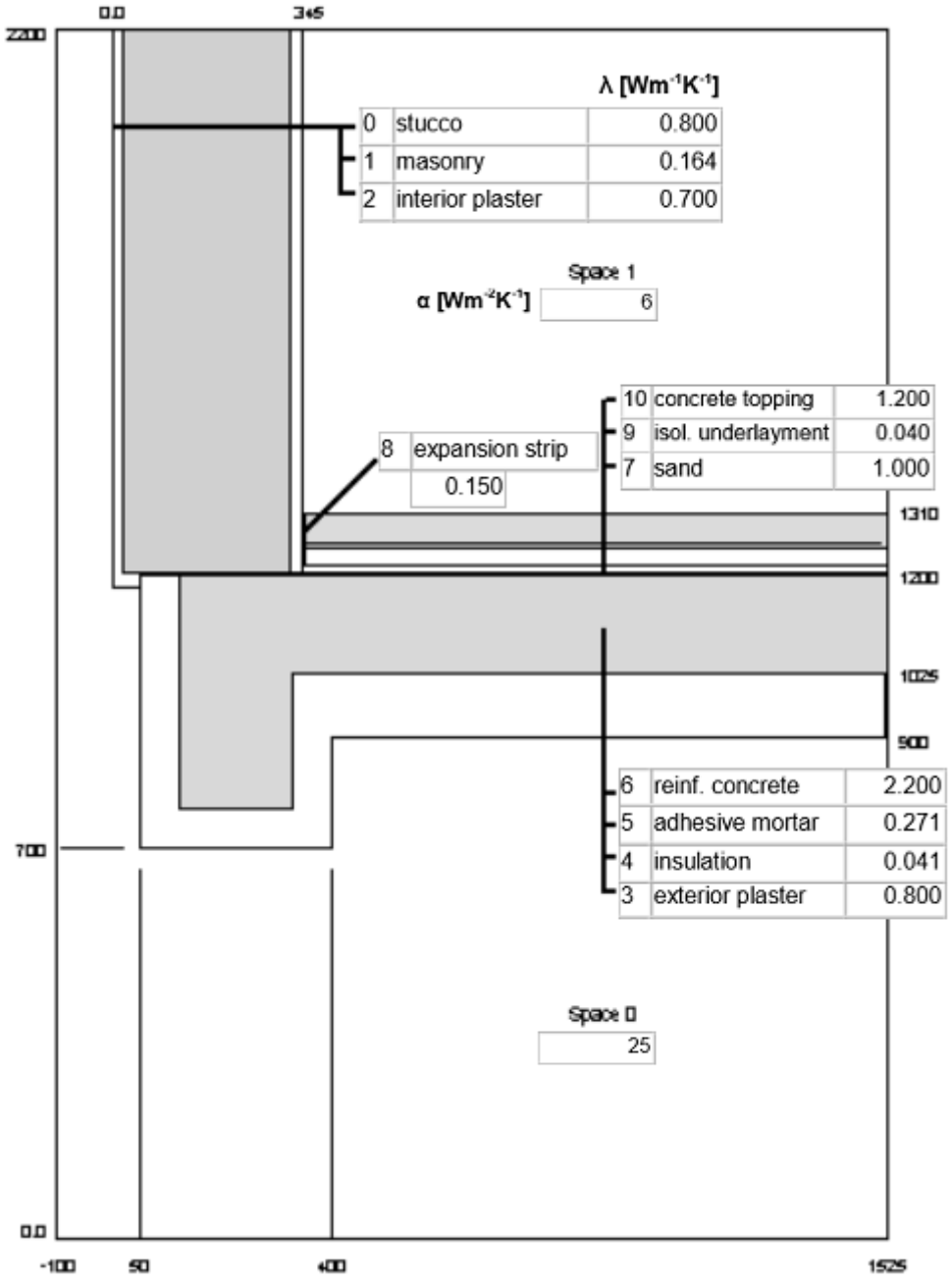
Manual

Instructions for working with AnTherm

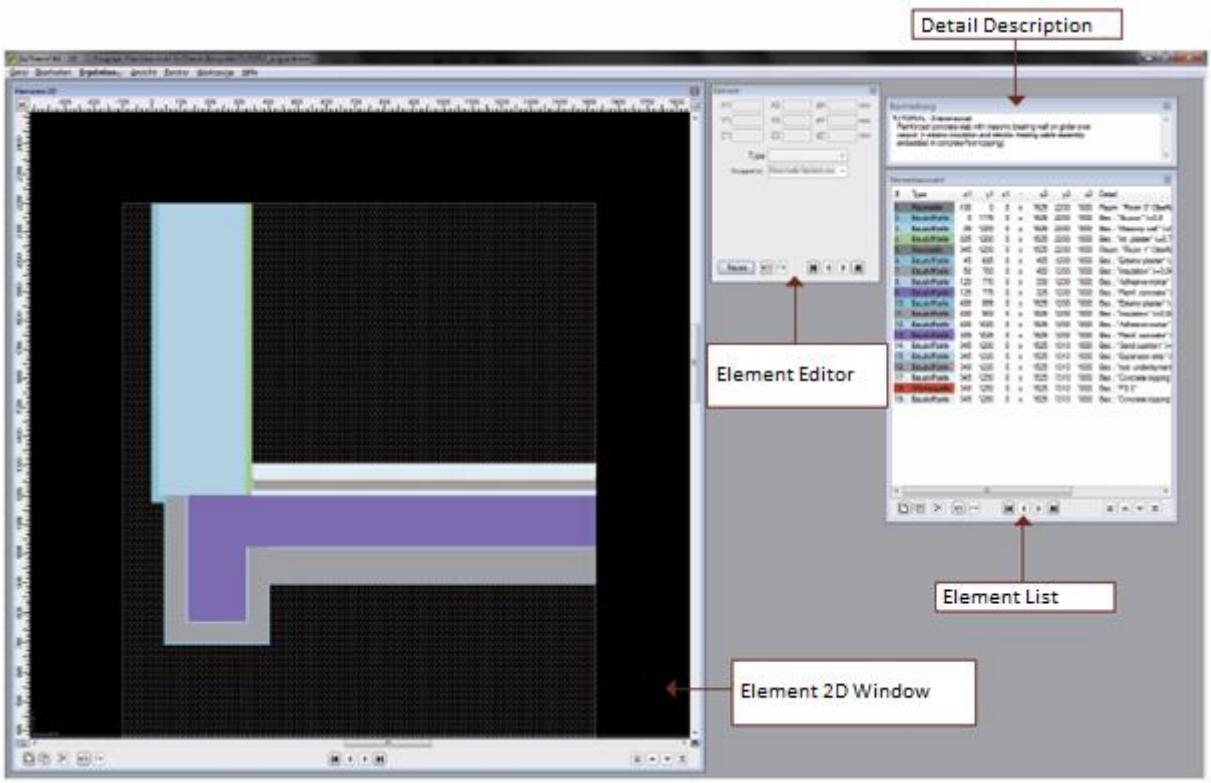
Step 1: two-dimensional evaluation

1) Preparations

Before starting to work with the program it may be useful to draw a sketch of the building components that provides all relevant data: dimensions, reference coordinates, material properties.

