

Heatmod 7.0 User Guide

Version 1.0



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Introduction

Online calculation tool *Heatmod 7.0* (<u>http://www.heatmod.lv</u>) use the same mathematical algorithms as for monthly and annual energy consumption, also for the determination of heating/cooling power, replacing the average temperatures with the minimum (in case of heating) un maximum (in case of cooling) values, thus, simulating regime at highest possible temperature difference. Therefore, a power needed to provide the set indoor temperature in extreme outdoor conditions is calculated.

Calculation tool landing page (**Figure 1**) has a small description, ability to log in for registered users, change languages (currently 2 languages are supported – English and Latvian), create new project, read the terms and conditions and register for the usage.

For **public users** (**Figure 1**), one can use all the features of the tool to make calculation only for one project and its related data within the session. After leaving the web page session and all its data will be lost.

For **registered users** (**Figure 2**), one can save and use unlimited number of projects, constructions, materials and climate data cities, in addition to group and tag all the data for more convenient usage.



Figure 1 Heatmod 7.0: landing page for public user.



Main structure & features

The program structure consists of such main choices:

- **Projects** (Figure 3), where all user-generated calculations are created, copied or deleted. Typically, one project corresponds to one building with defined set of parameters, every change of them (e.g., replacing the windows or insulation of walls) should be stored as a new project with following grouping feature. One project contains data and results for both heating and cooling seasons. In addition, user can join multiple projects for comparison reason, also add tags, tag projects to them, archive or export projects.
- **Constructions** (Figure 4) with user-set thermal transmittance values (*U*-values) and more complex composite building structures, whose *U*-values are calculated (Figure 5) based on material parameters (thickness and thermal conductivity). Constructions may be connected to a specific project, or they may not be related to them in that case, the created construction can be used for calculation in any project.
- **Materials Database** (**Figure 6**), in which the data from the Latvian Building Code LBN 002-19 are collected in a grouped form. The user also has the possibility to create his own materials and group them in a free form by specifying the name and the value of the thermal conductivity.
- **Common Data** (**Figure 7**) is for different cities in Latvia containing information about monthly average outdoor temperatures, solar irradiation for different orientations. There is also Latvian statistics on average consumption of different type of buildings. In addition, user can add its own custom cities and related climate data for it.
- **My Profile** (**Figure 8**) is for saving user profile data, change password and manage some default values for projects.

The interface of the calculation tool is divided into some parts (**Figure 9**). At the top there are described main menu with following short path. In the left part there are 3 top-level items – the project level, engineering systems level and the building construction level. The right part displays all the information about selected top-level item, allowing enter and view the content.

Heatmod 7.0

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Building Energy Efficiency Calculation Program

Projects 📫 Construction	ns 🍵 Material Database 🐁 Common Data		My Profile	🛒 Logout
Projects			Welcome	e, John Smith!
 2022. AST (x4) (4) 2022. Aalborga konf. (14) 	2023.04.LU.Ratnieki.Stallis(viesnica) (2)	af Archive	Delete	^
	🔁 2023.02.RCT.M-1.Esoss (2)	a Archive	Delete	
 № 2021. AST (4) № 2021 (21) 	🔁 2023.02.RCT.P-5.Esoss (3)	a Archive	Delete	
2020 (11) 2019. Kamsenes (11)	🔁 2023.02.RCT.N-7.Esoss (3)	at Archive	Delete	
	🔁 2022.12.Vesetas 7 (Rietumu banka) (6)	at Archive	Delete	
© 2018.EM. J. 7.Vie (4)	🍃 AST. Brocēni. 3-Garaža-3v (3)	at Archive	Delete	
≫ 2018.EM. J. 6.Ti (4) ≫ 2018.EM. J. 5.Ār (4)	🎦 AST. Brocēni. 2-Garaža-4v (3)	at Archive	Delete	
> 2018.EM. J. 4.Iz (4)	🔁 AST. Brocēni. 1-Admin. KOKA VĀRTU NOMAIŅA (4) 🖺	at Archive	Delete	
≥018.EM. J. 2.DDz (4)	🔁 AST. Dārzciema86. Esošs (4)	at Archive	Delete	
 2018.EM. J. 1.VDz (5) 2018.EM. E. 16.Ra-nE (6) 	🏠 2022.03. VaiņodesBekons - 4B - Kopija no 'oskars.pulkis@gr 🛛 🖺	at Archive	Delete	
2018.EM. E. 15.Ra-E (7) 2018.EM. E. 14.Vie-nE (5)	🏠 2022.03. VaiņodesBekons - 4A - Kopija no 'oskars.pulkis@gr 🛛 🖺	at Archive	Delete	
© 2018.EM. E. 13.Vie-E (6)	🏠 2022.08. Turaidas 34A 👘	at Archive	Delete	
 >> 2018.EM. E. 12.TI-nE (6) >> 2018.EM. E. 11.TI-E (9) 	Aalborga konf. 40(RCP8.5) (2)	at Archive	Delete	
2018.EM. E. 10.Ār-nE (11) 2018.EM. E. 9.Ār-E (11)	▲ Aalborga konf. 40(RCP4.5)	Archive	Delete	
		af Archive	Delete	•

Figure 3 Heatmod 7.0: project and group level.

nn 🏠 Projects 🌸 Constructions	🗊 Materials Database 🐁 Common Data		🚨 Му	Profile 🗾 Logout
Constructions				Welcome, John Smith!
AST Brocāni 1-Admin - SS (0)		0.3130		•
▲ 2023.02.RCT.M-1.E.(UZL-bēniņi)	🌸 2022.09.AST. Br-1. Ārsiena (40 cm mūris)	1.436	Delete	
	2022.09.AST. D86. Ārsiena pret zemi (1m dz.) + S	0.3597	📄 😑 Delete	
	🌸 2022.09.AST. D86. Ārsiena (18 cm betons + 15 cm	0.1987	🖻 😑 Delete	
	2022.09.AST. D86. Ārsiena pret zemi (1m dz.)	0.464	🕒 😑 Delete	
▲ 2023.02.RCT.N-7.(UZL-bēniņi) (0)	🍰 2022.09.AST. D86. Siltināts jumts	0.1724	📄 💿 Delete	
2023.02.RCT.N-7.Esoss (0) 2022.12.Vesetas 7 (Rietumu	🌸 2022.09.AST. D86. Ārsiena (18 cm betons)	1.322	Delete	
	齢 2022.08.T34A.Grīda.	0.641	🖻 🛛 🖯 Delete	
✿ 2022.12. Raiņa 19 - UZLABOJUMI - PROJEKTAM (0)	2022.08.T34A.Jumts.20+5	0.1697	🕒 😑 Delete	
☎ 2022.12.Vesetas 7 (Rietumu banka) (0)	2022.08.T34A.Ārsiena.GB_tikai(garāža)	0.7042	🖻 😑 Delete	
⚠AST. Brocēni. 3-Garaža-3v. SILT. Ārsienas (1)	2022.08.T34A.Ārsiena.GB+15	0.1934	Delete	
⚠AST. Brocēni. 3-Garaža-3v. SILT. StiklaBloki->PVC (0)	2022.08.T34A.Ārsiena.Koks+15	0.1845	🕒 😑 Delete	
⚠ AST. Brocēni. 3-Garaža-3v (2)		0.0000		
AST. Brocēni. 2-Garaža-4v. SILT - Ārsienas (1)	2022.08.134A.Arsiena.Koks+10	0.2398		
AST. Brocēni. 2-Garaža-4v. SILT - Varti (0)	🌸 2022.08. Rītausmas. Jumts/bēniņi	0.1946	🖻 😑 Delete	
⚠ AST. Brocēni. 2-Garaža-4v (3)	🏇 2022.08. Rītausmas. Ārsiena	0.2882	🖻 🛛 🖯 Delete	

