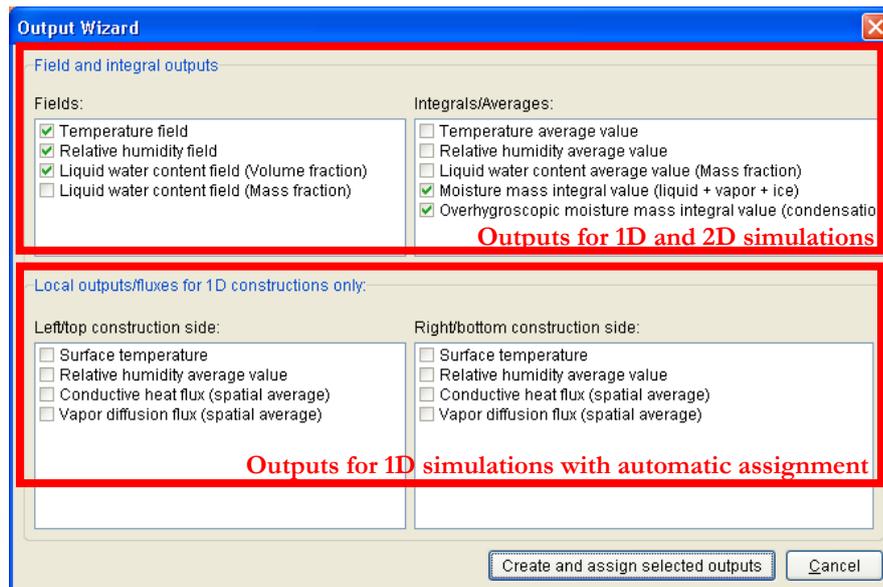# Generating Delphin Outputs

Delphin offers a variety of prefabricated outputs that can be generated automatically. Moreover it is often useful to define additional outputs. Both shall be explained in this tutorial.

1. Usage of output assistant

The assistant for output results is started with . Then the following dialog will open:


Outputs from the upper part are assigned automatically to the whole construction. Effected assignments can be modified later: to modify it first delete the wrong assignment in the window >> Assignments/Selections. Afterwards the desired output has to be marked in the dialogue >> Outputs >> Output files and assigned by clicking on zin the same dialogue.

Outputs from both parts can be pressed, whereby outputs from the lower part usually make sense at one-dimensional simulations because they are assigned to particular surfaces or, to be more exact, to the exterior discretised elements. **Number and kind of proposed outputs complies with the calculation type. The outputs shown in the table above correspond to a heat and moisture simulation (see >> Simulation >> Modeling and simulation settings). For a calculation with ice modeling additional outputs for ice content and freeze/thaw changes would be displayed.**

2. Defining own outputs

To define own outputs three steps has to be fulfilled:
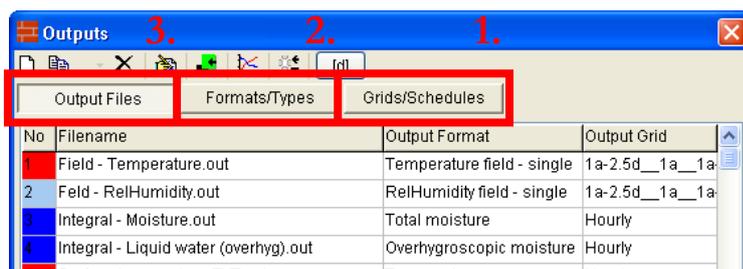
1. Grids/Schedules: definition of time grid.
2. Formats/Types: definition of output types.
3. Output Files: Assignment to elements with definition of output file name.

Defining time grids

If outputs have been generated with the output wizard time grids with hourly and daily output rhythm are defined already. The definition of further output grids can be generated by a click on ▯ or >> Outputs >> Grids/Schedules >> [right-click on the lower table] >> New output …