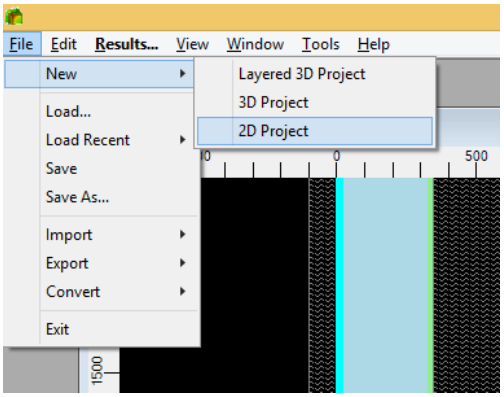


As soon as the program has been started from the start menu **Start** → **Programs** → **AnTherm** the program windows are displayed in standard configuration. At first the most recently saved detail is shown. Upon first execution AnTherm displays an example.

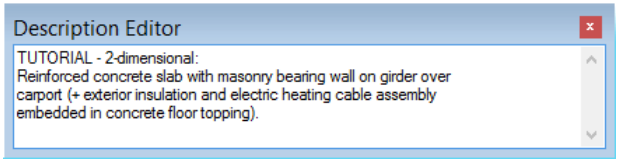


The Element 2D Window, the element list and the element editor constitute the central user interface where the user enters and edits the building components. It shows a two-dimensional section of the building components. The elements are displayed in their order of appearance in the element list. Due to this, the effect of an overlapping of several elements is immediately visible.

2) New Project – Building Components



Choose **File → New → 2D Project**



Enter a description of the current project in the window “Description Editor“. The text entered here is displayed in the headlines of all text reports of the program.

Note: The individual components are entered in the “Element” window using a coordinate system. Elements covered due to overlapping are not considered in the calculation and not displayed.

Start by entering the lowest layer, the outer space:

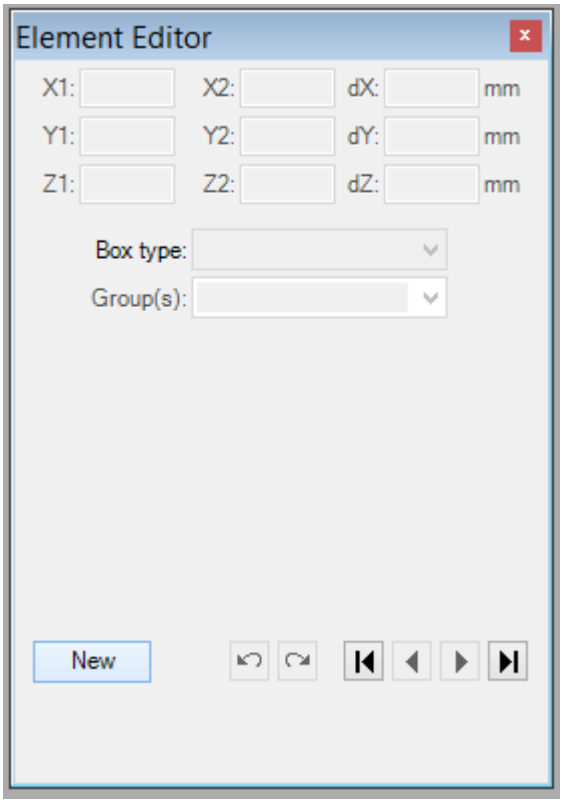
Click the button “New” in the Element window. A new, empty element is displayed in the element list and in the Element 2D window.

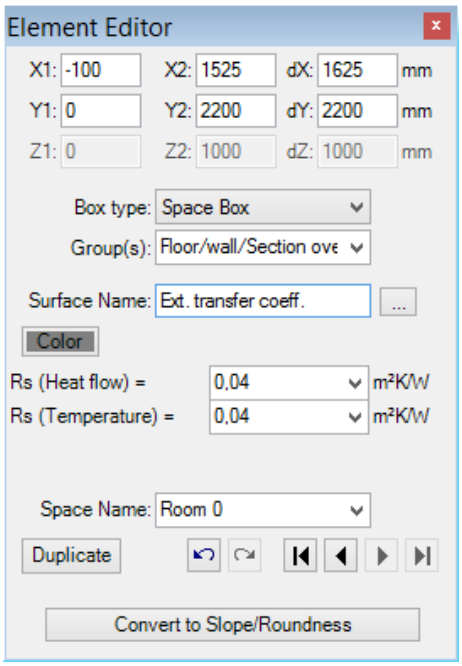
Element 1 should cover the entire model and have the following coordinates:

X1: -100 X2: 1500
Y1: 0 Y2: 2200

Use the <TAB> key to switch from an input field to the next one.

Then determine the type of element, in this case it is a space box.





Now enter the surface description, e.g. “Exterior surface“.

For this example, enter 0.04 in the input field “Rs“. In general, the following recommendations apply to the Rs values:

1. Rs (Heat flow)
The values can be found in Table 1 of EN ISO 6946:

Exterior	… 0.04 (always)
Interior	… horizontal heat flow: 0.13
	… upwards heat flow: 0.10
	… downwards heat flow: 0.17

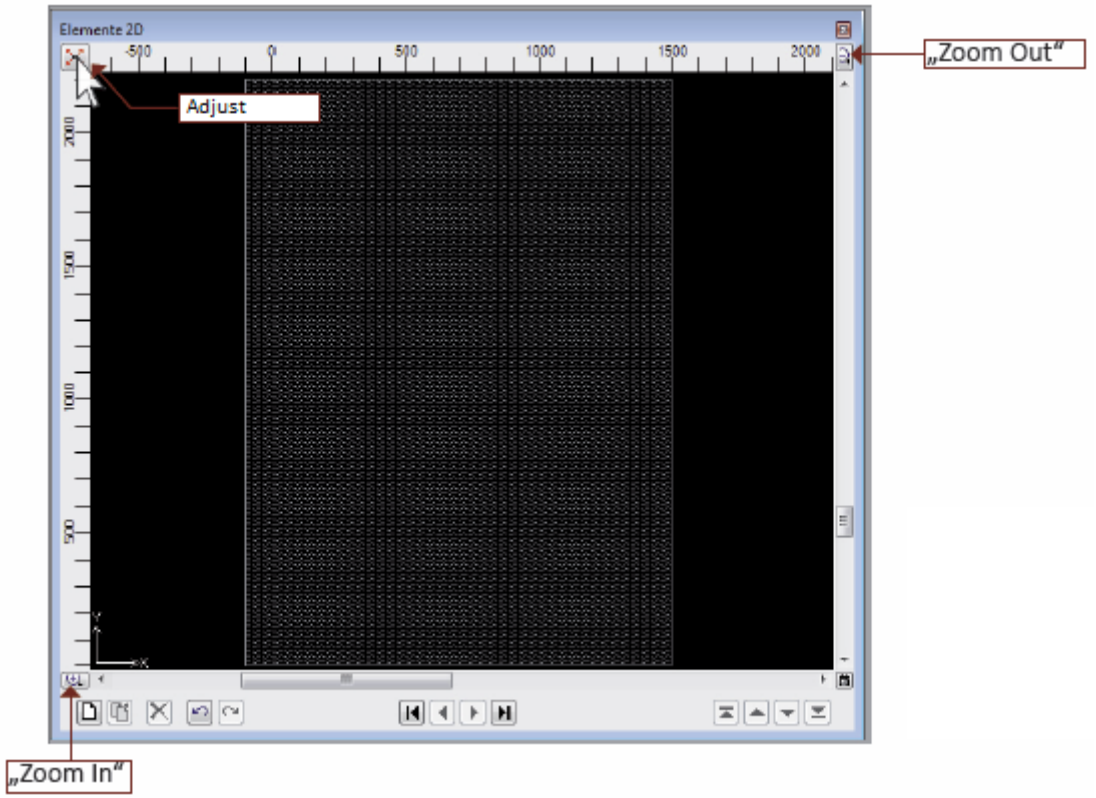
2. Rs (Temperature)
The values can be found in a table of EN ISO 13788:

Exterior	… 0.04 (always)
Interior	… for glass and borders: 0.13
	… for all other surfaces: 0.25

Note: If the Rs value is unknown, you can use one of the standardized, pre-defined surfaces. Click the button right to the input field and go to the library window “Materials & Surfaces”.