Figure 4 Heatmod 7.0: construction level.





Figure 5 Heatmod 7.0: U-value calculator at construction level.

🔒 🖓 Projects 🔹 Constructions 💿 🗈	Material Database	📥 Common Data	🚨 My	Profile	🗾 Logout
Material Database				Welcome	e, John Smith!
🔍 Metāli (12)					
Koks un materiāli uz tā bāzes (18)					
🔍 Ģipsis (3)					
🔍 <u>Java (1)</u>					
🔍 Betoni (7)					
🔍 Akmeņi (5)					
Augsnes (2)					
🔍 Ūdens, ledus, sniegs (6)					
🔍 Apmetumi (7)					
🔍 Stikli (3)					
🔍 Gāzes (5)					
🔍 Plastmasas, vietas (bez porām) (18)					
🔍 Silikoni (7)					
🔍 Gumija (4)					
🔍 Stiklojuma distanceri (4)					
Blīvēšanas materiāli (6)					



Heatmod 7.0

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Building Energy Efficiency Calculation Program

Projects	🛊 Constructions	🍵 Material Database 💁 Common Data	. 8. М	ly Profile	🗾 Logout
Calculation Parameters				Welcom	e, John Smith!
💹 LBN 003 Climate Data	-	🗞 Basic Information 🛛 🐁 Outdoor Temperature 💧 Solar Irradiation 🗞 Solar Share	ding 🔁 S	Shadings	*
Ainaži					
Alūksne					
Bauska		Normative heating days 201			
Daugavpils		Heating day 1 (°C)			
Dobele		Heating day 2 (°C)			
Gulbene		Cooling day 1 (°C)			
Jelgava					
Kolka		Cooling day 2 (°C)			
Liepāja		Average of the coldest five days (°C) -22.1			
Mērsrags		Heating season (°C)			
Pāvilosta					
Priekuļi					
Rēzekne		January (°C) -2.6			
Rīga		February (°C) -3.3			
Rūjiena		March (°C)			
Saldus					
Skrīveri		Арті (-С) 5.2			
Skulte		May (°C) 10.5			
Stende		June (°C) 14.6			
Ventspils		July (°C)			
Zīlāni					
Zosēni		August (°C) 17			
📠 Add a new city		September (°C) 12.4			-
					+

Figure 7 Heatmod 7.0: Climatic data for different locations.

nnn â Projects A Constructions 🗊 Materials Data	abase 🐧 Common Data 🛛 💍	My Profile 📑 Logout
My Profile	`	Welcome, John Smith!
User Profile Data Password Change		
User Data as an Independent Expert		
Name Surname Contact Information Registration Number	John Smith t. 987654321 ABC-12345	
 User Data as an Independent Expert's Represented Company Managing User Default Values 	9	
	⊗ Save ®	

Send Message (Question, Suggestion, Error Report, etc.)

Figure 8 Heatmod 7.0: User profile data.

Short path Ma	ain
🖌 🕂 🏠 Projects 🛊 Construction	is 🧃 Material Database 🐁 Common Data 🐁 My Profile 💐 Logou
Daudzdzīvokļu ēkas sagatave 2021 ▶ Basic Data ▶ Initia	Welcome, John Smith
🔯 Daudzdzīvokļu ēkas sagatave 2021	🔁 Basic Data 📑 Projected Consumption 📄 Calculated Consumption 😒 Model Validation 📄 Printouts
Engineering Systems 🗉	Initial Settings Building Data Building Owner Energoaudit Client Independent Expert
L Building Construction ■	Project Basic Data
Project's top- level menu	Input area

Figure 9 Heatmod 7.0: structure.



Working with projects

The project top-level menu **project** (**Figure 9**) contains all the information (input and output data) about the building that is being calculated:

- Basic data of the project, incl. initial data (name, calculation date, calculation type, building condition and life cycle, energy efficiency assessment type), building data (building type/category/usage, address, year of construction volume, number of floors, area and volume etc. (Figure 10), as well as geographic location, which is needed for reading the climatic data from the database (Figure 11). In addition, there can be added building owner, client and expert data.
- Measured (or projected) consumptions (Figure 12) are the consolidation of the consumption data entered by the user on engineering systems top-level (Figure 9). For data required for the consumption data, see section Engineering systems.
- Calculated consumptions (Figure 13), displaying calculated values for the cooling and heating by data entered by user on **building construction** top level (Figure 9). For data required for the calculation, see section **Building constructions**. Here it is also possible to visualize the calculated data using different views – by months, energy types (losses, sources), building constructions etc. (Figure 14).
- **Model validation** (**Figure 15**), showing differences between measured and calculated values. As heat balance model includes only heating and cooling balance, all other consumptions are to be entered manually (ventilation, DHW, lighting and other). Model is valid, if difference between measured and calculated values is less than 10% and not exceeding 10 kWh/m².
- **Printouts** (Figure 16), where it is possible to upload images, certificates and additional data files to be saved within active project. Here is possible also to print out all the project's input data and calculation results as temporary certificate. In addition, there can be planned building improvements and compared to other linked projects data.