Two-dimensional field outputs that will be explained later can lead to very big output files if a too fine temporal output grid has been chosen. Processing very big output files with the postprocessor can be quite time consuming. At the same time output data can be quite redundant as with cyclic recurring climate the annual outputs visually hardly differ from each other. So it can be reasonable to picture only the first and maybe the last year of a simulation in detail. Time grids are defined by their *duration* and their temporal grid (*time step*).
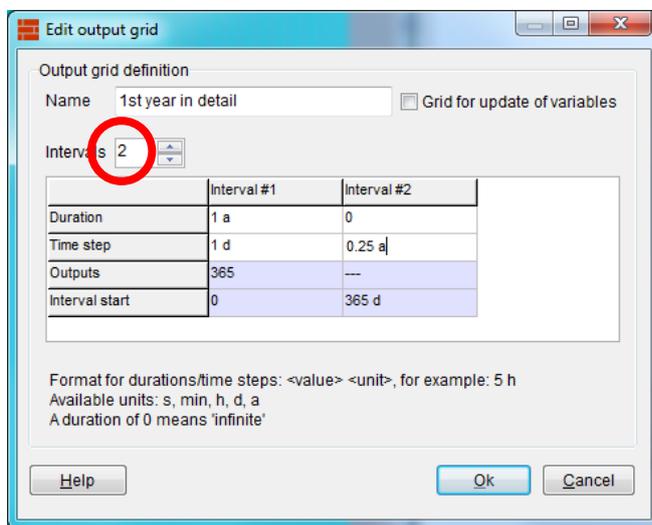

In the example above two different intervalls are defined. For a two-dimensional field the first year shall be monitored more closely. The first intervall for the first year (Duration = 1 a) is scheduled with narrower time steps. The '0' in the second intervall represents an infinite, unlimited time period.

The time steps of the narrower intervals #1 is set to 1 day whereas the other years the time step is 0.25 years. This means that during this interval there are only four outputs per year, every 91.25 days.

Defining output types

At Outputs >> Formats/Types the output type is set, which means what exactly shall be monitored.
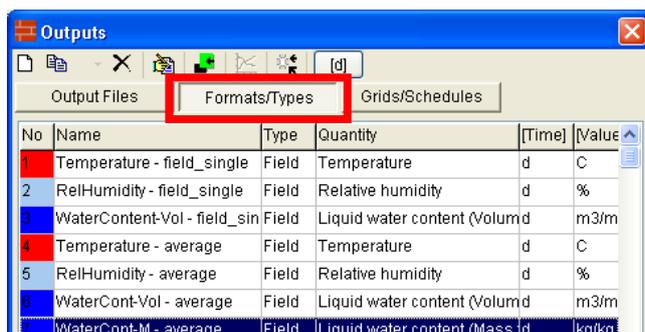
In this field output types not only can be defined but assigned to elements with . The definition of further outputs can be introduced with a click on or a >> [right click in the lower list] >> New output …
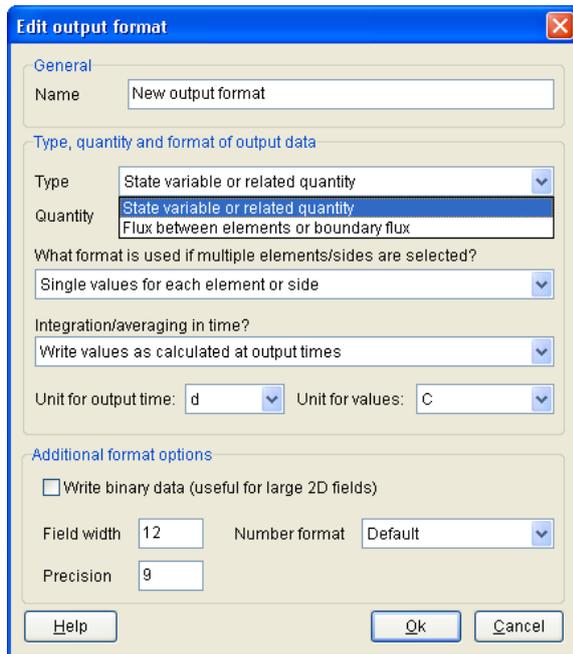
It is recommended to give an informative designation at „Name" so that already by the name it becomes clear what kind of simulation result is stored by the aid of this output. In so doing confusion can be avoided.

„Type" and „Quantity":
At >> Type one has to choose between the output of a state variable or a flux at first. To >> Type: Flux between … for example counts heat flux or convective transported water vapour flux. To >> Type: State variable … counts temperature, humidity, saturation degree or mass related moisture content.
The self-explaining selection at >> Quantity adjusts automatically to the choice at >> Type.