Denote the space as „exterior“, *this will be used later for temperature boundary conditions.*

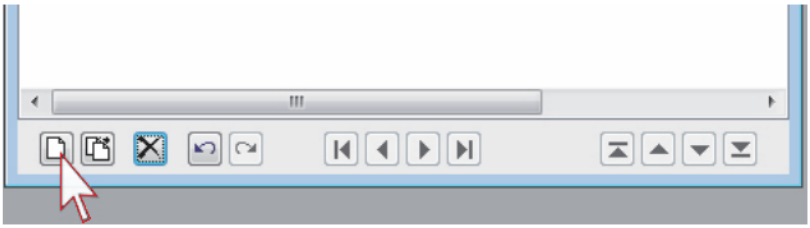
As soon as you confirm what you entered, the input of the first element is complete, and the program is ready for the input of the next element.



To get a better view of the detail in the “Elements 2D Window” you can scale the view or adjust the display options.

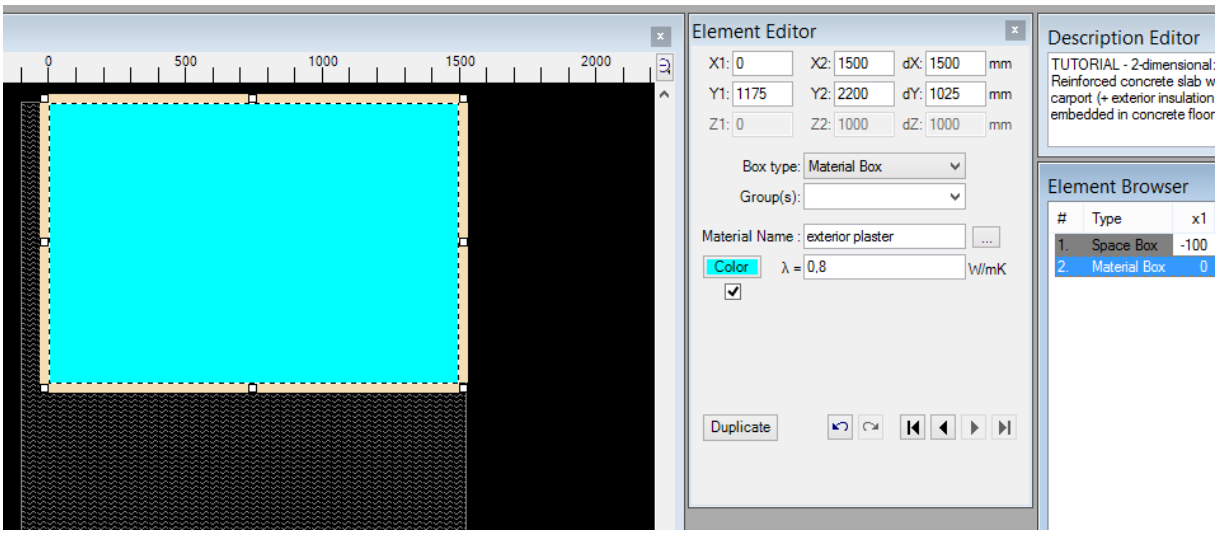
Hint: Before proceeding to the input of the building components, you should think about the order of the elements in order to take advantage of the possibilities to make elements overlap. To explain this principle the demo example has been divided into components with parallel material layers. This dramatically simplifies the input of the coordinates.

To select the next element click “New” in the Element Selection Window.



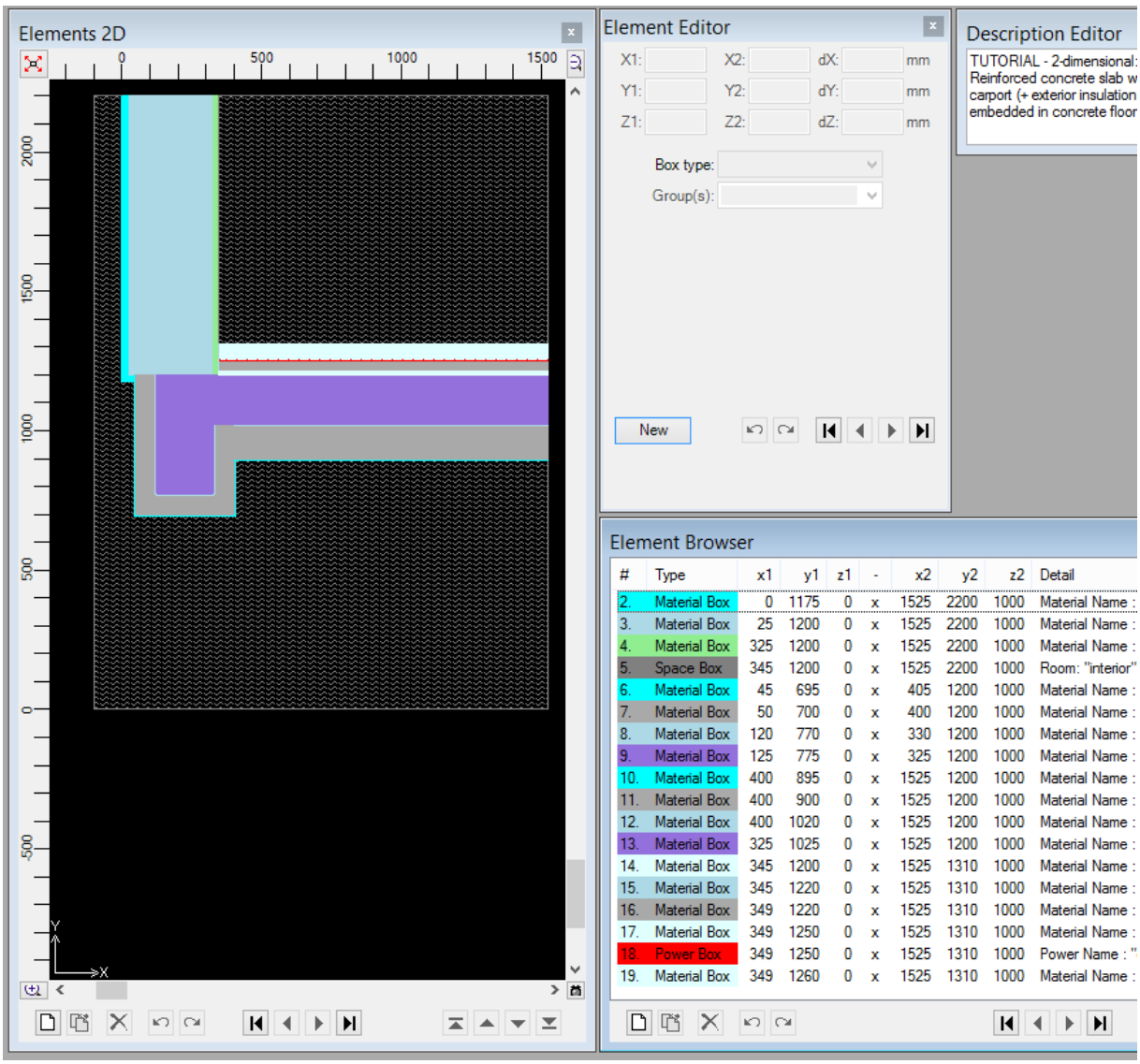
The first part to be entered is the wall structure. The “onion sequence” starts with the outmost layer as the second element of the building component:

X1: 0 X2: 1500
Y1: 1175 Y2: 2200

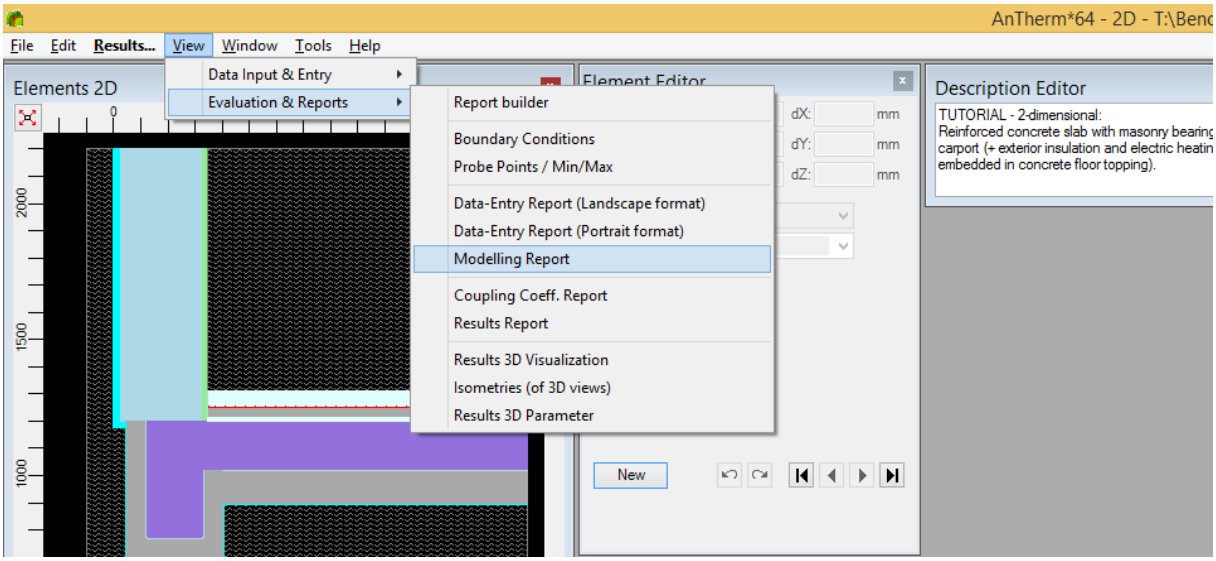


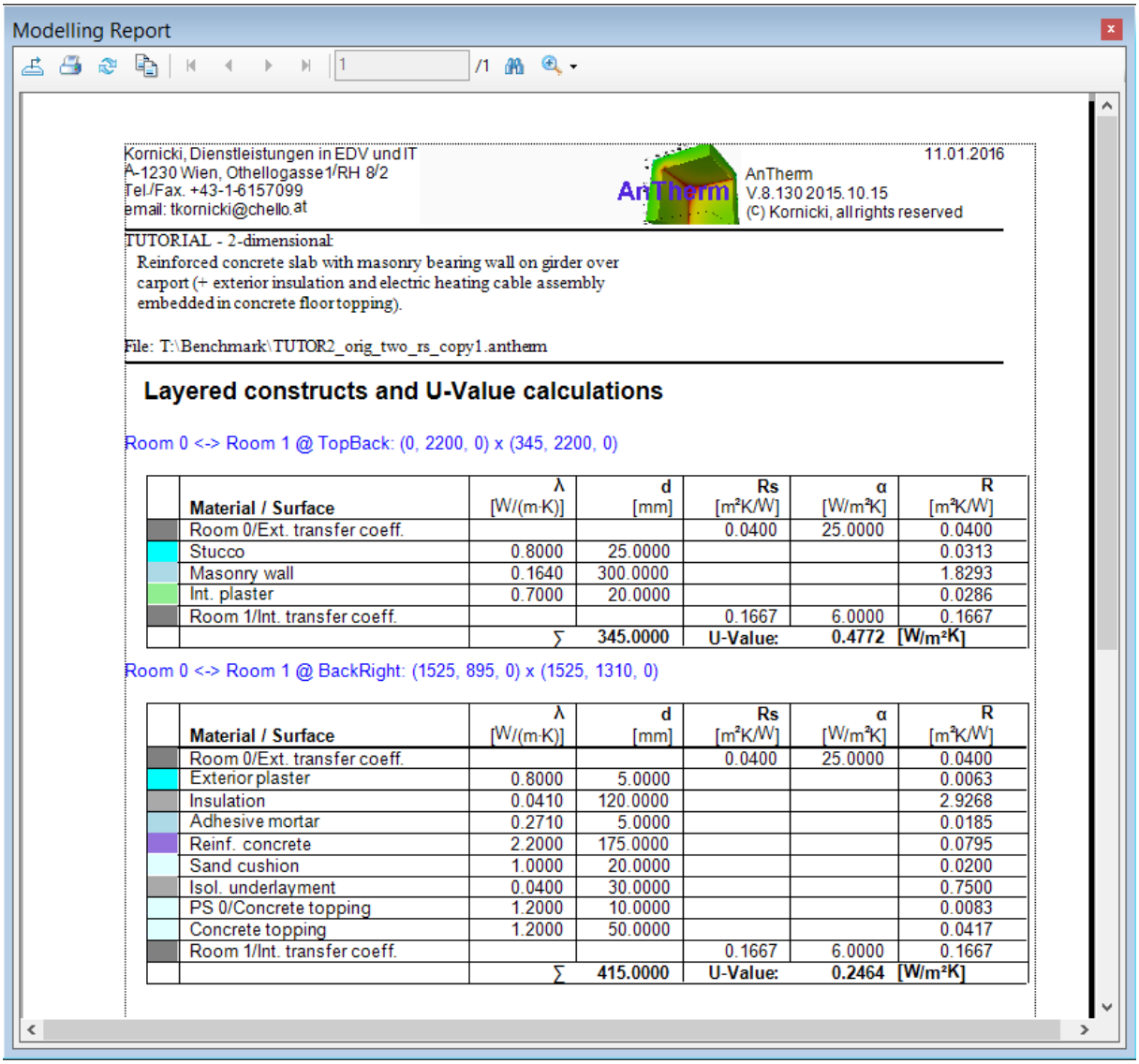
This time enter “Material box” as the “Element Type“. In the field “Material name” enter “plaster”. “Lambda” should be assigned a value of “0.8”.