🔯 Daudzdzīvokļu ēkas sagatave 2021	🔝 Basi	c Data 🛛 📰 Proj	jected Consumption	Calculated Const	umption Z Model Validation	n Printouts
🌾 Engineering Systems	Initial S	ettings Buildin	g Data Building Ov	vner Energoaudit Clie	ent Independent Expert	
🚊 Building Construction	∓ ● Build	ding Type				
				Object Type	Entire Building 🗸	. 🔞 🗉
				Building Category	Residential Building 🗸	. 🔞
				Building Use	Other 🗸	• 🔞
				Building Type	Multi-Apartment Buildings 🗸	•
	• Build	ding Data				
		Cadast	ral Designation of th	e Building or Its Part	123456789	
				Address	Brīvības 10, Kārsava	
	 Build 	ding Characteris	tics			
			Year of Initia	al Acceptance for Use	1978	
			Last Reconstruction	n/Refurbishment Year	2011	
			Number of	Above-Ground Floors	5	
			Number o	f Underground Floors	1	
				Mansard	● no 🔿 yes	_
				Roof Floor	◉ no 🔿 yes	

Figure 10 Heatmod 7.0: Basic data of the building.

🙆 Daudzdzīvokļu ēkas sagatave 2021		Number of Underground Floors	1
🖐 Engineering Systems	÷	Mansard	● no () yes
🚊 Building Construction	÷	Roof Floor Total Area	no () yes
		Reference Area Reference Volume	Ainaži Alūksne
		Average Height of Heated Spaces	Bauska Daugavpils Dobele
		 Building Inspection and Results 	Gulbene Jelgava
		Indicators are based on actual construction results	Kolka Liepāja
		Air Exchange Test Index for the Building q ₅₀ , m ³ /(m ² h) Method of Building Preparation for Testing	Mērsrags Pāvilosta Priekuļi
		Nearly Zero-Energy Building Properties	Rězekne Riga Rujiena Saldus Skrīveri Skulte
		Nearest Inhabited Place	Rēzekne V 😣 🗖
		Latitude	○ 56°

Figure 11 Heatmod 7.0: Geographic location of the building.

🔯 Daudzdzīvokļu ēkas sagatave 2021		🙍 Basic Data	Projected Consumption	Calculated Consumption	Z Model Validation	Printouts	
Engineering Systems	Ŧ	Period Yearly	Data Average Data				
L Building Construction	÷	2019 (508 2020 (399)	3 352 909 Wh) 9 423 923 Wh)				
			Send a Messa	age (question, suggestion, erro	or report, etc.)		

Figure 12 Heatmod 7.0: Measured values.

	A	L D L Translation		un al autore		- out-start
		ic Data	S ventilation -	arnai gains	Solar gains	
a Summary Data Visualization						
Total Room Volume (m ³) 6 750						
Total Heated Floor Area (m2) o soo	• Cal	culation Results				
			Average Calculation Re	esults heatin	ng day 1	~
Power	e Par	ameters				
Heating Maximum Predicted Power N _{heat} (KW) 169.8	- 101	unicers		(1.1)		
			Set temperature 1	(°C) 20		
Calculation Results	• Tota	al heat flow				
Average Calculation Results per year					w w	/m²
Heat Loss Coefficients			Heat loss flow	Φ _{loss} 19 196	6 7.678	×
W/K W/m²K			Heat gain flow	Φ _{ανία} 54.003	7 21.6	H
With Distribution H _T 4 108 1.643			Total heat fle	yann broos		
With Air Flow Hyp 2 161 0.8645			Total field fig	-34 81	-13.93	2
Total Heat Loss with Distribution						
Wh kWh/m ²						
For Heating Q _{heat,dist} 385 444 542 154.2						
For Cooling Q _{cool,dist} 468 764 409 187.5						
vTotal Heat Loss with Ventilation						
Wh kWh/m²						
For Heating Q _{heat,vent} 134 926 722 53.97						
For Cooling O	-					

Figure 13 Heatmod 7.0: Calculated values – for heating and cooling amount (left) or power (right).

Heatmod 7.0

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🙆 Daudzdzīvokļu ēkas sagatave 2021	🙍 Basic	Data	📰 Proje	cted Cons	umption	🔲 Cal	culated (Consumpti	ion	🔁 Model	Validatior	n 📑 Printouts	
Engineering Systems	Data Sun	nmary	Data Vis	sualization									
Building Construction	🔳 Energ	ıy Distr	ibution										
	ΒH	leating	- Energy	y distributi	ion by mo	onths (k)	Vh)						
	50 836	35 957										36 376	
			28 273								25 871		
				12 423	3 973	0	0	0	\$ 319	14 558			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Figure 14 Heatmod 7.0: Calculated values – graphs.

🔯 Daudzdzīvokļu ēkas sagatave 2021	🔝 Basic Data	Projected Consumption	Calculated Const	umption	Z Model Validation	Printouts			
Engineering Systems									
Building Construction	 Difference b 	petween Projected and Calcula	ation Results						
		kWh/m² %							
		Total B	Energy Consumption	22.53	11.45	0			
			For Heating	72.66	59.87	0			
		For Cooling 50.39 140.5							
	Results by F	Purpose/Consumption							
				Project	ion Calculation				
		Total Energy Con	sumption (kWh/m²)	208	185.5	Ξ			
		For Heating (adjusted) (kWh/m²)	157.7	85.03	0			
		For Cooling (and a	ir drying) (kWh/m²)	10.68	61.07				
		For ventilation (and air humid	dification) (kWh/m²)						
		For Hot Wat	er Supply (kWh/m²)	7.272	7.154				
		Fo	r Lighting (kWh/m²)	29.78	29.78				
		,	Additional (kWh/m²)	2.56	2.429				
				Save					

Figure 15 Heatmod 7.0: Model validation.

🙆 Daudzdzīvokļu ēkas sagatave 2021	Basic Data Projected Consumption Calculated Consumption
✓ Engineering Systems	Images Attachments Improvements Temporary Certificate Saved Certificates
La Building Construction ∎	 Allowed file extensions: gif, png, jpg, jpeg, bmp, tiff. Maximum size: 4 MB.
	Image No.1 © Delete
	Set as Certificate Image
	○ Set as Certificate Image
	Izvēlieties bildi: Choose File No file chosen
	🔕 Add Selected Image
	Save

Figure 16 Heatmod 7.0: Data for printout.

After entering the basic project data, the information should be entered in the following two top-menu items: **engineering systems** and **building constructions** (Figure 9):

- Systems (or engineering systems) a list of the main engineering systems used in the building, the measured (or designed) consumptions for them are to be entered here. The results of this section are further summarized in the "Measured values" section of the project (Figure 12).
- Building (or building constructions) a main data of the whole building (or their zones) and the list of the boundary structures with following heat balance modelling and the heating/cooling demand and power. Includes heat losses and sources. The results of this section are further summarized in the "Calculated values" section of the project (Figure 13).

Notes:

- Depending on the project data (condition, like life cycle etc.) its input area (Figure 9) menu is adjusted, by showing only appropriate items.
- Depending on weather user needs to calculate heating and cooling consumption or maximal powers, input area (**Figure 9**) field are adjusted.