**„What format is used if multiple elements/sides are selected?":**
Here three different formats are distinguished:

- "Single values for each element or side"
  If to several elements this format has been assigned, of EVERY element one value will be saved at every time step. With this format at one dimensional wall constructions profiles can be generated and at two dimensional details „coloured pictures". With two dimensional simulations the outputs can become very big. Therefore bigger output time steps shall be chosen as explained at „Definition of time grid".
  If a „Single values" output is assigned to one single discretised element, a diagram will emerge with the x-axis as timescale, similar to the assignment of „Averaged values …" or „Integrated values …".
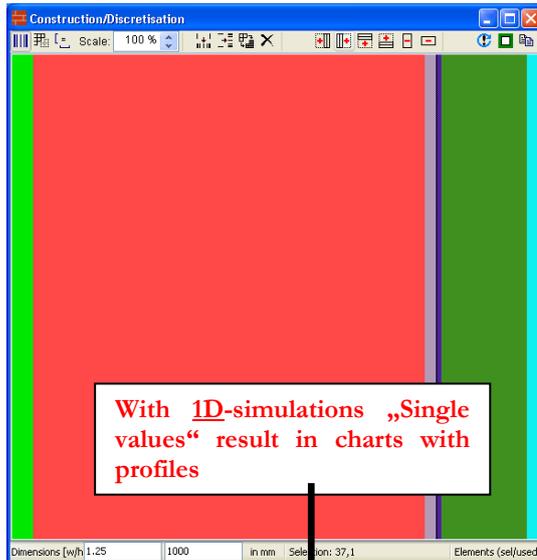
One-dimensional wall structure: Two-dimensional detail:
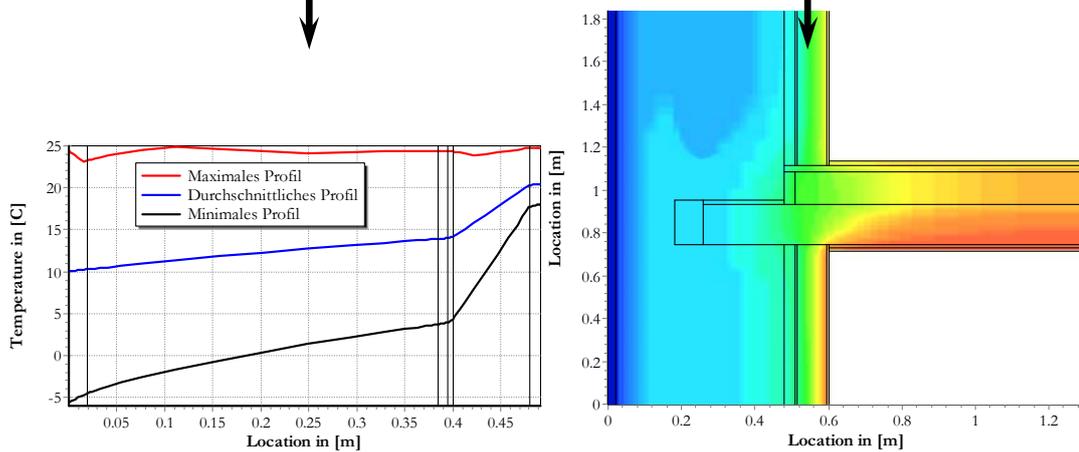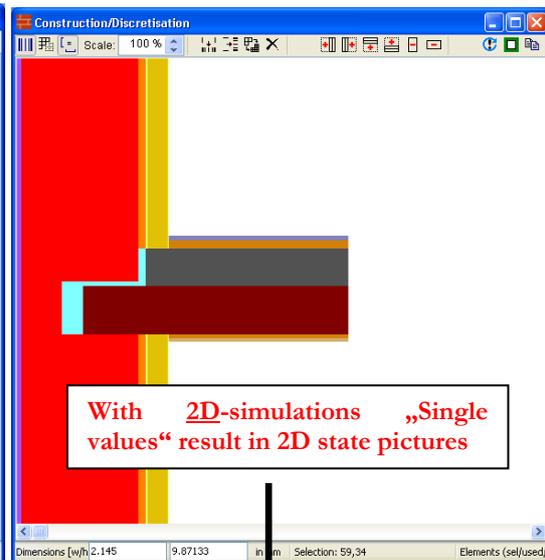

- "Integrated values in space" or "Averaged values of elements or sides"
  If one of these output formats is assigned to several elements **of all selected elements only one value is** recorded at every editing date (resp. output time step). With "Integrated values …" all values from the selected elements are integrated, with "Averaged values …" a mean values is calculated, averaged over element widths.
  Averaging in time currently is not possible.

