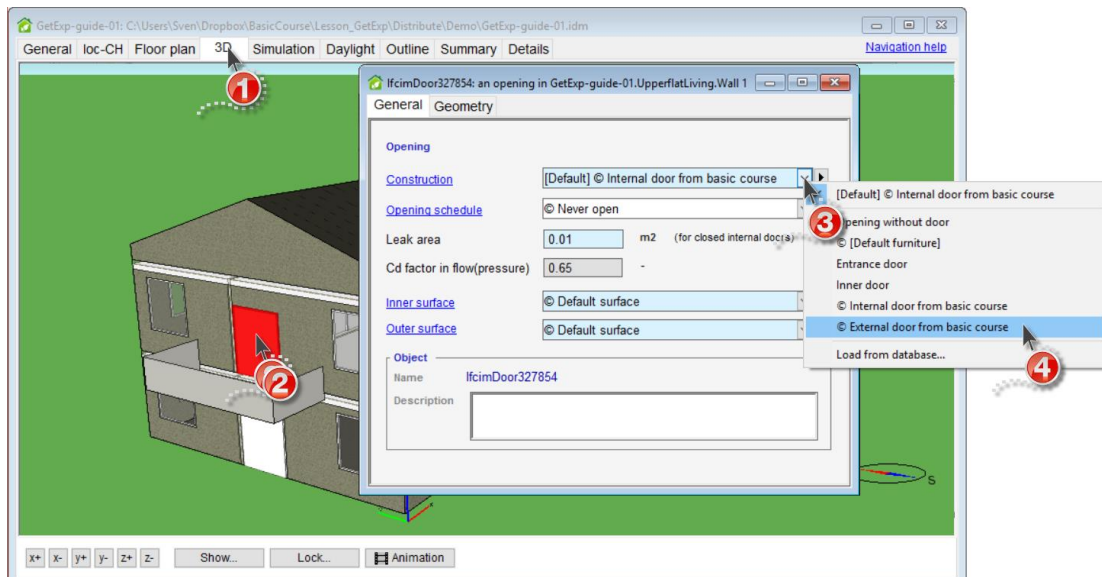
Note: “Glazing from basic course” is now marked with a ©. This means that this resource is “protected”. Its parameters cannot be changed without renaming the data object.

- f. Click on  in the shortcut bar. This will open the IDA ICE database. You can now drag and drop data objects from the database to your project. Do this with both “External door from basic course” and “Internal door from basic course. Go back to the defaults of your project and select “Internal door from basic course” as default construction for doors.



Note: After copying the two construction data objects to the project resources, we can select these resources for any construction in our project.

- g. Go to the **3D** tab. Open one external door after the other (there are 3 in total) and select its constructions.

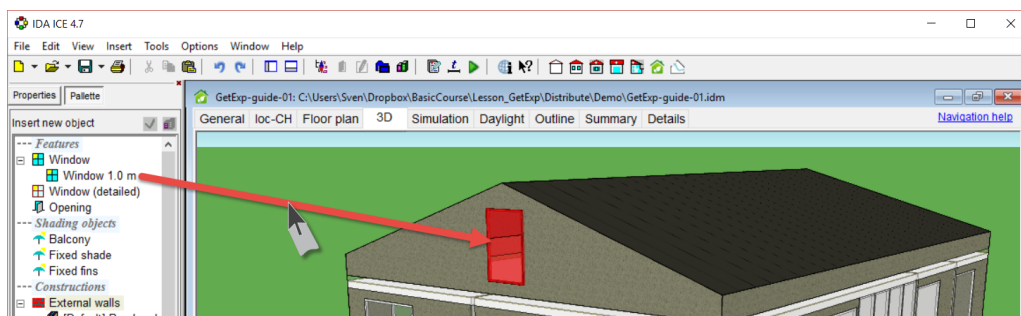


- h. Got back to your resource container (*GetExp-guide-ResourceContainer.idm*) and drag and drop “Dwelling” from the resource container to either the **General** tab or the resource container of your simulation project. Reset zones to this zone template by going to the **Floor plan** tab, floor by floor marking all zones (clicking on them with hold shift-key), selecting the

zone template “Dwelling” and then selecting “Reset selected zones to the current template”.



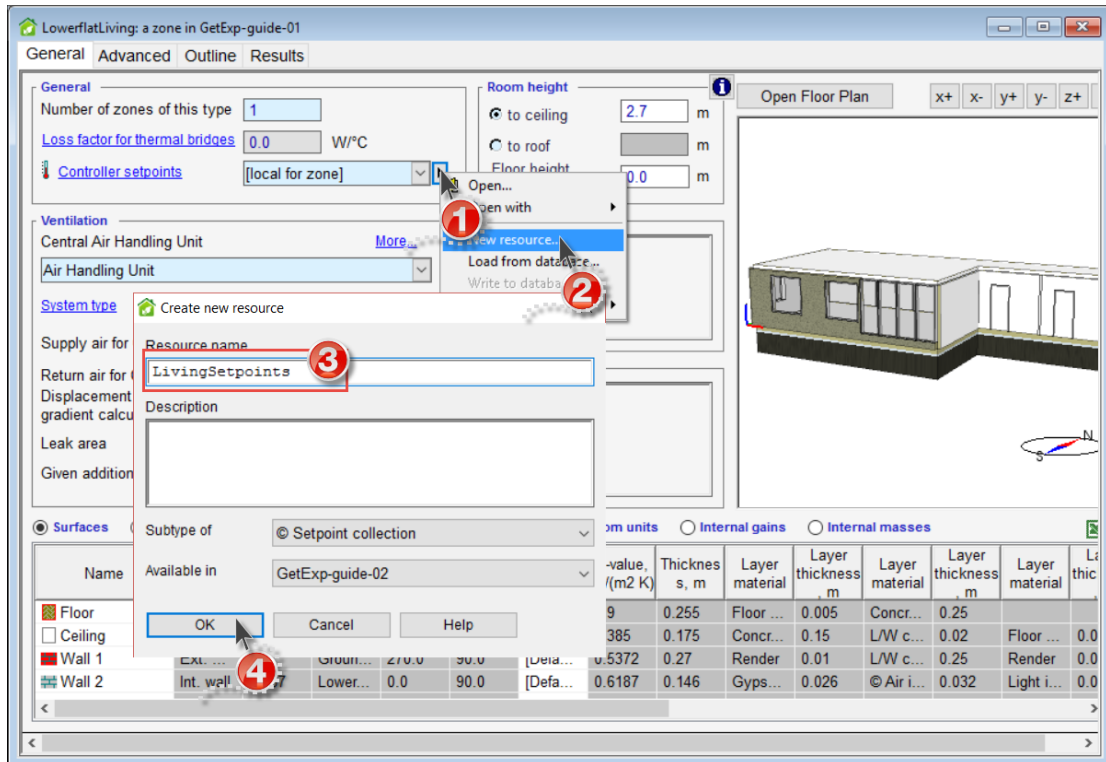
- i. Open *Power-guide-06.idm* and copy the window resource “Window 1.0 m” to the resources of your simulation project. You can open the resources of both projects and drag and drop directly. After this, you can find “Window 1.0 m” in the Palette of the 3D view and drag and drop a “Window 1.0 m” directly. Do this for the western wall of the “Roof” zone:



- j. Open the resources of your simulation project. Right click on some objects and select “Where it is used”. You will get a list of all data objects taking its parameters from this resource.

Note: For some resources (e.g. “Entrance door”, “Inner door” or “Ordinary zone”) you will get no data object at all. This means that these resources are not used at all in your project. You can select “Delete” for these resources (which you cannot for the used resources).

- k. Open the zone “LowerflatLiving”. In the “General” section in the upper left corner of the zone form you can find [Controller setpoints](#). The default for the zone controller setpoints is „[local for zone]“, which means that the setpoints are parameters of the zone and not taken from any resource object. This can be changed by creating a new resource. As many things in IDA ICE, we can do this in many ways. We do it as follows :



Open any Bathroom and create a new resource “BathSetpoints”. But this time you open the zone setpoints data object and change minimum temperature from 21 to 24 °C. Then open LowerflatRoom1 and create a new resource “SleepingSetpoints”. This time you change minimum temperature from 21 to 18 °C.

- l. Did you already testsimulate your project? If not, do so by clicking on . You can click „Stop“ and „Abort“ as soon as the simulation started.

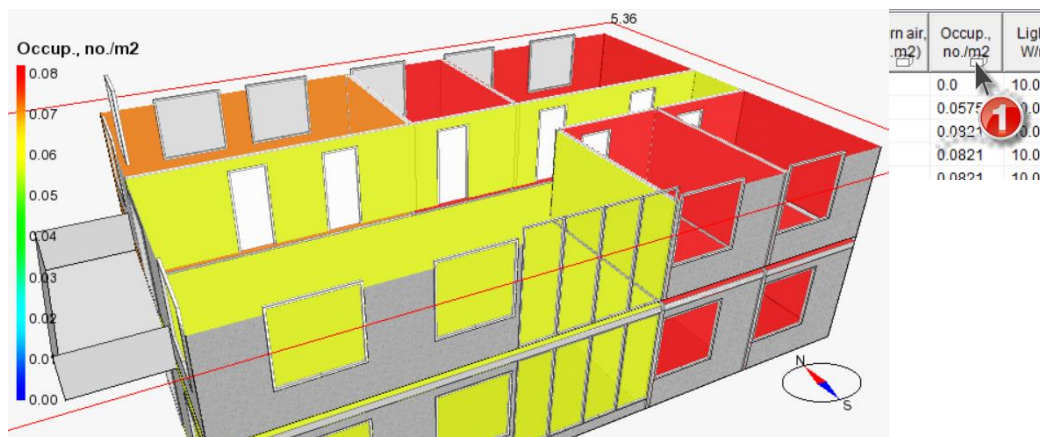
Step 2

Use of the input tables

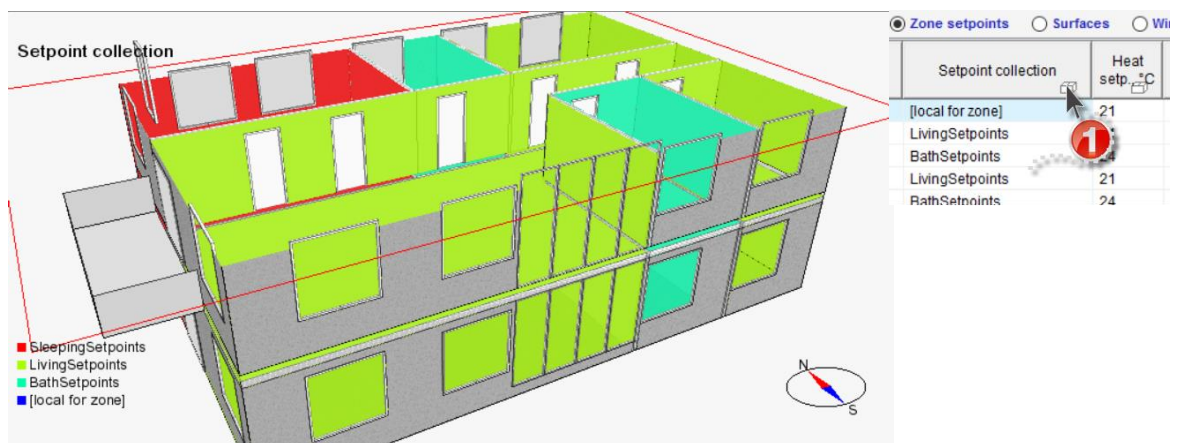
- a. Go to the **General** tab. In the “Zones” table, look at Occup., no./m2. They are all on 0.1. In the “Zone totals” table, adapt M*Occupants, items as follows