Engineering systems

The project's top-level menu **engineering systems** (**Figure 17**) is being created from the user entered information about following engineering systems presented is the building: heating, cooling, domestic hot water (DWH), mechanical ventilation and lighting. Additional non-specified energy also can be added to ensure the work of other systems (e.g., circulation pumps for the heating system or DHW).

Each of the engineering systems has the possibility to enter energy into and out of it. For incoming energies, it is possible to indicate the measured data (energy consumption,



length of heating season an indoor/outdoor temperatures) for different years (**Figure 18**), while for outgoing energies the consumption amounts are automatically calculated depending on the efficiency of the engineering system. In case of the heating boiler, the typical efficiency is within the range 85...95%. In case of heat pump, the seasonal coefficient of performance (SCOP) should be used, which it greater than 1 - in this case all the energy difference is assumed to be produced from renewable energy resources (**Figure 19**). Schematic drawing of energy flows is shown near the input form for better understanding of the process (**Figure 20**).

A list of all entered engineering systems is displayed on the left side in a tree structure, each of the items can be collapsed or expanded by clicking on a plus/minus button on the right. The results of this section are summarized in the "Measured values" section of the project (**Figure 12**).

🖾 Daudzdzīvokļu ēkas sagatave 2021	A Basic Data Projected Consumption
5 Engineering Systems	Period Yearly Data
✤ Apkures sistēma	Measurement Year 2020 V
Input Energy	Energy consumption
Central Heating - Fossil Fuel with Cogeneration (70% Vield)	Energy consumption Q1 (Wh) 399 423 923
General Structure From Grid	CO ₂ Emission volume (kg) 73 893
Output Energy =	Climate correction
💡 Heating (100%)	1. Measured 2. Normative
Read New Energy	Number of heating days Duration (-)
🖐 Karstā ūdens piegāde	
Input Energy	
Central Heating - Fossil Fuel	Outdoor temperature Vidējā ārgaisa temperatūra (°C)
with Cogeneration (70% Yield)	Indoor temperature Grādu dienu skaits GDD (-) 4 141 4 141 😡
@ Cits	Corrected energy consumption Q (Wh) 399 423 923
Output Energy	
💡 Hot Water Supply (98%)	Save Save
Add New Energy	Send a Message (question suggestion error report etc.)

Figure 17 Heatmod 7.0: System top-level menu.

🗟 Daudzdzīvokļu ēkas sagatave 2021 💧	🖻 Basic Data F Projected Consumption			
🗲 Engineering Systems 🛛	Period Yearly Data			
✓ Apkures sistēma	Measurement Year	2019	~	
Input Energy 😑	Meter: Measurements			
Central Heating - Fossil Fuel	At the beginning of the period (Wh)			
Flectricity from Grid	At the beginning of the period (Wh)	389 023 909		
Output Energy =	Energy consumption			
Pleating (100%)	Energy consumption Q1 (Wh)	389 023 909		
Add New Energy	CO ₂ Emission volume (kg)	71 969		
🖐 Karstā ūdens piegāde				
Input Energy	Climate correction			
Central Heating - Fossil Fuel		1. Measured Data	2. Normative Data	
Yield)	Number of heating days D _{heating} (-)		202	0
© Cits	Indoor temperature (°C)		20	0
Output Energy	Outdoor temperature Vidējā ārgaisa temperatūra (°C)		-0.5	0
Hot water Supply (98%)	Indoor temperature Grādu dienu skaits GDD (-)	4 141	4 141	0
add New Energy	Corrected energy consumption Q (Wh)	280.022.000		
≁ Apgaismojums		203 053 303		
Input Energy 😑		Save		
Plectricity from Grid				

Figure 18 Heatmod 7.0: Heating data (energy consumption, heating days and temperatures) input for one year.



Figure 19 Heatmod 7.0: Definition of the heat pump for cooling with SCOP of 3.



Figure 20 Heatmod 7.0: Schematic drawing of energy flows in one zone.

Building constructions

The project's top-level menu **building constructions** (Figure 21) is the frame for heat balance model of the selected building. It contains at least one building zone (number of zones is unlimited), for which heat losses and gains are defined and needed energy amount and power is calculated according [2]. Each zone consists of set of general parameters (for ventilation and internal heat sources) and boundary structures with their own parameters describing transmittance and solar heat gains (number of structures is unlimited).



A list of all entered zones with corresponding boundary structures is displayed on the left side in a tree structure, each of the items can be collapsed or expanded by clicking on a plus/minus button on the right. The results of this section are summarized in the "Calculated values " section of the project (**Figure 13**, **Figure 14**). Any zone or boundary structure can be copied and deleted. Boundary structures can be copied to another zone as well.

Operations within zone includes:

- **Basic data** (**Figure 22**): name, description, type (residential, office, etc.), main construction material and classification, heated floor area, average height and total volume, as well as monthly indoor temperature for heating and cooling in of annual calculation method or one temperature for power calculations (**Figure 23**).
- Transmission contains a summary of heat transmission losses in the selected zone, which is calculated from data on building elements of the zone (Figure 24). It includes area of all defined boundary structures (m²), heat transfer coefficient H_T (W/K), power and energy as absolute (W, Wh) or normalized (W/m², kWh/m²) value.
- Ventilation provides an opportunity to define the ventilation parameters in the selected zone (Figure 25) for both natural and mechanical ventilation cases. For the natural ventilation it is possible to define an air exchange rate (h⁻¹) or an air flow (m³/h), in case or mechanical ventilation also heat recovery coefficient (%), which affects the inlet air temperature (Figure 26). Calculation of the related heat transfer coefficient *H*_T (W/K), power and energy as absolute (W, Wh) or normalized (W/m², kWh/m²) value are shown as the results on this page (Figure 27). In addition, there is a possibility to add multiple windows and night ventilation calculations for further use in ventilation (Figure 28).
- Internal sources (heat gains) provides an opportunity to define all internal heat gains (Figure 29) inside the zone. The minimum needed input data consists of parameters characterizing residents, appliances and lighting. Additionally, the data about domestic hot water system incl. heat release from the circulation may be defined. Another specific internal heat gains form processes and objects may be defined here too.
- Solar heat gains contains a summary of solar heat gains through transparent and opaque building elements according to EN ISO 52016-1 standard [2] as power distribution over the cardinal directions, and total energy as absolute (W, Wh) or normalized (W/m², kWh/m²) values for selected zone (Figure 30).
- Calculation summarizes all the results of heat balance calculations for one zone according to EN ISO 52016-1 standard [2] both heating and cooling seasons. The main data includes set indoor temperature, transmittance and ventilation power and energy, indoor and solar heat gains, as well the overall results heating and cooling energy demand for the whole year in kWh and kWh//m² (Figure 31). In case of only one room modelling, the power for pre-set 4 days are displayed (Figure 32)
- Heating interruptions (or breaks) provides a way to define interruptions and "holidays" in the zone, thereby correcting the total required energy for heating and/or cooling (Figure 33).