Repeat this until the building components are finished.



For the first significant results (building component properties and U values) and to check the input go to: **View → Evaluation&Reports → Modelling Report**





Modelling Report

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11.01.2016
AnTherm
V.8.130.2015.10.15
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TUTORIAL - 2-dimensional:
Reinforced concrete slab with masonry bearing wall on girder over carport (+ exterior insulation and electric heating cable assembly embedded in concrete floor topping).

File: T:\Benchmark\TUTOR2_orig_two_rs_copy1.antherm

Layered constructs and U-Value calculations

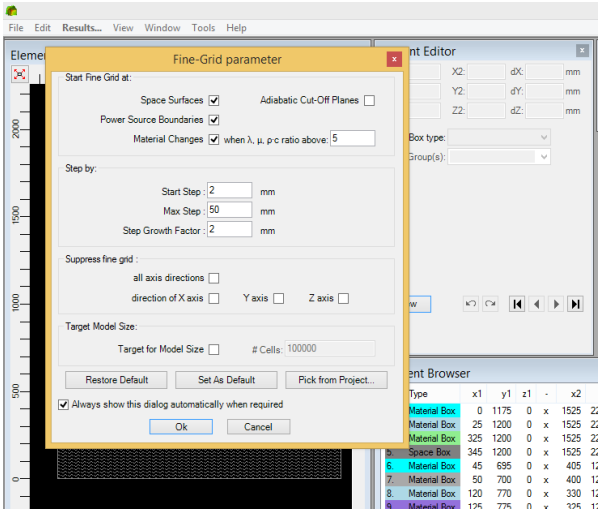
Room 0 <-> Room 1 @ TopBack: (0, 2200, 0) x (345, 2200, 0)

Material / Surface	λ [W/(m·K)]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]
Room 0/Ext. transfer coeff.			0.0400	25.0000	0.0400
Stucco	0.8000	25.0000			0.0313
Masonry wall	0.1640	300.0000			1.8293
Int. plaster	0.7000	20.0000			0.0286
Room 1/Int. transfer coeff.			0.1667	6.0000	0.1667
	∑	345.0000	U-Value:	0.4772	[W/m²K]

Room 0 <-> Room 1 @ BackRight: (1525, 895, 0) x (1525, 1310, 0)

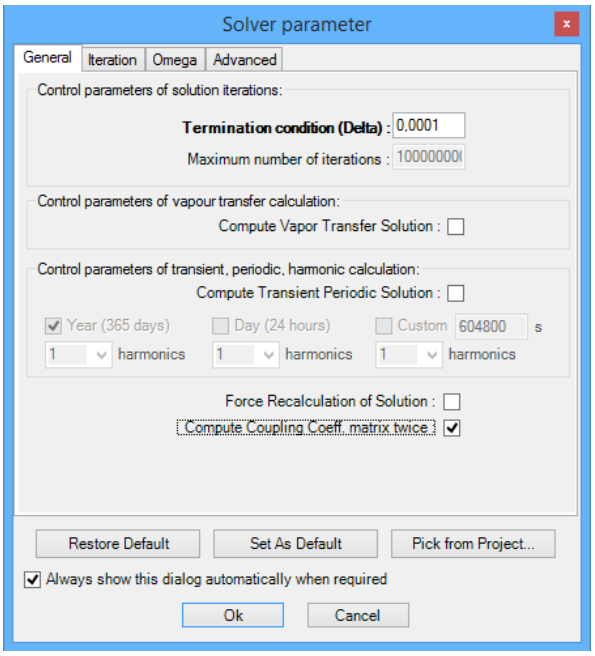
Material / Surface	λ [W/(m·K)]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]
Room 0/Ext. transfer coeff.			0.0400	25.0000	0.0400
Exterior plaster	0.8000	5.0000			0.0063
Insulation	0.0410	120.0000			2.9268
Adhesive mortar	0.2710	5.0000			0.0185
Reinf. concrete	2.2000	175.0000			0.0795
Sand cushion	1.0000	20.0000			0.0200
Isol. underlayment	0.0400	30.0000			0.7500
PS 0/Concrete topping	1.2000	10.0000			0.0083
Concrete topping	1.2000	50.0000			0.0417
Room 1/Int. transfer coeff.			0.1667	6.0000	0.1667
	∑	415.0000	U-Value:	0.2464	[W/m²K]

3) Results

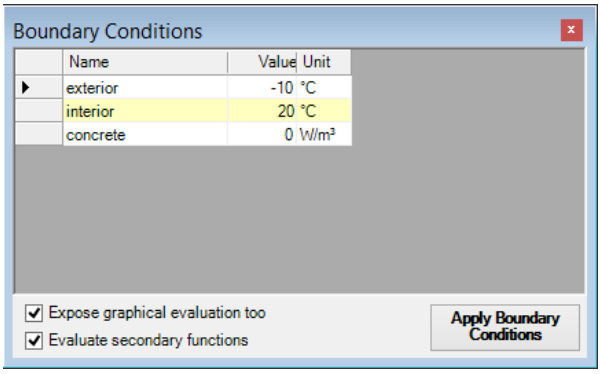


All other results require a calculation.

Click: ⟶ **Results**

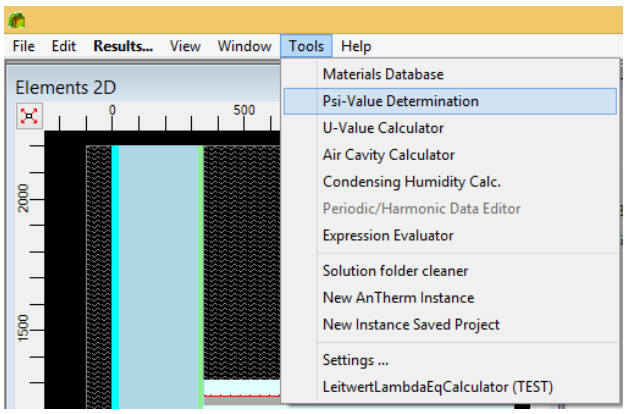


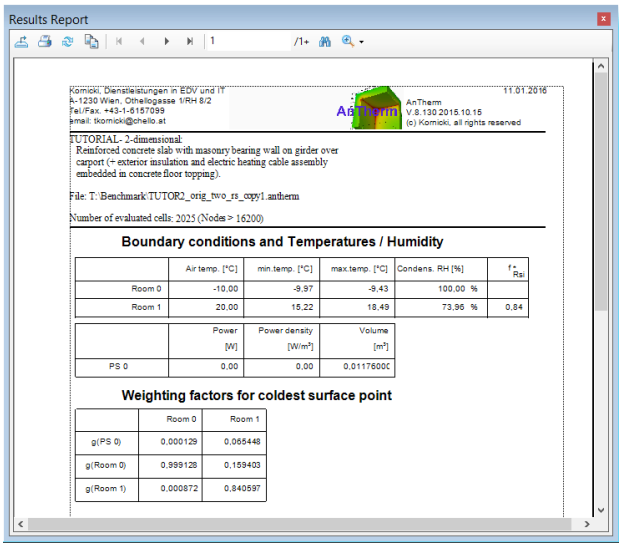
This prompts you to enter project data, fine grid and solver parameters. After a short while you also have to enter the boundary conditions. Click Ok to confirm your input. The predefined standard parameters for the fine grid and the solver are adequate for most use cases.