HINT: Take care which „Unit for values" is shown! At „Unit for output times" consistent units should be chosen normally. At the simulation of perennial time periods days (d) or years (a) are recommended.
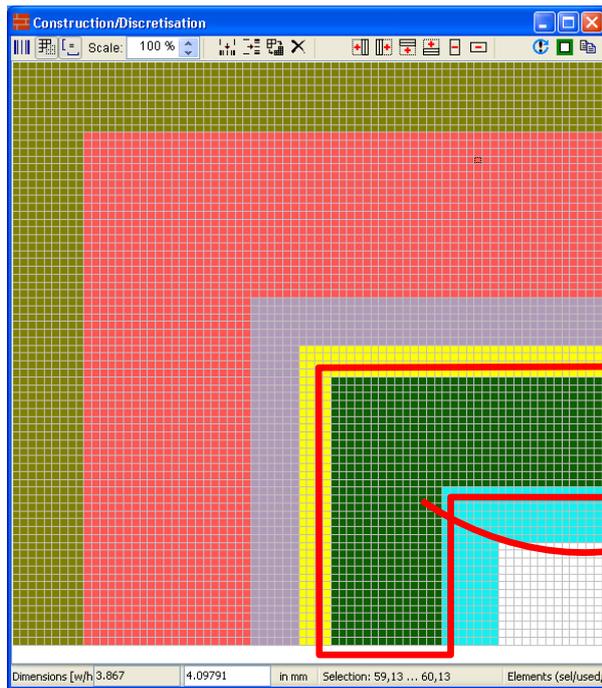
„Averaged …" or „Integrated …" values result in time dependent curves in x-y-charts (below two variants are compared)
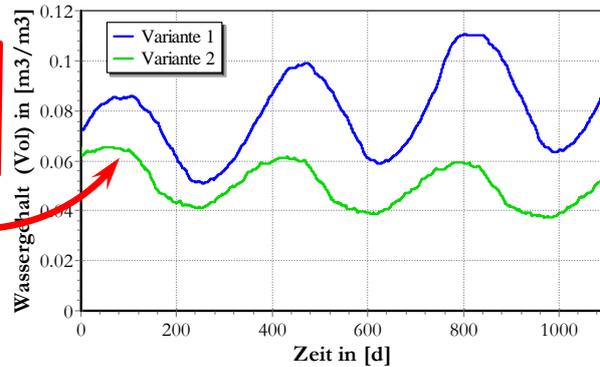
Example: Definition of an output format for over-hygroscopic moisture

The output of the over-hygroscopic moisture is used as an aid to calculate whether or how much liquid water evolves. In Delphin the default setting for over-hygroscopic moisture is the moisture mass above 95 % relative humidity. The moisture mass below 95% relative humidity is not taken into account. This default setting can be changed at >> Simulation >> Output related options >> Maximum hygroscopic relative humidity.

Specify in tab >> Format/Types a new output format with the following statements:
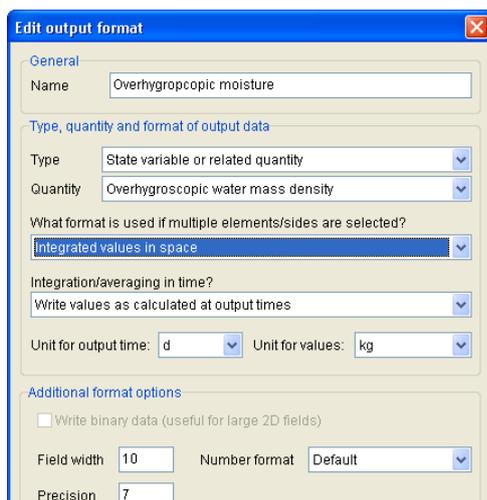
If at >> Quantity: Overhygroscopic water mass denity and at output format >> Integrated values in space is chosen, kg at "Unit for values" is given.

Often with the calculation of one-dimensional wall structures the reference to one m² is favoured. This arises as a result automatically if the height of the structure comes to 1 m because the the default setting of the z-direction which means normal to the screen surface lenght is 1 m, as well. The length in z-direction can be changed after a rightclick in >> Construction/Discretisation >> Edit construction …

Assignment of output formats to elements

Outputs can be assigned at the tab >> Output >> Format/Types as well as at >> Output >> Output files to single elements or element areas.