📠 Add New Zone

Daudzdzīvokļu ēkas sagatave	2021	🚡 Basic Data 👔	Transmission 🧔	Ventilation	🖐 Internal g	ains 💧 🌞 Solar g	jains 📄 C	alculations	🕝 Breaks
# Engineering Systems	Ŧ	Zone Basic Data	Indoor Temperature	e					
🚊 Building Construction	-	Basic Data							
📕 Visa ēka					Name	Visa ēka			
North facade	Ξ				Description				
Arsiena									
PVC logi								11	
South facade	=	 Construction D 	ata						
Arsiena	-			Zor	ne Space Type	Residential Area	a `	• •	
Icejas durvis				Main Cons	struction Type	Medium		/ @	
Vecie koka logi			-	Zone Floor Are	ea Δ , (m²)	2500			
West facado				7 6	apr,1 (m)	2300			
(⁶) Ārsiena				Zone Spa	ce Height (m)	2.7		+	
PVC logi	Ch I			Zone V	olume V (m ³)	6750	Σ	÷	
East facade	-					📀 Save	Delete		
Arsiena	Ph		0d						
PVC logi	P		Send	a Message (d	question, sugge	estion, error repo	rt, etc.)		
Horizontal surface	=								
Pagraba pārsegums									
Bēniņu pārsegums	P								
Add New Building Eleme	ent								



🗈 Daudzdzīvokļu ēkas saga	atave 2021	🔝 Basic Data 🛔 🏠 Transmission	🤹 Ventilation 🛛 🐥 Int	ernal gains	🌞 Solar gains	🔳 Calo	culations	🕑 Breaks	
Find the second state in the second state is a second state is a second state is a second state in the second state in the second state is a second state in the second state is a second state in the	Ŧ	Zone Basic Data Indoor Temperat	ture						
🚊 Building Construction	Ξ	Basic Data							
🚊 Visa ēka	=			Name Vis	a ēka				
North facade	=		Desc	iption					
Arsiena	D								
PVC logi	P					11			
South facade	=	Construction Data							
Arsiena	D		Zone Space		aidential Area		0		
Ieejas durvis			Zone Space	ке	sidential Area	*			
Vecie koka logi			Main Construction	туре Ме	dium	~			
PVC logi	D		Zone Floor Area A _{apr} ,	(m ²) 250	00		÷		
West facade	-		Zone Space Heig	nt (m) 2.7			÷		
Arsiena			Zone Volume \	(m ³) 675	50	Σ	Ŧ		
PVC logi	P				-		_		_
East facade	=				Save 😔 D	elete			
									-



🙍 Basic Data 👔 Transmission 🧒 Ventilation 🖉 Internal g	ains 💧 Solar gains 🛛 📺 Cal	culations	👩 Basic Data 👔 Transmission 🍕 Ventilation 롲 Internal g	ains 🛛 😑 Solar gains 🛛 🗮 Ca	lculations
			Zone Basic Data Indoor Temperature		
Zone Basic Data Indoor Temperature			 Heating indoor temperature set T (°C) 		
a Harting indeed to reach a set T (00)			January	20	9
• Heating Indoor temperature set 1 (*C)			February	20	2
heating day 1	20	2	March	20	9
heating day 2	20		April	20	9
floating day 2	20	<i>4</i>	May	20	9
cooling day 1	20	2	June	20	9
cooling day 2	20	່ລ	July	20	9
	20	<i>e</i>	August	20	9
 Cooling indoor temperature set T (°C) 			September	20	9
		1 -	October	20	9
heating day 1	23	9	November	20	9
heating day 2	23	9	December	20	9
and in a day of			 Cooling indoor temperature set T (°C) 		
cooling day 1	23	2	January	23	2
cooling day 2	23	2	February	23	៍ ១
		1	March	23	ិ ୭
	Save				п.,

Figure 23 Heatmod 7.0: Input of temperatures for power (left) and monthly (right) calculations.

Version 1.0

🖾 Daudzdzīvokļu ēkas sagatave 2021		🙍 Basic Data	📙 Transmission	🤹 Ventilation	🖐 Internal g	ains Solar	gains 📄 Cal	culations	🕑 Breaks
Engineering Systems	1								
Duilding Construction	1		Total Enclosing Str	ucture Area for t	he Zone (m²)	2 979			
								1	
North facade				Zone Heat Loss (Coofficient H	W/K	W/m²K	1	
Arsiena D				Zone near Loss	coefficient n _T	4 108	1.643		
PVC logi		 Calculation 	Results						
South facade				Average Calcu	lation Results	per year	~		
🏐 Ārsiena 👘		Total Heat F	low with Transmiss	ion					
🏐 Ieejas durvis 🛛 🖺						W	W/m²		
🕲 Vecie koka logi 👘				Heating (period Φ _{apk,pr}	44 166	17.67	0	
🖤 PVC logi				Cooling	period Φ_{d-nr}	53 673	21 47	0	
West facade 😑					parroa + az,pr	55 075	21.77		
🎱 Ārsiena 👘		 Total Heat L 	oss with Transmiss.	ion					
🖤 PVC logi 👘						Wh	kWh/m²		
East facade				Heating	period Q _{apk,pr}	385 444 542	154.2		
🏐 Ārsiena 👘				Cooling	period Q _{dz,pr}	468 764 409	187.5		
🕲 PVC logi 👘								1	
Horizontal surface									
Pagraba pārsegums			Se	end a Message (g	uestion, suga	estion, error reg	oort, etc.)		
🎱 Bēniņu pārsegums 🛛 🖺				5 ()	, ,,				
G Add New Building Element									
🗟 Add New Zone	-								



🖾 Daudzdzīvokļu ēkas sagatave 2021	🙍 Basic Data	🅞 Transmission	o Ventilation	🖐 Internal ga	ains 🛛 🥚 Solar	gains 📄 Ca	lculations	🕑 Breaks
	Ventilation Syst	ems Ventilation L	ist Ventilation Da	ata				
	Natural Ven	tilation (including i	nfiltration)					
📕 Visa ēka 🗧	Operati	ing Time Fraction i	n the Calculation P	Period f _{t,d} (-)	0.5		•	
North facade						0	_	
Ārsiena PVC logi			Inpu	ut Parameter	• n _d (1/h)	q _{ve,d} (m ³ /h)	0	
South facade				January	0.8	5 400	2	
🇐 Ārsiena 👘				February	0.8	5 400	2	
🏐 Ieejas durvis 👘				March	0.8	5 400		
🖤 Vecie koka logi 👘				Anril	0.0	6 075		
PVC logi					0.9	0 0 / 5		
West facade =				May	1	6 750	2	
🏐 Ārsiena 👘				June	1	6 750	2	
🖤 PVC logi				July	1	6 750	2	
East facade				August	1	6 750	9	
PVC logi				September	0.9	6 075	0	
Horizontal surface				October	0.8	5 400	2	
🎱 Pagraba pārsegums 👘				November	0.8	5 400	2	
🇐 Bēniņu pārsegums 👘				December	0.8	5 400	2	
G Add New Building Element					0.0	5 100	-	
Add New Zone	Air Supply F	low Temperature						