Name	Group	Floor height, m	Zone multiplier	M*Area, m2	M*Supply air, L/s	M*Return air, L/s	M*Occupants, items	M*Lights W
Roof		6	1	162.2	324.4	324.4	0.0	1622.0
LowerflatLiving	Living	0.0	1	69.51	139.0	139.0	4.0	695.1
LowerflatBath2	Bath	0.0	1	12.18	24.36	24.36	1.0	121.8
LowerflatRoom3	Room	0.0	1	12.18	24.36	24.36	1.0	121.8
LowerflatBath1	Bath	0.0	1	12.18	24.36	24.36	1.0	121.8
LowerflatRoom1	Room	0.0	1	27.73	55.46	55.46	2.0	277.3
LowerflatRoom2	Room	0.0	1	24.79	49.58	49.58	2.0	247.9
UpperflatLiving	Living	3.0	1	69.36	138.7	138.7	4.0	693.6
UpperflatBath2	Bath	3.0	1	12.18	24.36	24.36	1.0	121.8
UpperflatRoom3	Room	3.0	1	12.18	24.36	24.36	1.0	121.8
UpperflatBath1	Bath	3.0	1	12.18	24.36	24.36	1.0	121.8
UpperflatRoom1	Room	3.0	1	27.73	55.46	55.46	2.0	277.3
UpperflatRoom2	Room	3.0	1	24.79	49.58	49.58	2.0	247.9
Total			13	479.19	958.34	958.34	22.0	4791.9

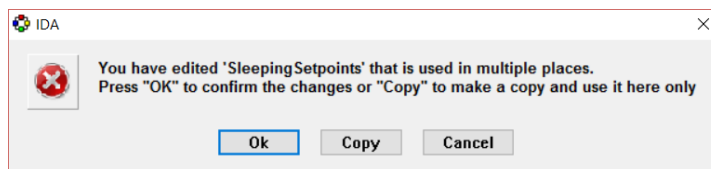
and look again at Occup., no./m2 in the “Zones” table. You can see that these values are adapted and not the same for all zones any more.



- b. Activate the “Zone setpoints” table and copy the setpoints objects created in step 1 to all zones as follows:



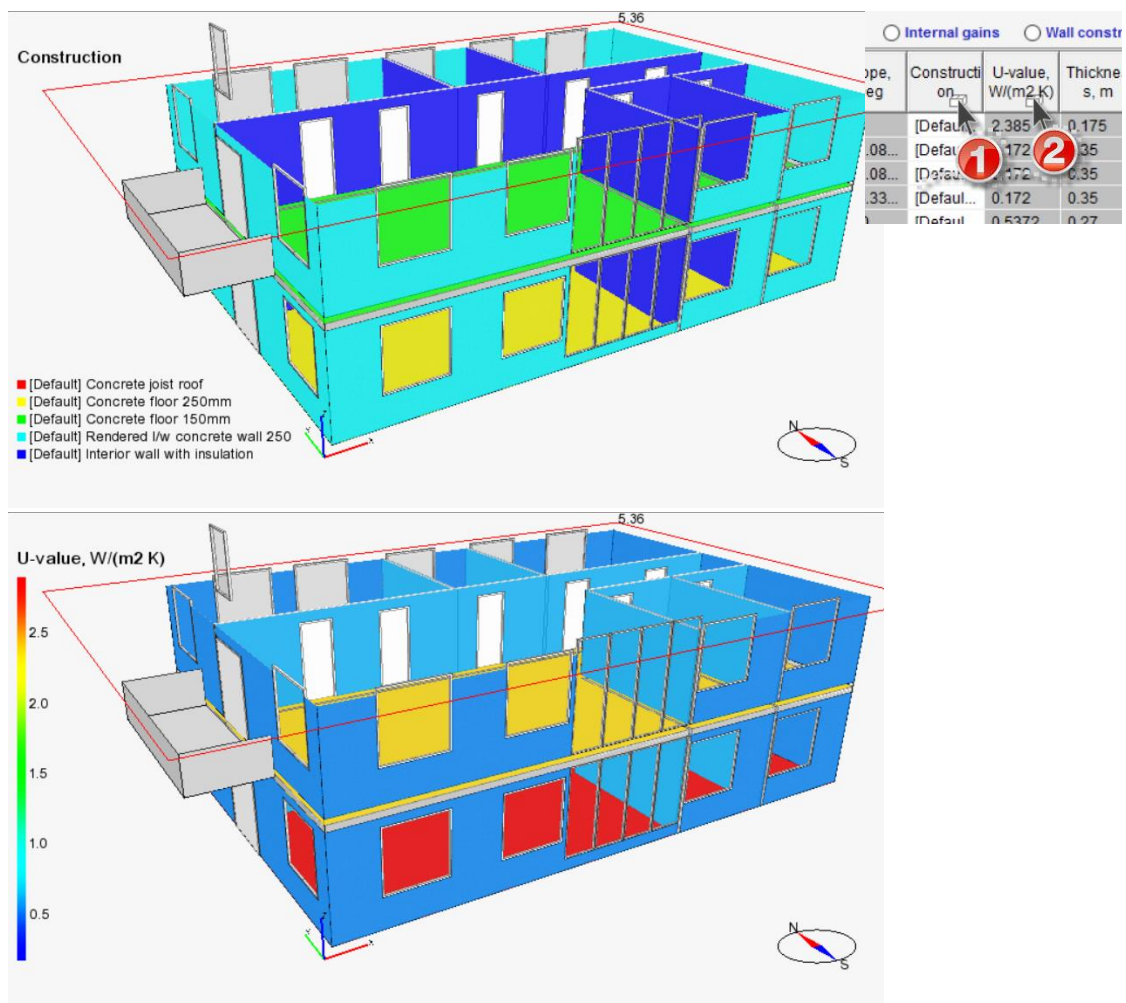
- c. In the “Zone setpoints” table, change heat setpoint of LowerflatRoom1 from 18 to 19 °C. You will get the following message:



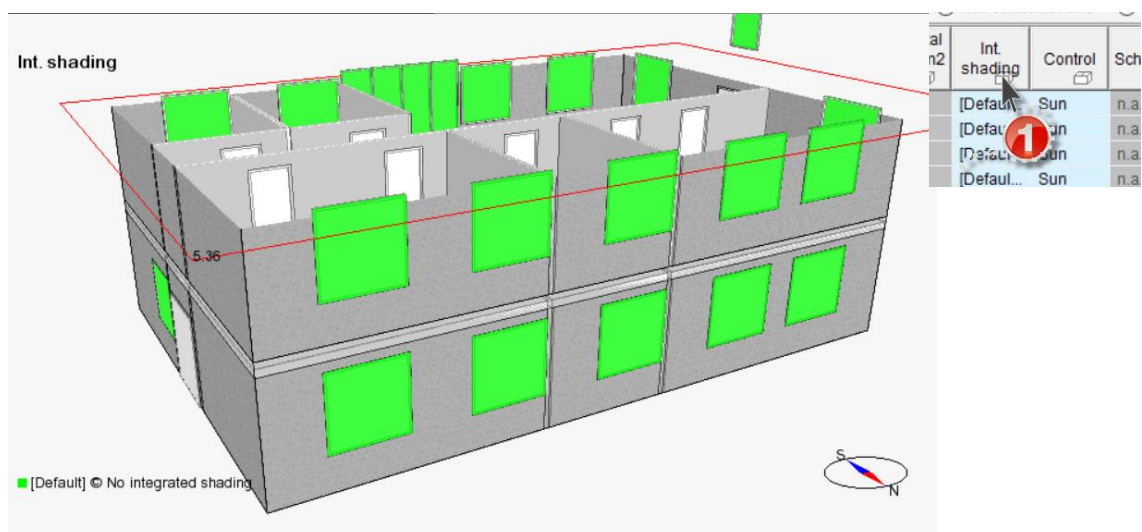
Select “OK” and observe that the same change is done for UpperflatRoom1.

- d. Change heat setpoint of LowerflatRoom1 back from 19 to 18 °C, but this time select “Copy” and name the new zone setpoints resource “LowerflatSleepingSetpoints”. Observe that now both Room1 have different heat setpoints.
- e. Now, change heat setpoint of LowerflatRoom1 from 18 to 17 °C. Observe that the same message is not any more occurring. This is because the resource “LowerflatSleepingSetpoints” is used at only this place.

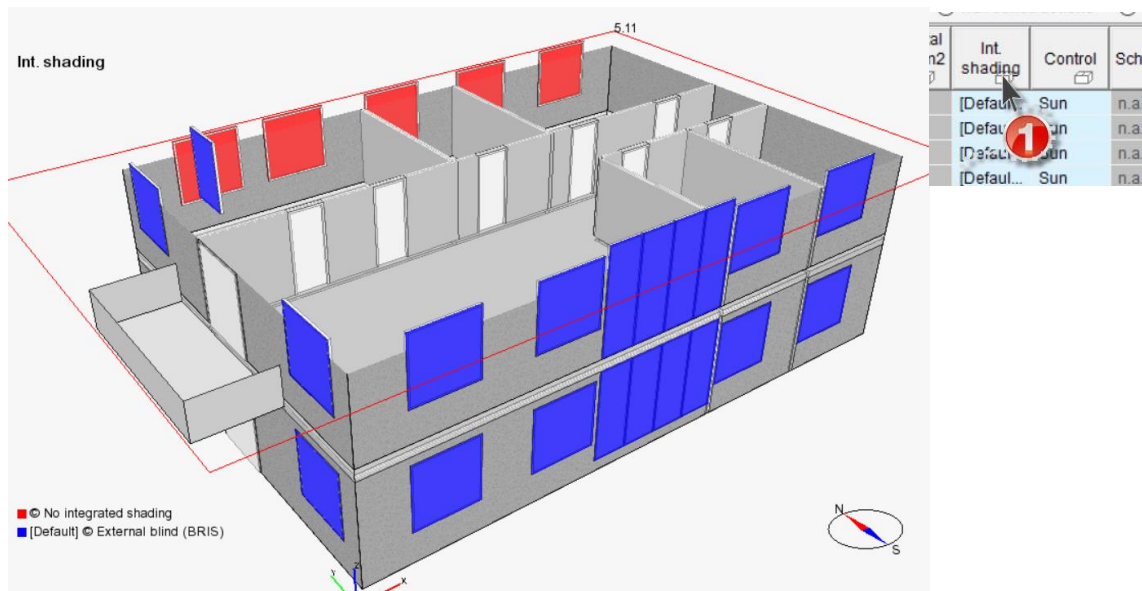
- f. Go to the “Surfaces” table and visualize construction and U-value.



- g. Go to the “Windows” table and visualize Int. shading.



- h. Go the defaults and change the default integrated shading from “No integrated shading” to “External blind (BRIS)” (load this object from the IDA ICE database). Now sort the windows in the “Windows” table by azimuth (by clicking on the column title “Azimuth, Deg.”) and change shading of northern windows (azimuth = 0) to “no integrated shading”. Visualize again.



- i. Click on  to test-simulate again your project.

Step 3

IDA ICE installation folder, private folder and common folder

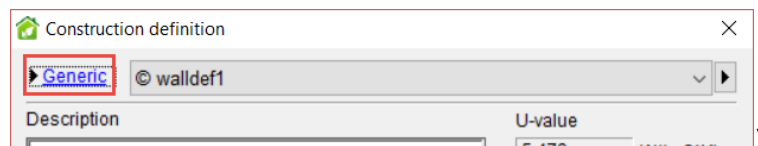
- a. Go to “Options” >> “Preferences...” >> “Advanced” and look at the paths for your IDA ICE “private folder” and “common folder”. For this step it will be important that you know these folders as well as the IDA ICE installation folder (folder where IDA ICE is installed on your computer).

Note: For the following we will write *<ida>* for the IDA ICE installation folder (in most cases *C:\Program Files (x86)\IDA*), *<private>* for the IDA ICE private folder (in most cases *C:\Users\Username\AppData\Roaming\Equa\IDA*) and *<common>* for the IDA ICE common folder (in most cases *C:\ProgramData\Equa\IDA*).

- b. Open both *<ida>\lib\dbdata.lsp* and *<private>\lib\dbdata.udb* with a text editor. The first file is the part of your IDA ICE library which was delivered with the software and saved within the installations process. The second file is the part of your IDA ICE library which you added yourself. Check that both constructions “Internal door from basic course” and “External door from basic course” are represented.