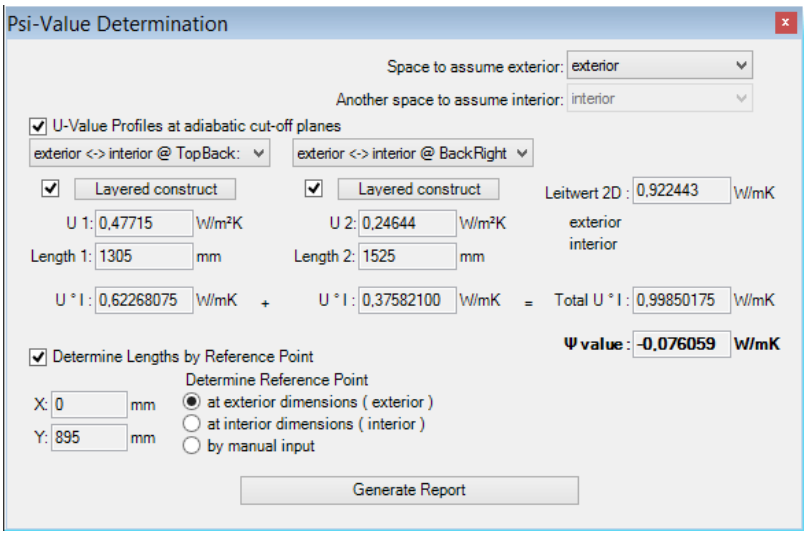


After a short period during which the temperature distribution in the building component is calculated the results are displayed in the Results report.

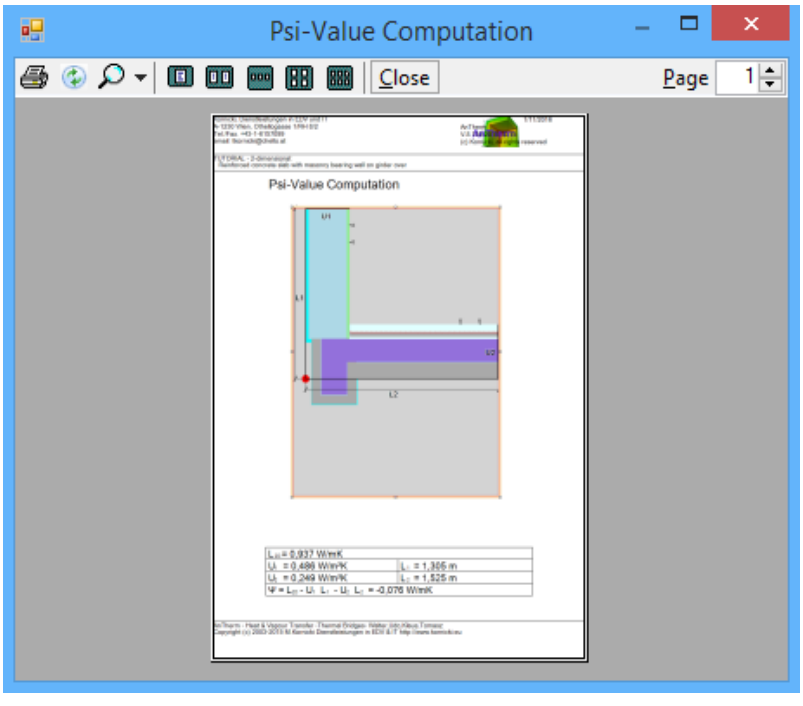
To determine the thermal bridge “Correction factor“ Psi, click: **Tools ⟶ Psi-Value Determination**





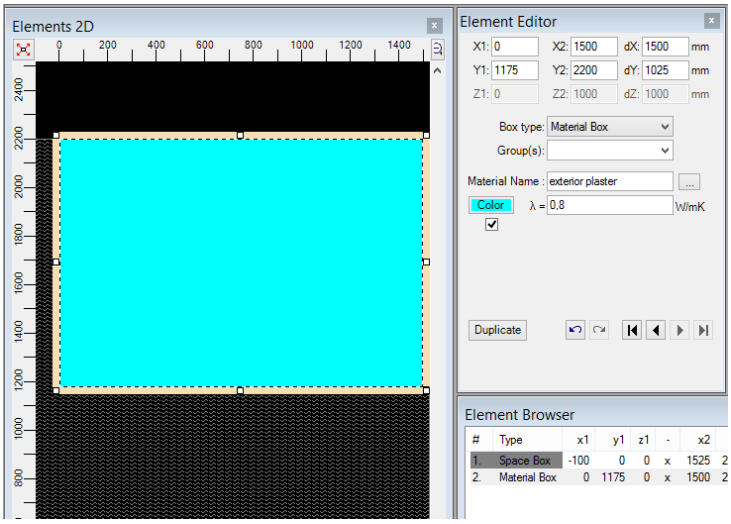


For the typical 2D cases the calculation works automatically.



The report also displays the reference point, the dimensions and the U value.