Figure 25 Heatmod 7.0: Defining the air exchange rate for ventilation calculations.

hm7	Heatmod 7.0
	Building Energy Efficiency Calculation Program

	 Mechanical (forced) Ventilation 			
Daudzdzivokju ekas sagatave 2021	Operating Time Fraction in the Calculation Period $\mathbf{f}_{t,m}$ (-)	0.5		
Duilding Construction		۲	0	
	Input Parameter	n _m (1/h)	q _{ve,m} (m ³ /h)	9
📆 Visa eka 🗧	January	1	6 750	2
North facade	February	1	6 750	2
Arsiena 4	March	-	6 750	
VC logi	hadi	1	6750	ø
South facade	April	1	6 750	2
🖤 Ārsiena 🧤	May	1	6 750	2
🕲 Ieejas durvis 🦷	June	1	6 750	2
Vecie koka logi	July	-	6 750	
PVC logi	Sury	1	0 / 50	4
West facade =	August	1	6 750	9
🎱 Ārsiena 🛛 🗋	September	1	6 750	2
PVC logi	October	1	6 750	9
East facade	November	1	6 750	2
🎱 Arsiena 🧤	December	1	6 750	
PVC logi	December	1	0750	<i>w</i>
Horizontal surface	Air Supply Flow Temperature			
🎱 Pagraba pārsegums 🛛 🗋				
🇐 Bēniņu pārsegums 👘	Matches Outdoor Air Temperature?	🔾 yes 💽 n	10 😡	
G Add New Building Element	Efficiency of Ventilation Equipment with Heat Recovery (%)	85		
🔜 Add New Zone 🗸		-		

Figure 26 Heatmod 7.0: Defining the heat recovery for mechanical ventilation calculations.

🖾 Daudzdzīvokļu ēkas sagatave 2021	Natural Ventilation (including infiltration)				
Engineering Systems 🗉	Mechanical (forced) Ventilation				
Building Construction	Total Ventilation System Parameters				
📕 Visa ēka 🗧	Average Calculation Results	per year	~		
North facade	Operating Time Fraction in the Calculation Period ${\rm f}_{\rm t}$ (-)	1		0	
🎱 Ārsiena 👘	Air Exchange Coefficient n (1/h)	0.9417		0	
PVC logi	a Sat Tamparatura				
South facade	Hasting T				
Arsiena 4	Heating 1,heat,m (-C)	20		۲	
	Cooling T _{1,cool,m} (°C)	23		0	
PVC logi		W/K	W/m²K		
West facade =	Heat Loss Coefficient with Air Flow H_{Ve}	2 161	0.8645	0	+
🎱 Ārsiena 👘	@ Total Heat Flow with Ventilation				
🗐 PVC logi 👘		W/	W/m2		
East facade	Heating period $\Phi_{heat.ve}$	15 468	6.187	0	Ŧ
🎯 Ārsiena 👘	Cooling period $\Phi_{cool yo}$	10.026	7.61	0	Ŧ
PVC logi		19 020	7.01		
Horizontal surface =	Total Heat Losses with Ventilation				
🤍 Pagraba pārsegums 👘		Wh	kWh/m²		
🖤 Bēniņu pārsegums 👘	Heating period Q _{heat,ve}	134 926 722	53.97	÷	
G Add New Building Element	Cooling period Q _{cool,ve}	166 103 654	66.44	÷	

Figure 27 Heatmod 7.0: Ventilation heat losses for one zone.



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Building Energy Efficiency Calculation Program

🖸 Basic Data 👍 Transmission 🥪 Ventilation 롲 Internal gains 👙 Solar gains 📑 Calcula	🗟 Basic Data 🔓 Transmission 🥪 Ventilation 🛹 Internal gains 🧔 Solar gains 🕅 Calculation
Ventilation Systems Ventilation List Ventilation Data	Ventilation Systems Ventilation List Ventilation Data
Guidance on using ventilation calculations	Ventilation 25 atvērtie logi 🗸
	Ventilation Data
Σ n _{d,total} : 0.02231	Ventilation Name 25 atvērtie logi
Ventilation No.1 (25 atvērtie logi, n _d : 0.02231)	Descriptive Parameters
Add a new ventilation scenario with a name:	Average ventilation duration in hours per day (h/d) 2
	Reduction Factor (-) 1
	Climate Conditions
	Temperature Difference between Indoor and Outdoor (K) 10
	Wind Speed (m/s) 1
	• First Window Group
	Number of Windows 25
	Window Width (openable part) (m) 1
	Window Height (openable part) (m) 1
	Is the window tilted downward? 💿 yes 🔿 no 🛞
	Width of the tilted window opening (m) 0.05
	Second Window Group (cross-ventilation)

Figure 28 Heatmod 7.0: Window and night ventilation calculations – list (left) and data form (right).

🖻 Daudzdzīvokļu ēkas sagatave 2021	A Basic Data	p Transmission	🔧 Ventilation	🦊 Internal gains	🥚 Solar gains	Calculations	🕑 Breaks
🗲 Engineering Systems 🗉							
La Building Construction	Heat Flows	from Inhabitants a	nd Devices				
🚊 Visa ēka 🛛 🗧			Inhabitant	s Φ _{int,occ} (W) 15 0	000	Ξ	
North facade		Time Fraction	Inhabitants Are	Present f _{occ} (-) 1			
 Arsiena PVC logi 		Heat Output from Ir	nhabitants per Ar	ea q _{occ} (W/m²) 6			
South facade			Device	s Φ _{int,dev} (W) 15 0	000	Ξ	
 Ārsiena Ieejas durvis 		Time Fractio	n Devices Are Op	perating f _{dev} (-) 2			
🎯 Vecie koka logi 🛛 👘		Heat Output from	n Devices per Are	ea q _{dev} (W/m²) 3		0	
PVC logi			Lighting	Φ _{int,light} (W) 5 06	i3	ΣΞ	
West facade =			Installed Ligh	ting Power (W) 27	7 000	Σ	
🍥 PVC logi			Heat Energy	Coefficient (-) 0.9	9		
East facade		Ope	erating Hours dur	ing the Day (h) 5		÷	
 Ārsiena PVC logi 					2 🛛		
Horizontal surface	Heat Flows	from Hot Water Sys	stems				
Pagraba pārsegums		Hot V	Vater System Φ _{in}	t,hot,other (W) 7 54	14	Σ Ξ	
Add New Building Element		Hot Wat	er Liters Used du	ring the Day (I) 4	500	Σ	
Add New Zone	+		Hot Water Te	mperature (°C) 55	5		