Note: In case you have one or more IDA ICE localizations installed, your IDA ICE database consists of a third part, which is stored in *<ida>\lib\ice\local-XX.lsp*.

- c. Move *<private>\lib\dbdata.udb* to your desktop (we will need it later). Load a construction from database and you will see that “Internal door from basic course” or “External door from basic course” do not occur on the list any more.
- d. Go back to “Options” >> “Preferences...” >> “Advanced” and change the private folder e.g. to *C:\Users\Username\Documents\Privatefolder*. Create a new construction (make sure it is a “generic” Construction:



and write it to the IDA ICE database. Now check that the new *dbdata.udb* (in our example *C:\Users\Username\Documents\Privatefolder\lib\dbdata.udb*) is created.

- e. For the default door construction, load a construction from database and you will see that your construction you just have written to the database is within the selection list, but not “Internal door from basic course” or “External door from basic course”. They are both in *dbdata.udb* on your desktop.

Note: The IDA ICE database is loaded when starting IDA ICE. The program will then search *dbdata.lsp* and *dbdata.udb*. Both files will be searched in *<private>\lib*, *<common>\lib* and *<ida>\lib* in this order. The first file with the correct name will be loaded. All others found later with the same name will be ignored.

Note: If one or more IDA ICE localizations are installed, the program will also search for *local-xx.lsp* in all *<...>\lib\ice* folders.

- f. Change the IDA ICE common folder e.g. to *C:\Users\Username\Documents\Commonfolder* and move *dbdata.udb* from your desktop to the new common folder (don't forget to put the file into a subfolder called *lib*). Again try to load a default construction for doors from the IDA ICE database. "Internal door from basic course" or "External door from basic course" will still not be in the list, as *<private>\lib\dbdata.udb* still exists.
- g. Delete *<private>\lib\dbdata.udb* and try again to load a default construction for doors from the IDA ICE database. You will need to restart IDA ICE before "Internal door from basic course" and "External door from basic course" appear in the list.

Step 4

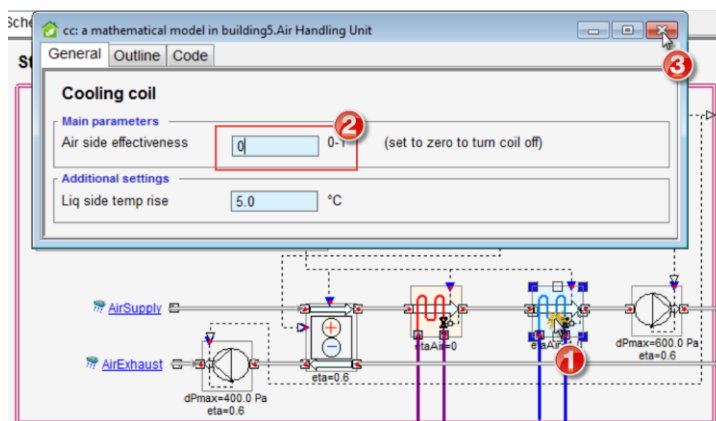
Going to “File” >> “New...” and selecting “IDA Indoor Climate and Energy” in the IDA Application list will open a list of IDA ICE templates. You can create your own default building and use it as an IDA ICE project template occurring in this list.

- a. First of all we will verify where the two existing default buildings (“Building” and “Empty”) are stored. Go to “File” >> “Open...” and browse to `<ida>\lib\ice\building`. You will find the two files *default.idm* and *Empty.idm*. Open them and check that they are identical with the two default buildings that can be opened from the IDA ICE template list.
- b. Go back to your simulation project (you can use *GetExp-guide-02.idm*), delete all zones, all building bodies and the balcony. Save as `<private>\lib\ice\building\mybuildingtemplate.idm` or `<common>\lib\ice\building\ourbuildingtemplate.idm`.
- c. Close your project, restart IDA ICE and go to “File” >> “New...” and select “IDA Indoor Climate and Energy”. You will find your own default building in the template list. Open it and check defaults (you will find 2x “... from basic course”) and resources (you will find 4x “...Setpoints” and also your “Dwelling” zone template).

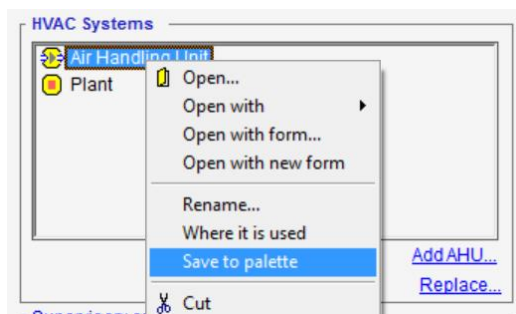
Step 5

Create templates for macros (air handling units, plants, controls)

- Open a new building with single zone by clicking on 
- Open the air handling unit by doubleclicking on  Air Handling Unit
- The standard air handling unit has preheating and precooling of air. You might want to change this. To do so, doubleclick on the heating and cooling coil and change Air side effectiveness to 0:



- You can now close the air handling unit and rightclick on the object to select “Save to palette”:



The program automatically browses to the correct subfolder in your private folder. If you want your colleagues having access to the same air handling unit template, just change to the same subfolder in your common folder.

- Name your air handling unit and save it. You will then find your air handling unit in the template list. If you name your air handling unit *default.idm*, it will be handled as the default air handling unit.