APPENDIX: How to Enter a Building Component

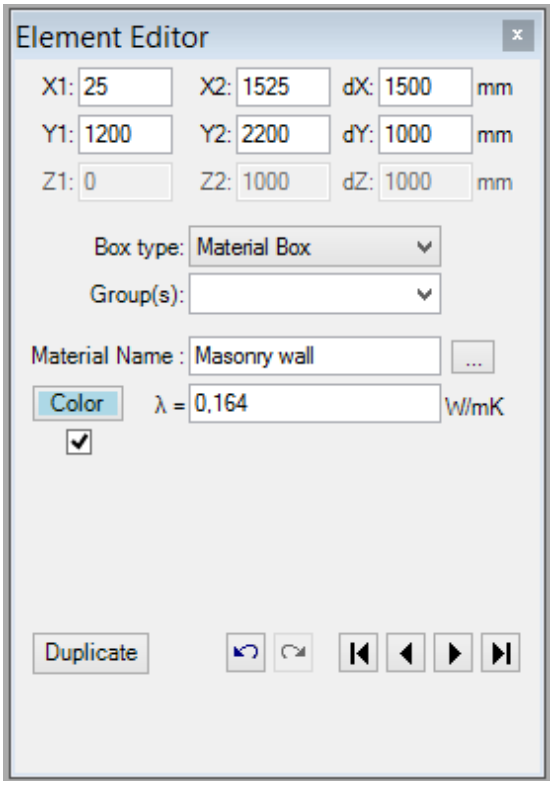


1. First enter exterior plaster and its material properties.

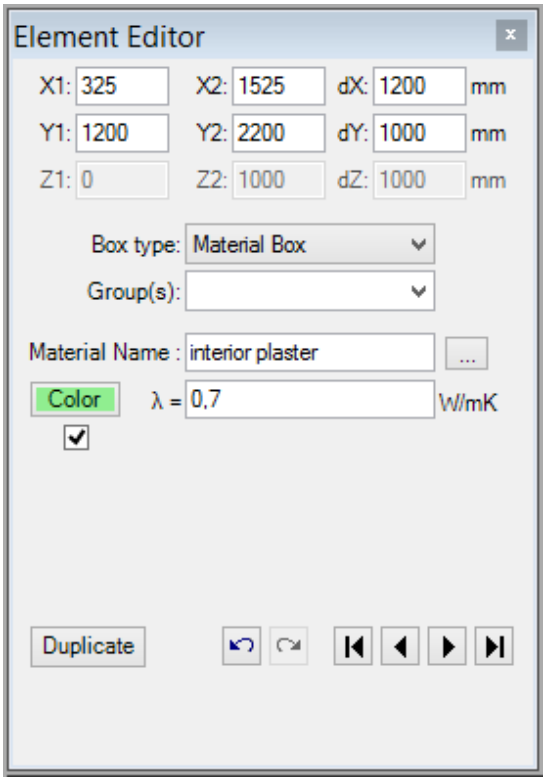
Note: The order shown here is only one of many possible ways.

Hint: Make use of the overlapping in order to minimize the entering of coordinates. Use the Elements 2D Window for a preview.

2



3



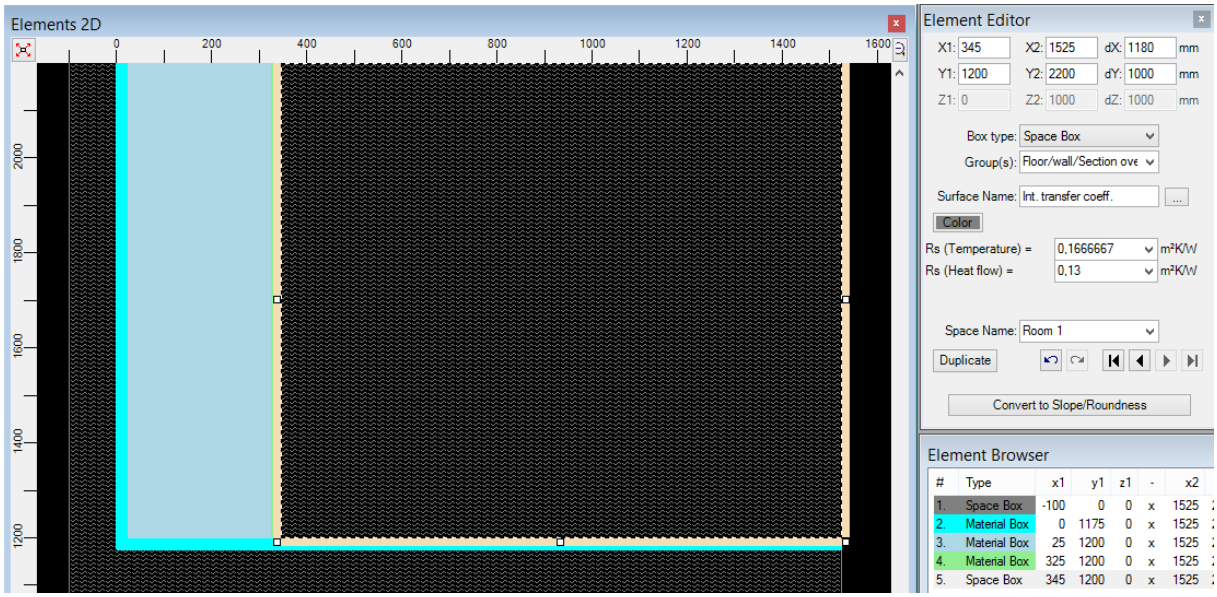
2. The next element is the masonry,

3. Followed by the interior plaster, and then comes

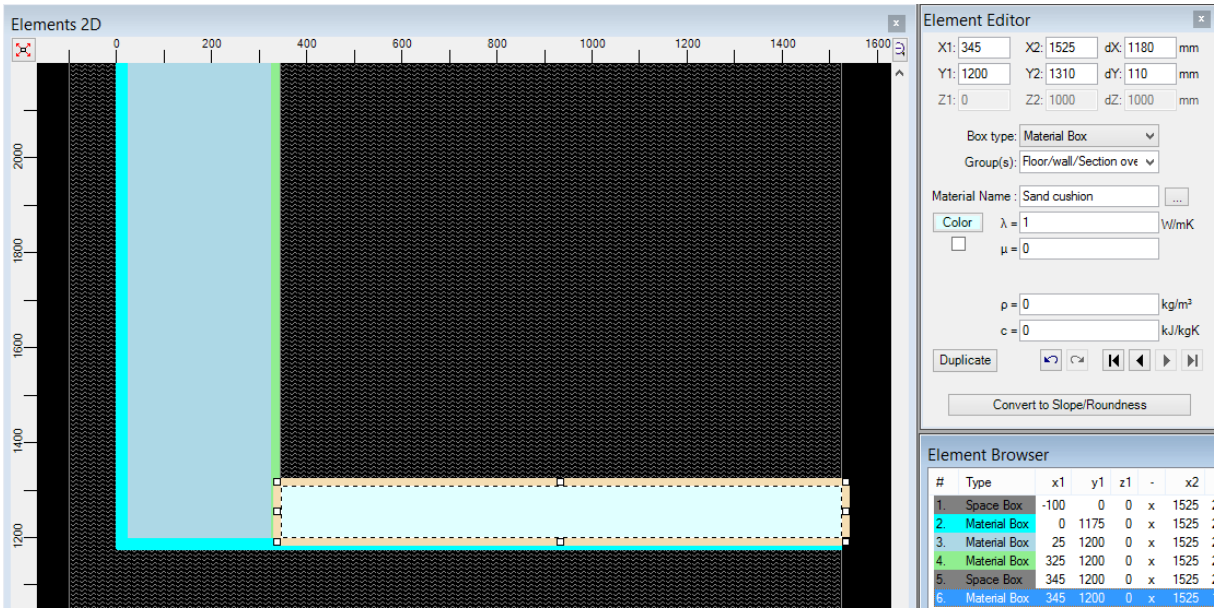
4. The interior space.

Hint: Materials and their properties can also be chosen from the materials list and the materials database. Click the symbol right to “Material Name“.