Figure 29 Heatmod 7.0: Defining of internal heat gains for one zone.

hm

	Daudzdzīvokļu ēkas sagatavo	e 2021	🙍 Basic Data	Fransmission	n Ventilation	🖐 Internal g	ains 👸 Solar	gains	🔳 Calcu	ulations	🕑 Breaks	-
%	Engineering Systems	Ŧ										
	Building Construction	Ξ	Calculation	Results								
1	Visa ēka	=			Average Calcu	lation Results	per year		~			
	North facade	=	 Transparent 	Building Elements	- Resulting Heat	Flow from Sola	ar Heat Gains					
	Arsiena			-	North Faca	ide Φ _{sol,z} (W)	800.6			0		
	South facade	-			South Faca	de Φ _{sol,d} (W)	1 003			0		
	🏐 Ārsiena	-			West Faca	ade Φ _{sol,r} (W)	655.1			0		
	Ieejas durvis	P			East Faca	ide Φ _{sol,a} (W)				0		
	Vecie koka logi PVC logi				Horizontal Surfac	ces Φ _{sol,h} (W)				0		
	West facade	-	Opaque Bui	lding Elements - Re	sulting Heat Flov	v from Solar He	eat Gains					
	Arsiena				North Faca	ide Φ _{sol,z} (W)	380.7			0		
	W PVC logi	40			South Faca	de Φ _{sol,d} (W)	778.2			0		
	East facade	=			West Faca	ade Φ _{sol,r} (W)	401.5			0		
	PVC logi				East Faca	ide Φ _{sol,a} (W)	378.8			0		
	Horizontal surface	-			Horizontal Surfac	ces Φ _{sol,h} (W)	0			0		
	Pagraba pārsegums	Ph	Total Solar I	Heat Flow								
	Bēniņu pārsegums		10101 00101 1				W	W/r	m²			-
	Add New Building Elem	ent				Total Φ_{sol}	4 398	1.759		0		
	Add New Zone											-

Figure 30 Heatmod 7.0: Summary of solar heat gains for one zone.

🙍 Basic Data 👔 Transmission 🛃 Ventilation 🖉 Internal g	ains 💧 Solar gains	🔒 Calcula	tions	🙍 Basic Da	ta 👔 Transmission	🤹 Ventilation	🦐 Internal ga	ins 🥚 Sol	ar gains	Calculat	ions
Heating Cooling				Heating Co	ooling						
Dimensionless Numerical Parameter a _{apk,0}	1	0)		Dimensionless numerical parameter a _{cool,0} 1						
Specified Time Constant $\tau_{apk,0}$	15	0)			Specified time c	onstant T _{cool,0}	15		0	
Calculation Results				 Calculati 	on Results						
Average Calculation Results	per year	~				Average Calci	lation Results	per year		~	
Parameters				 Paramet 	ers						
Building or Zone Time Constant τ_{apk}	18.28	0)		Build	constant T _{cool}	18.28				
Numerical Parameter $a_{\mbox{\scriptsize apk}}$ corresponding to time constant $\tau_{\mbox{\scriptsize apk}}$	2.219	0)	Numerical	Numerical parameter a_{cool} corresponding to time constant τ_{cool}				2.219		
Heating set temperature T _{1,heating} (°C)	20	0)		Cooling set temperature T _{1,cooling} (°C)				23		
Total duration of the period t (h)	8 760				Т	otal duration of th	ne period t (h)	8 760			
Heat balance coefficient during heating period γ_{apk} (-)	1.809	0	0		Heat balance coefficient during cooling period γ_{dz} (-)			-) 1.113			
Utilization factor of gains $\mbox{during heating}$ period $\eta_{\mbox{apk,ieg}}$ (-)	0.61	0)	Utilia	Utilization factor of gains during cooling period ndz,ieg (-) 0.6403					0	
Total heat flow				 Total hei 	at flow						
	W	V/m²						W	W/m	2	
Heat loss flow during heating period $\Phi_{heating,loss}$	59 635 23.8	5 😡			Heat loss flow du	iring cooling peri	od $\Phi_{cooling,loss}$	72 698	29.08	Θ	Ŧ
Heat gain flow Φ_{gain}	58 408 23.30	5	•			Heat g	jain flow Φ _{gain}	58 408	23.36	Θ	Ħ
Total heat flow during heating period $\Phi_{heating,1}$ 1 226 0.4905)		Total heat flow	during cooling pe	riod $\Phi_{cooling,1}$	-14 290	-5.716	0	
Heat balance and required energy				 Heat bal 	ance and required ene	ergy					

Figure 31 Heatmod 7.0: Calculation results for monthly calculations (heating – left, cooling - right).

🙆 Daudzdzīvokļu ēkas sagatave 2021	🔝 Basic Data 👔 Transmission	nternal g	ains 🛛 🌞 Solar	gains 🔐 Cal	culations
🚊 Building Construction 🗉					
📕 Visa ēka 🗧	 Calculation Results 				
North facade		Average Calculation Results	beating day 1	~	
🎱 Ārsiena 👘		Average calculation results	neating day 1		
🗐 PVC logi 👘	Parameters				
South facade		Set temperature T ₁ (°C)	20		
🎯 Ārsiena 🛛 👘					
🎯 Ieejas durvis 🛛 👘	 Total heat flow 				
🏐 Vecie koka logi 🛛 👘			W	W/m²	
🏐 PVC logi 👘		Heat loss flow Φ_{loss}	19 196	7.678	÷
West facade 📃		Heat gain flow Φ_{gain}	54 007	21.6	Ŧ
🎯 Ārsiena 🛛 👘		Total heat flow Φ_1	-34 811	-13.92	
🖗 PVC logi 👘					
East facade					

Figure 32 Heatmod 7.0: Calculation results in case of one room calculations.