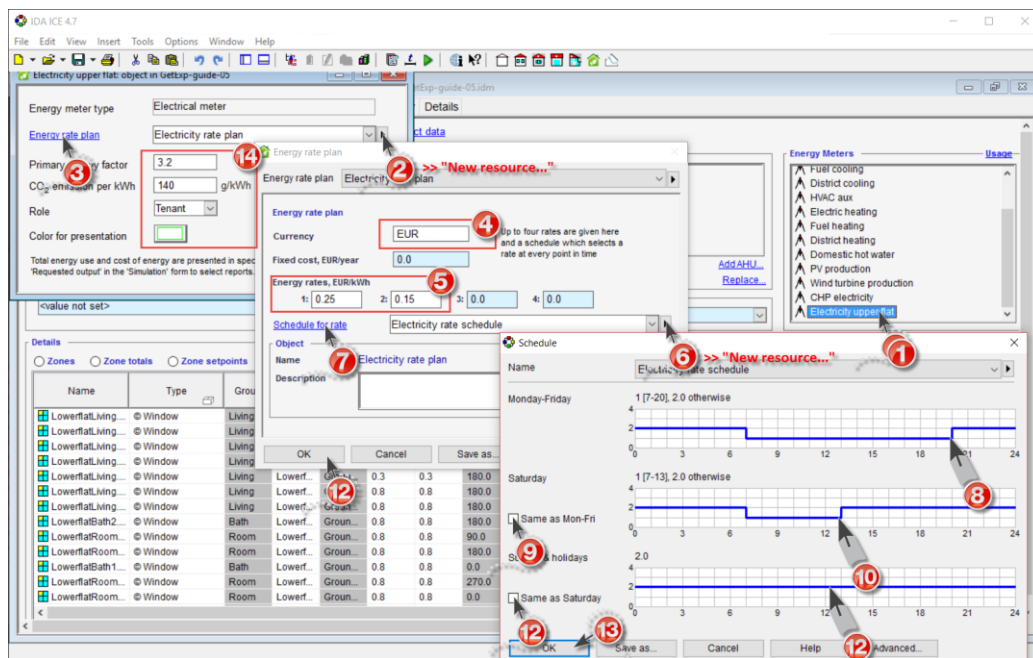
Step 6

During the IDA ICE basic course, we now went through almost everything in the **General** tab. The last missing section is the “Energy Meters” section in the upper right corner.

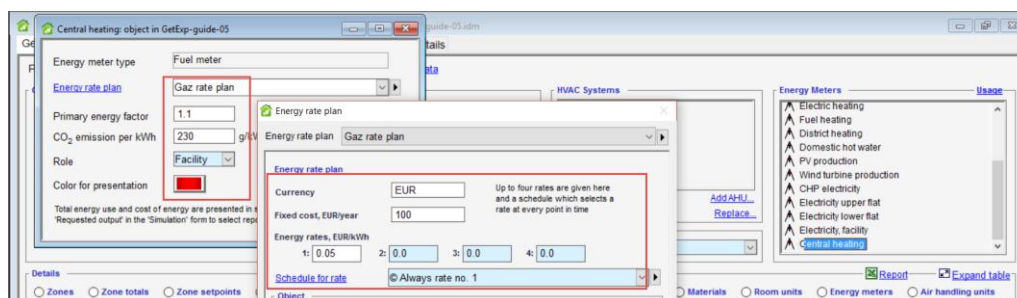
- a. We start from *GetExp-guide-02.idm*. Try to delete the first energy meter (called “Lighting, facility”). It is not possible. So right click on it and select “Where it is used”. A list of one lighting per zone will be shown. All are using the same energy meter which is taken from the defaults. One item in the list (Defaults.Energy meters.Lighting[1]) is the default energy meter for lighting itself. Double click on it and change its value from “Lighting, facility” to “Lighting, tenant”. Now all lighting take the new default energy meter “Lighting, tenant” and “lighting, facility” is not used any more. Check it again with “Where it is used”. No list pops up and in the bottom message bar it says “‘Lighting, facility’ is not used in ‘GetExp-MyGuide.idm’”. You can now delete this energy meter.
- b. Also delete “Equipment, facility” and “Heating, tenant”.
- c. Insert a new electrical meter. You can do that by either double-clicking on “Electrical meter” in the palette, drag and drop one from the palette to the energy meter list, or right-clicking on the energy meter list and select “New Object...”

Note: There are three different type of energy meter objects representing different energy carriers: Electrical, fuel and district.

- d. The new energy meter has the name “Energy meter”. Rename it to “Electricity upper flat”. Insert a rate plan and fill in primary energy factor as well as CO₂ emission per kWh as shown below. Select also role and color.



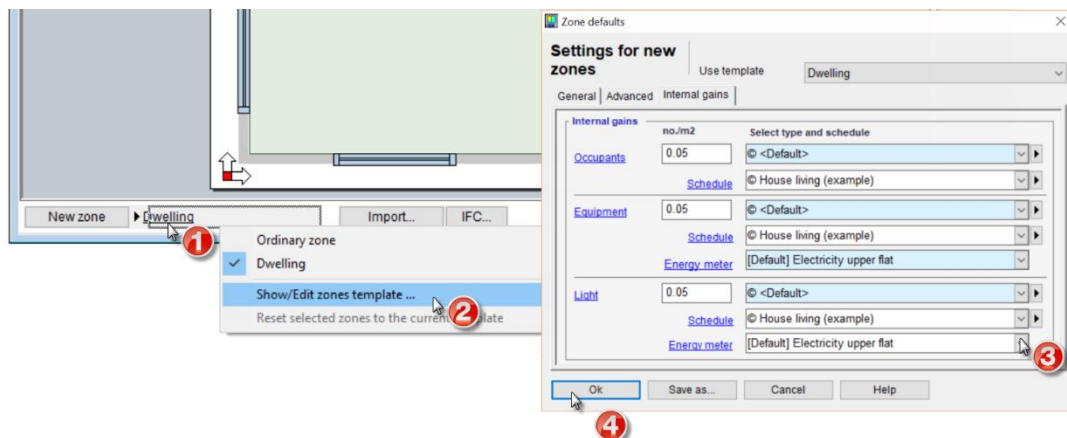
- e. Copy this electrical meter, rename it to “Electricity lower flat” and change its color from bright to dark green.
- f. Copy this electrical meter, rename it to “Electricity, facility” and change its role from “Tenant” to “Facility”. Change its color to middle green.
- g. Insert a new fuel meter, rename it to “central heating” and change its parameters as follows.



- h. Go to defaults and change the default energy meters as follows.