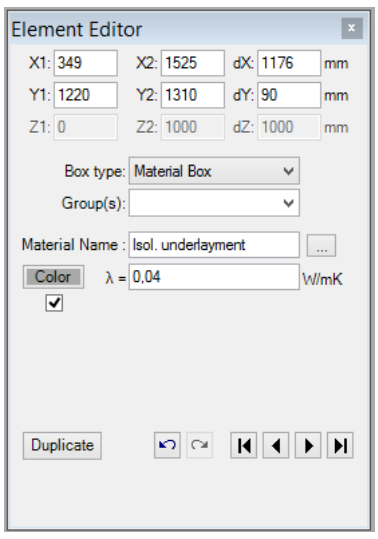
4


Elements 2D
Element Editor
X1: 345 X2: 1525 dX: 1180 mm
Y1: 1200 Y2: 2200 dY: 1000 mm
Z1: 0 Z2: 1000 dZ: 1000 mm
Box type: Space Box
Group(s): Floor/wall/Section ove
Surface Name: Int. transfer coeff.
Color
Rs (Temperature) = 0,1666667 m²K/W
Rs (Heat flow) = 0,13 m²K/W
Space Name: Room 1
Duplicate
Convert to Slope/Roundness
Element Browser
Type x1 y1 z1 - x2
1. Space Box -100 0 0 x 1525
2. Material Box 0 1175 0 x 1525
3. Material Box 25 1200 0 x 1525
4. Material Box 325 1200 0 x 1525
5. Space Box 345 1200 0 x 1525

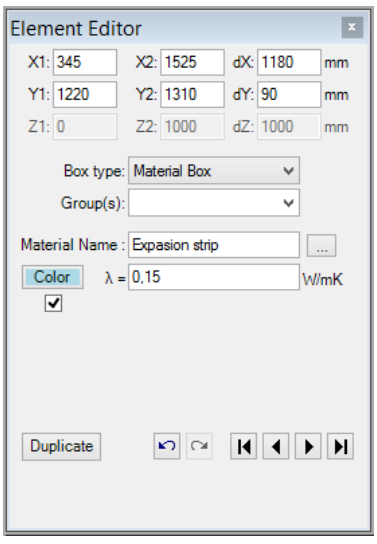
5


Elements 2D
Element Editor
X1: 345 X2: 1525 dX: 1180 mm
Y1: 1200 Y2: 1310 dY: 110 mm
Z1: 0 Z2: 1000 dZ: 1000 mm
Box type: Material Box
Group(s): Floor/wall/Section ove
Material Name : Sand cushion
Color
λ = 1 W/mK
μ = 0
ρ = 0 kg/m³
c = 0 kJ/kgK
Duplicate
Convert to Slope/Roundness
Element Browser
Type x1 y1 z1 - x2
1. Space Box -100 0 0 x 1525
2. Material Box 0 1175 0 x 1525
3. Material Box 25 1200 0 x 1525
4. Material Box 325 1200 0 x 1525
5. Space Box 345 1200 0 x 1525
6. Material Box 345 1200 0 x 1525

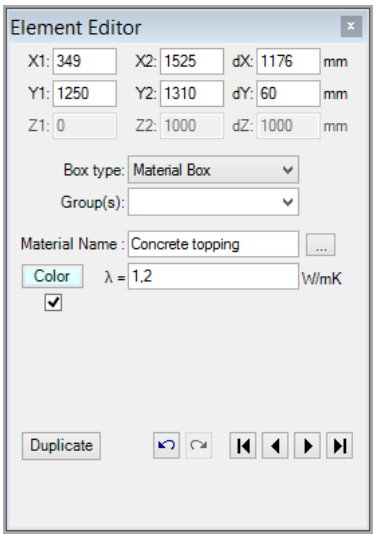
6


Element Editor
X1: 349 X2: 1525 dX: 1176 mm
Y1: 1220 Y2: 1310 dY: 90 mm
Z1: 0 Z2: 1000 dZ: 1000 mm
Box type: Material Box
Group(s):
Material Name : Isol. underlayment
Color
λ = 0,04 W/mK
Duplicate

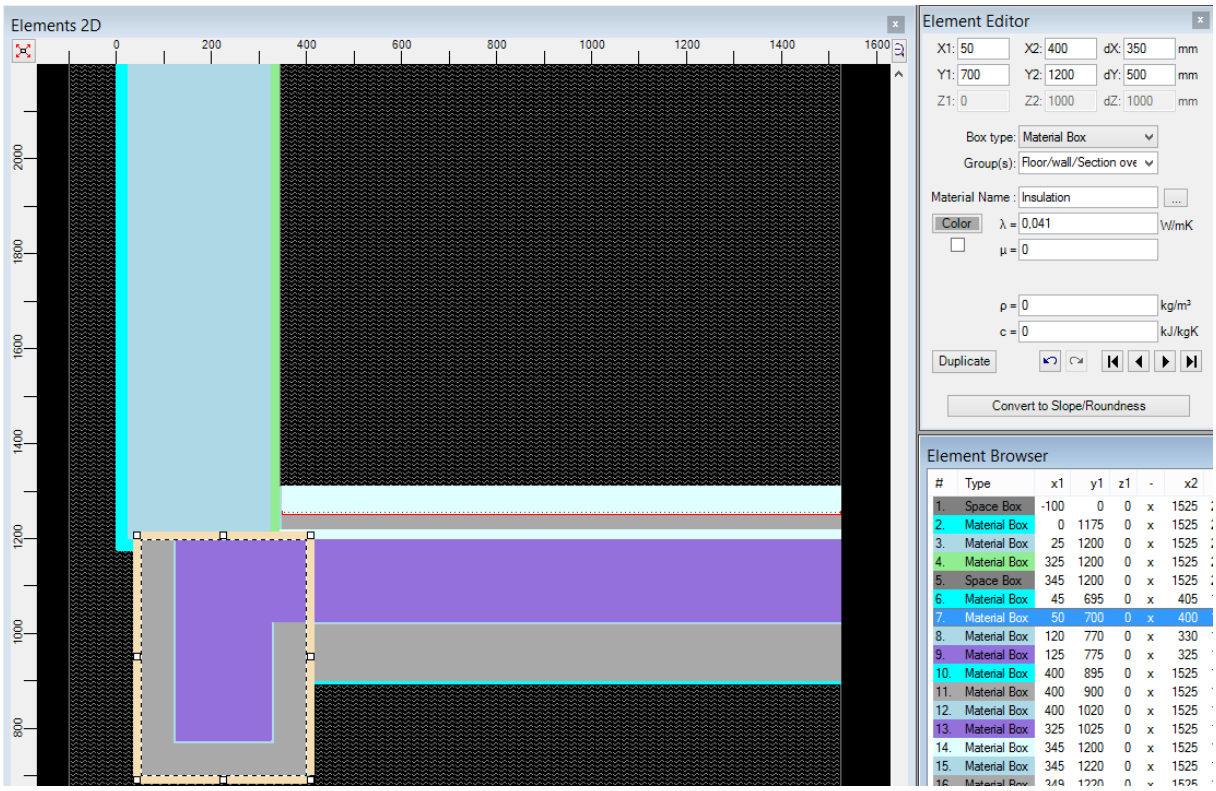
7


Element Editor
X1: 345 X2: 1525 dX: 1180 mm
Y1: 1220 Y2: 1310 dY: 90 mm
Z1: 0 Z2: 1000 dZ: 1000 mm
Box type: Material Box
Group(s):
Material Name : Expasion strip
Color
λ = 0,15 W/mK
Duplicate

8


Element Editor
X1: 349 X2: 1525 dX: 1176 mm
Y1: 1250 Y2: 1310 dY: 60 mm
Z1: 0 Z2: 1000 dZ: 1000 mm
Box type: Material Box
Group(s):
Material Name : Concrete topping
Color
λ = 1,2 W/mK
Duplicate

9



Now enter the following elements in this order:

5. Sand

6. Isol. underlayment

7. Expansion strip

8. Concrete topping

9. Thermal insulation and finally reinforced concrete

Thermal bridge & Vapor diffusion Program AnTherm Version 8

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