

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** \rightarrow **Programs** \rightarrow **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



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.

Element Edito	or		×
X1:	X2:	dX:	mm
Y1:	Y2:	dY:	mm
Z1:	Z2:	dZ:	mm
Box type:		~	
Group(s):		~	
New	2	I	H

Element Edito	or				×			
X1: -100	X2: 1	525	dX:	1625	mm			
Y1: 0	Y2: 2	200	dY:	2200	mm			
Z1: 0	Z2: 1	000	dZ:	1000	mm			
Box type:	Box type: Space Box 🗸							
Group(s):	Floor/	wall/Sec	tion o	ove 🗸]			
Surface Name:	Ext.tr	ansfer co	oeff.					
Color								
Rs (Heat flow) =		0.04		¥	m²K/W			
Rs (Temperature) =	0,04		~	m²K/W			
Space Name:	Room	0		~				
Convert to Slope/Roundness								

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	N)
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 (Tempera	ature)
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.

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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:

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

	× A	Element Editor X1: 0 X2: 1500 dX: 1500 Y1: 1175 Y2: 2200 dY: 1025 Z1: 0 Z2: 1000 dZ: 1000	x mm mm mm	Description Editor TUTORIAL - 2-dimensional: Reinforced concrete slab w carport (+ exterior insulation embedded in concrete floor
		Box type: Material Box ✓ Group(s): ✓ Material Name : exterior plaster Color λ = 0.8]]]] W/mK	Element Browser # Type x1 1. Space Box -100 2. Material Box 0
		Duplicate no a K 🕻		

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 \rightarrow Evaluation&Reports \rightarrow Modelling Report

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carp	ort (+ exterior insulation and elect	ric heating cable assem	ably				
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Roon	Senchmark\TUTOR2_orig_two_ yered constructs and 0 <-> Room 1 @ TopBack: (0 Material / Surface Room 0/Ext. transfer coeff. Stucco Masonry wall Int. plaster Room 1/Int. transfer coeff. 0 <-> Room 1 @ BackRight: (0 Material / Surface Room 0/Ext. transfer coeff. Exterior plaster Insulation Adhesive mortar Reinf. concrete Sand cushion Isol. underlayment PS 0/Concrete topping Concrete topping Room 1/Int. transfer coeff.	<u>I U-Value calcu</u> <u>I U-Value calcu</u> (2200, 0) x (345, 220 <u>λ</u> [W/(m-K)] 0.8000 0.1640 0.7000 <u>Σ</u> (1525, 895, 0) x (1525 <u>λ</u> [W/(m-K)] 0.8000 0.0410 0.2710 0.2710 0.2710 1.0000 1.2000 1.2000 <u>Σ</u>	Jlations 00, 0) d [mm] 25.0000 300.0000 20.0000 345.0000 5, 1310, 0) d [mm] 5.0000 120.0000 120.0000 120.0000 120.0000 175.0000 10.0000 30.0000 415.0000	Rs [m²K/W] 0.0400 0.1667 U-Value: Rs [m²K/W] 0.0400 0.0400 0.0400 0.0400	0 [W/m ² K] 25.0000 0.4772 0 [W/m ² K] 25.0000 0.2464	R R [m²K/W] 0.0400 0.0313 1.8293 0.0286 0.1667 [W/m²K] 0.0400 0.0400 0.0633 2.9268 0.0185 0.0795 0.0200 0.7500 0.0083 0.0417 0.1667 [W/m²K] 0.0417	



Solver parameter

Termination condition (Delta): 0.0001

Maximum number of iterations : 10000000

Compute Vapor Transfer Solution :

 Year (365 days)
 Day (24 hours)
 Custom
 604800
 s

 + harmonics
 1
 harmonics
 1
 harmonics

Force Recalculation of Solution : Compute Coupling Coeff. matrix twice :

Pick from Project...

Set As Default

Ok Cancel

General Iteration Omega Advanced

Restore Default

Always show this dialog automatically when required

Control parameters of solution iterations:

Control parameters of vapour transfer calculation

Control parameters of transient, periodic, harmonic calculation:

3) Results

All other results require a calculation.

 $\mathsf{Click} : \to \mathbf{Results}$

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.

Name	Value	Unit		
exterior	-10	°C		
interior	20	°C		
concrete	0	W/m ³		

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 \rightarrow Psi-Value Determination

1						
File	Edit	Results	View	Window	Tools	Help
Elou	mont	- 20				Materials Database
ciei	nents	0		500		Psi-Value Determination
		ΙĬΙ				U-Value Calculator
-						Air Cavity Calculator
- -						Condensing Humidity Calc.
<u>8</u> -						Periodic/Harmonic Data Editor
-						Expression Evaluator
						Solution folder cleaner
_						New AnTherm Instance
-20						New Instance Saved Project
- II						Settings
-						LeitwertLambdaEqCalculator (TEST)

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	Komicki, Dienstlik A-1230 Wien, Of Fel/Fax, +43-1-6 amail: tkomicki@ IUTORIAL-2- Reinforced con carport (+ exte embedded in c File: T:\Benchm	listunger helloges 157099 chello.et dimensia acrete sla rior insu oncrete f ark\TUT	onal: ab with n lation an loor topp 'OR2_ori	und 14 assonry bea d electric h ing). g_two_rs_	aring wall on girder eating cable assemt copy1.antherm	AG	AnTherm V.8.1302015.10.15 (c) Komicki, all rights	11.01.2	516
Number of evaluated cells: 2023 (Nodes > 16200) Boundary conditions and Temperatures / Humidity									
		Room 0		-10.00	-9,97	-9,43	100.00 %	RSI	
		Room 1		20,00	15,22	18,49	73,96 %	0.84	
	Power Power density Volume [M] [Wim ²] [m ²] PS 0 0.00 0.0117600C								
Weighting factors for coldest surface point									
	g(PS 0)	0	.000129	0,05	5448				
	g(Room 0)	0	.999128	0,15	9403				
<	artoom i)		.000072	0,041					~

Psi-Value Determination			×
Space to assume exterio	or: exterior		~
Another space to assume interio	or: interior		\vee
exterior <-> interior @ TopBack: V exterior <-> interior @ BackRight V			
Layered construct Layered construct	eitwert 2D :	0,922443	W/mK
U 1: 0,47715 W/m²K U 2: 0,24644 W/m²K Length 1: 1305 mm Length 2: 1525 mm	exterior interior		
U°I:0,62268075 W/mK + U°I:0,37582100 W/mK =	Total U ° I :	0,99850175	W/mK
✓ Determine Lengths by Reference Point	Ψvalue:	-0,076059	W/mK
Determine Reference Point			
X: 0 mm • at exterior dimensions (exterior)			
Y: 895 mm by manual input			
Generate Report			

For the typical 2D cases the calculation works automatically.

Psi-Value Computation	– 🗆 🗙
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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	Element Editor				2	Element Editor			
2	X1: 25	X2: 1525	dX: 1500	mm		X1: 325	X2: 1525	dX: 1200	mm
	Y1: 1200	Y2: 2200	dY: 1000	mm		Y1: 1200	Y2: 2200	dY: 1000	mm
	Z1: 0	Z2: 1000	dZ: 1000	mm		Z1: 0	Z2: 1000	dZ: 1000	mm
	Box type	Material Box	~			Box type	: Material Box	~	
	Group(s)	:	~			Group(s)	:	~	
	Material Name	: Masonry wall				Material Name	: interior plaster		
	Color λ = 0,164 W/mK					Color λ	= 0,7		W/mK
	Duplicate	5	H I)			Duplicate	N (14	K))I

- 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".





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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