Usage	Electric	Fuel	District
Heating	Electricity, facility	Central heating	District heating
Cooling	Electricity, facility	Fuel cooling	District cooling
Domestic hot water	Electricity, facility	Central heating	<undefined>
Fans	Electricity, facility		
Pumps	Electricity, facility		
Humidification	Electricity, facility		
HVAC - other	Electricity, facility		
Equipment	Electricity upper flat	<undefined>	<undefined>
Lighting	Electricity upper flat		
Photovoltaics	PV production		
Wind turbine	Wind turbine production		
CHP	CHP electricity		

- i. In the **General** tab, activate the “Internal gains” table and sort rows by Name. Change Energy meter of all lower flat zones from default to “Electricity lower flat”.
- j. Our zone template “Dwelling” uses non-default energy meter for lights. Open the zone template and change it back to default.



- k. Go back to the energy meter list and delete the ones that are not used any more. This should be the remaining ones:

Energy Meters	Usage
Fuel cooling	
District cooling	
District heating	
PV production	
Wind turbine production	
CHP electricity	
Electricity upper flat	
Electricity lower flat	
Electricity, facility	
Central heating	

Note: Not all these energy meters are really used in our simulation project. But some (Fuel cooling, District cooling, District heating, PV production, Wind turbine production and CHP

electricity) are selected in (non-used) defaults. But we do not need to care about them, as energy meters that count zero energy will not appear in the results.

- l. Open the plant and check the selection of carrier and meter in the heater (hot water and heating) and the (non-used) chiller model. Check also the selections in any lighting and any equipment form

Note: As “equipment” of zones can be anything, their energy meter have three different defaults for all the three energy carriers.

- m. Open the air handling unit and check the selection of meter in the fan models.

Note: For fans (and pumps) only electrical meters can be selected.

- n. Click [Usage](#) at the upper right corner of the energy meter list and check where the energy meters are used.
- o. Run a yearly energy simulation and look at the [Delivered Energy](#) report.

		Delivered Energy Report	
Project		Building	
		Model floor area	479.2 m ²
Customer		Model volume	1075.7 m ³
Created by	Sven Moosberger	Model ground area	178.6 m ²
Location	Kalmar	Model envelope area	665.6 m ²
Climate file	Kalmar-1968	Window/Envelope	12.9 %
Case	GetExp-guide-06	Average U-value	0.4267 W/(m ² K)
Simulated	11.01.2018 15:17:47	Envelope area per Volume	0.6187 m ² /m ³

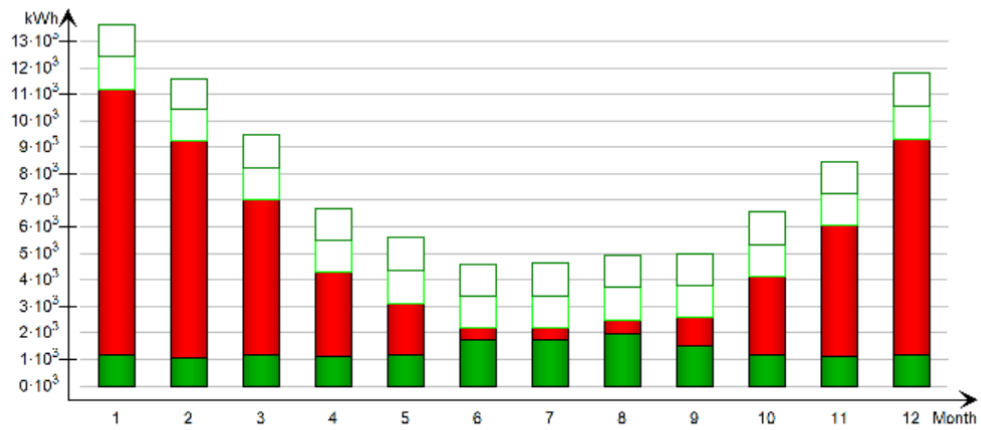
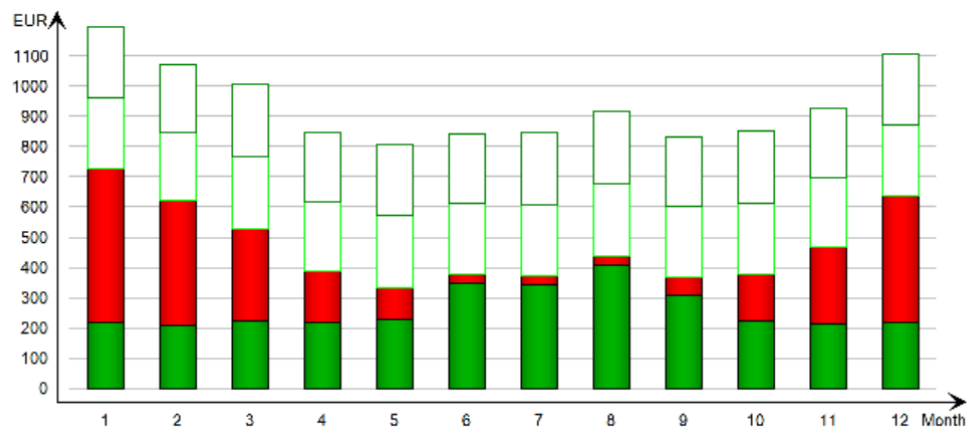
Building Comfort Reference