Assignment in the tab "Format/Types":
Mark the desired discretised elements and the output format. Then click on and
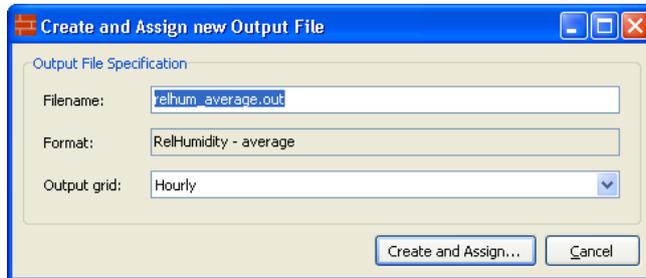
appears. Give at „Filename" an unique and comprehensible name. „.out" is the output format of Delphin5. Under „Output grid" the suitable temporal output grid can be chosen. With a click on „Create and assign …" the output is generated and automatically registered in the tab >> Output >> Output files. Furthermore, the output assignment is registered in the table of the window „Assignments/Selections".

Assignment in the tab "Output files":
Mark the desired discretised elements. Then click on or choose after a right click on the white shimming table >> New output …
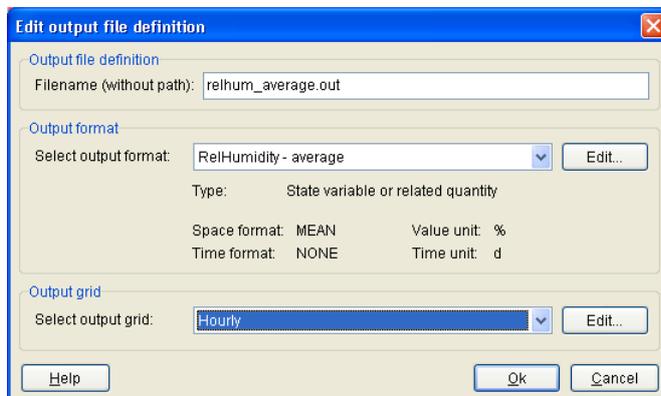

Give here as well an unique and comprehensible name for the output file. At >> Select output format one can choose between the different output formats that have been defined under >> Format/Types. The lines below show the properties of the selected output type, especially the areal format. At last the temporal output grid at >> Select output grid has to be chosen. The assignment will be finished with OK and the output appears in the list.
For the ultimate assignment of the output the desired elements have to be marked and assigned by clicking on . The assignment is registered automatically in the list of the window >> Assignments/Selections.

HINT 1: It can be more timesaving to copy outputs that have been assigned already in the tab >> Output >> Output files. The name can be changed after a double click on the output definition in the list.

HINT 2: If an output format from the list in >> Output files is assigned to different areas in the construction model all assigned elements will be taken into account. For example, if the output definition was of an integral, all results from the assigned output will be summed up and saved in one value/file. In the example below, one definition of an over-hygroscopic water mass (per definition in Delphin the water mass higher than 95% relative humidity, see >> Simulation >> Output related options) is assigned to two areas, one perpendicular to the other. With an average output format of all selected elements a mean value would be calculated dependent on the element widths.
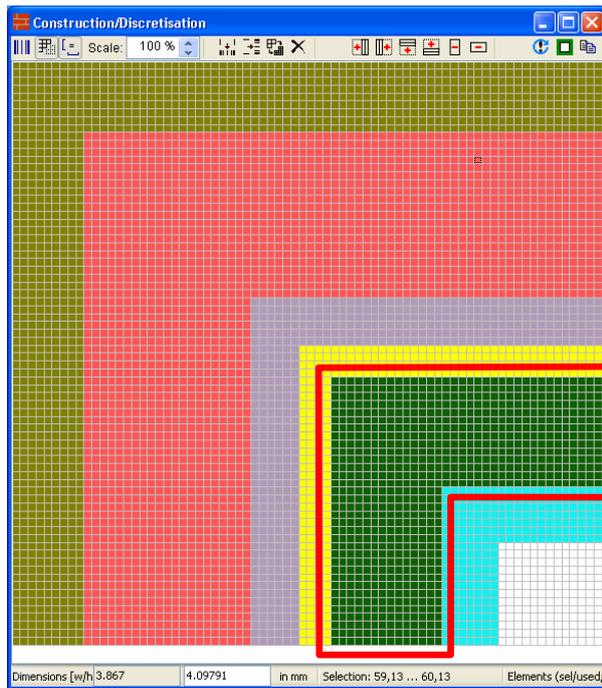
One output has been assigned to the vertical and horizontal insulation layer.