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	11 %

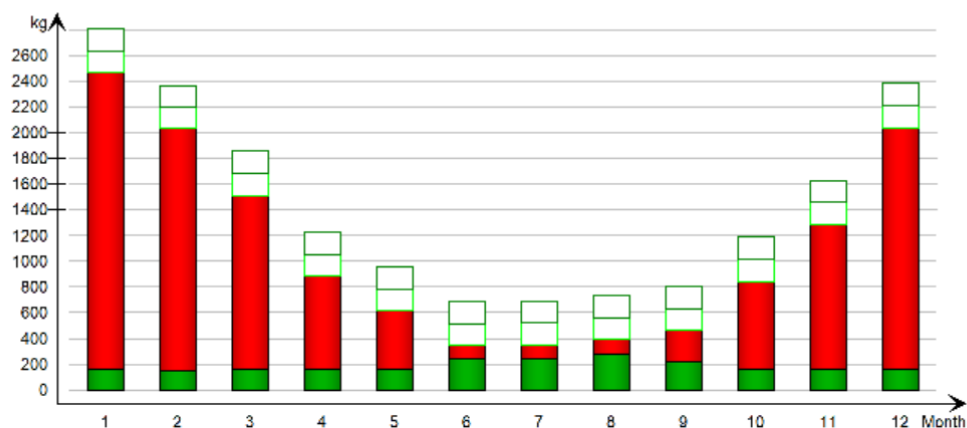
Delivered Energy Overview

		Purchased energy		Peak demand	Cost		CO ₂		Primary energy	
		kWh	kWh/m ²	kW	EUR	EUR/m ²	kg	kg/m ²	kWh	kWh/m ²
	Electricity, facility	16118	33.6	7.24	3156	6.6	2257	4.7	51578	107.6
	Total, Facility electric	16118	33.6		3156	6.6	2257	4.7	51578	107.6
	Central heating	47665	99.5	31.33	2484	5.2	10963	22.9	52431	109.4
	Total, Facility fuel*	47665	99.5		2484	5.2	10963	22.9	52431	109.4
	Total	63783	133.1		5640	11.8	13220	27.6	104009	217.1
	Electricity upper flat	14616	30.5	1.66	2808	5.9	2046	4.3	46771	97.6
	Electricity lower flat	14628	30.5	1.67	2811	5.9	2048	4.3	46810	97.7
	Total, Tenant electric	29244	61.0		5619	11.7	4094	8.5	93581	195.3
	Grand total	93027	194.1		11259	23.5	17314	36.1	197590	412.3

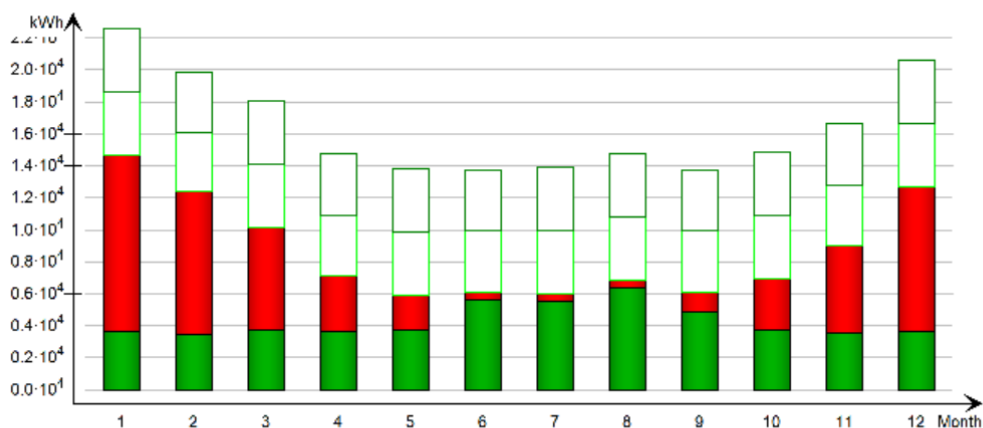
*heating value

Monthly Purchased/Sold Energy**Monthly Energy Cost**

Monthly CO₂ Load



Monthly Primary Energy



Month	Facility electric				Facility fuel (heating value)				Tenant electric			
	Electricity, facility				Central heating				Electricity upper flat			
	(kWh)	Cost (EUR)	CO ₂ (kg)	Prim. (kWh)	(kWh)	Cost (EUR)	CO ₂ (kg)	Prim. (kWh)	(kWh)	Cost (EUR)	CO ₂ (kg)	Prim. (kWh)
1	1147.0	218.0	160.6	3670.4	10015.0	509.3	2303.5	11016.5	1238.0	235.3	173.3	3961.6
2	1073.0	207.8	150.2	3433.6	8174.0	416.7	1880.0	8991.4	1158.0	224.1	162.1	3705.6
3	1160.0	224.8	162.4	3712.0	5861.0	301.5	1348.0	6447.1	1238.0	239.3	173.3	3961.6
4	1135.0	219.0	158.9	3632.0	3150.0	165.7	724.5	3465.0	1198.0	230.4	167.7	3833.6
5	1173.0	225.9	164.2	3753.6	1960.0	106.5	450.8	2156.0	1238.0	237.6	173.3	3961.6
6	1755.0	349.3	245.7	5616.0	433.1	29.9	99.6	476.4	1198.0	231.6	167.7	3833.6
7	1725.0	341.6	241.5	5520.0	459.1	31.4	105.6	505.0	1238.0	236.2	173.3	3961.6
8	1986.0	406.5	278.0	6355.2	485.6	32.8	111.7	534.2	1238.0	238.9	173.3	3961.6
9	1533.0	306.4	214.6	4905.6	1086.0	62.5	249.8	1194.6	1198.0	232.1	167.7	3833.6
10	1162.0	221.8	162.7	3718.4	2958.0	156.4	680.3	3253.8	1238.0	236.3	173.3	3961.6
11	1119.0	215.0	156.7	3580.8	4917.0	254.1	1130.9	5408.7	1198.0	229.9	167.7	3833.6
12	1150.0	219.8	161.0	3680.0	8166.0	416.8	1878.2	8982.6	1238.0	236.6	173.3	3961.6
Total	16118.0	3155.9	2256.5	51577.6	47664.8	2483.6	10962.9	52431.3	14616.0	2808.3	2046.2	46771.2

Month	Tenant electric			
	Electricity lower flat			
	(kWh)	Cost (EUR)	CO ₂ (kg)	Prim. (kWh)
1	1239.0	235.5	173.5	3964.8
2	1159.0	224.3	162.3	3708.8
3	1239.0	239.6	173.5	3964.8
4	1199.0	230.7	167.9	3836.8
5	1239.0	237.8	173.5	3964.8
6	1199.0	231.8	167.9	3836.8
7	1239.0	236.4	173.5	3964.8
8	1239.0	239.2	173.5	3964.8
9	1199.0	232.3	167.9	3836.8
10	1239.0	236.5	173.5	3964.8
11	1199.0	230.2	167.9	3836.8
12	1239.0	236.8	173.5	3964.8
Total	14628.0	2811.1	2047.9	46809.6