📷 Basic Data 👔 Transmission 🍕 Ventilation 🖊 Internal gains 🥚 Solar gains 📷 Calculations 📀 Breaks	📷 Basic Data 👷 Transmission 💰 Ventilation 🖉 Internal gains 💧 Solar gains 📓 Calculations 📀 Breaks
Heating coling	Heating Cooling
Calculation Results	Calculation Results
Average Calculation Results per year 🗸	Average Calculation Results per year 🗸
Energy for uninterrupted heating Q _{heating,N} (Wh) 212 586 226	Required energy for continuous cooling Q _{cooling,N} (Wh) 152 666 486
Heating interruption corrections	Cooling interruption corrections
Heating time share in a week f _{heating,N} (-) 1	Cooling time share in a week f _{cooling,N} (-) 1
Interruption time (minimum and maximum) t _{heating,ducts} (h) 2 6	Cooling Interruption time (minimum and maximum)
Set temperature during interruption Theating, ducts (°C) 19	Set temperature during interruption T _{cooling,setting} (°C)
Energy for Interrupted heating Qheating, ducts (Wh) 212 586 226	Energy for interrupted cooling Q _{cooling,setting} (Wh) 152 666 486
Heating calculation in "holiday" mode	Cooling calculation in "holiday" mode
Heating time share in the heating period $f_{heating,N}$ (-) 1	Cooling time share in the cooling period $f_{cooling,N}$ (-) 1
"Holiday" set temperature T _{heating,ducts} (°C)	"Holiday" set temperature T _{cooling.setting} (°C)
Energy for "holiday" heating mode Qheating,setting (Wh) 58 551 196	Energy for "holiday" cooling mode Q _{cooling,setting} (Wh)
Final Result	Final Result
Required resulting energy for heating Q _{heating} (Wh) 212 586 226	Required resulting energy for cooling Q _{cooling} (Wh) 152 666 486
Savening	Save Save

Figure 33 Heatmod 7.0: Heating or cooling breaks (or interruptions) and "holidays" – heating (left) and cooling (right).

Without parameters describing one zone as one object (ventilation and internal heat gains), there are parameters characterizing different boundary structures individually – transmittance heat losses and solar heat gains. Generally, they depend on the construction's area and spatial orientation, therefore, should be defined separately. Operations for each building element (boundary structure) includes:

- **Basic data** (**Figure 34**) type (wall, ceiling, floor, window, door), orientation (north, south, east, west or horizontal), name, optional description.
- Transmission heat losses (Figure 35) with
 - **main data** area (m²) with build-it calculator option, *U*-value (W/m²/K), optional thermal bridges, and resulting heat transfer coefficient H_T (W/K);
 - calculations of *U*-value for adjoining rooms (Figure 36) and floor (Figure 37) or ceiling (Figure 38) constructions;
 - possibility to set different temperature outside (e.g., to other rooms Figure 39).
- Solar heat gains (Figure 40) with
 - main data proportion of the frame and type of glazing for *g*-value selection;
 - adding multiple shading to element (Figure 41), for each making calculations of different types of shadings (Figure 42);
 - summary of solar heat gains for one building element for heating and cooling seasons (Figure 43).



🔯 Daudzdzīvokļu ēkas sagata	ve 2021		🚡 Basic Data	🔓 Transmission	🌞 Sun			
Engineering Systems	Ŧ							
Pullifier Construction						Туре	Windows / Balcony doors 🗸	
	Ξ					Orientation	West facade 🗸	
🛄 Visa eka						Name	PVC logi	
North facade	Ξ						- VC logi	
Arsiena	-					Notes		
PVC logi								
South facade	=							
Ārsiena	D						Save 🕞 Delete	
Ieejas durvis	P							
🏐 Vecie koka logi	D			S	end a Mess	sage (question, sugge	estion, error report, etc.)	
PVC logi	D							
West facade	=							
Arsiena								
🍑 PVC logi								
East facade	-							
Arsiena	P							
I PVC logi	P							
Horizontal surface	=							
Pagraba pārsegums								
Bēniņu pārsegums	P							
G Add New Building Ele	ment							
Add New Zone		-						

Figure 34 Heatmod 7.0: data entry for one building element.

🖾 Daudzdzīvokļu ēkas sagatave 2021	🕋 🖻 Basic Data 📙 Transmission 🧶 Sun
	Transmission Data U Calculation Outer Temperature
Building Construction	• Element Parameters
🛄 Visa ēka 🛛 🖂	Būvelementa laukums (m²) 91.36 Σ
North facade	Previously specified construction of the element -
🏐 Ārsiena 👘	Heat Transfer Coefficient U (W/(m² K))
🖗 PVC logi 👘	
South facade 📃	🖻 Linear Thermal Bridges 🖉
🏐 Ārsiena 👘	Linear Thermal Bridges
🏐 Ieejas durvis 🛛 🖺	Type of connection
🖗 Vecie koka logi 🛛 👘	Host transfer soufficient III (W//m K))
🇐 PVC logi 👘	
West facade =	Element Linear Thermal Bridge Data
🏐 Ārsiena 👘	Perimeter, m
🏟 PVC logi 🛛 🐚	Heat transfer coefficient Ψ (W/(m K))
East facade	
🗇 Ārsiena 👘	🗉 Point Thermal Bridges 🛛 💆
🗐 PVC logi 🛛 🗈	
Horizontal surface	Calculation Results
🎯 Pagraba pārsegums 🛛 👘	Resulting heat loss coefficient H _T (W/K) 155.3
🏐 Bēniņu pārsegums 👘	
G Add New Building Element	Save Save

Figure 35 Heatmod 7.0: Transmission heat losses thought one building element.



Figure 36 Heatmod 7.0: Calculation of U value for adjoining rooms.



Figure 37 Heatmod 7.0: Calculation of U value for floor.

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User Guide Version 1.0

Daudzdzīvokļu ēkas sagatave 2021	🔊 Basic Data 📙 Transmission 🍵 Sun
	Transmission Data U Calculation Outer Temperature
Building Construction	Schematic Drawing Roof Construction Description O Type 1 Roof covering made of piece materials without a continuous load- bearing or waterprovide for a series of the s
 Arsiena South facade South facade Arsiena Teejas durvis Vecie koka logi PVC logi West facade Arsiena Arsiena PVC logi PVC logi East facade East facade 	Ru (baards, roofing felt, etc.) Type 2 Roof covering made of piece materials with a continuous load- bearing or vaterproofing layer (boards, roofing felt, etc.) Type 2 Same as Type 2, but with an aluminum or other low emissivity material layer on the inside of the roof Type 4 Roof covering
 Arsiena PVC logi 	
Horizontal surface = Image: Pagraba părsegums Image: Pagraba părsegums Image: Pagraba părsegums Image: Pagraba părsegums	Unheated Attics Thermal Resistance of Unheated Attics R _u (m ² K/W) 0.3
Add New Building Element	Roof Construction Previously Specified Roof Construction

Figure 38 Heatmod 7.0: Calculation of U value for ceiling.

🔊 Daudzdzīvokļu ēkas sagatav	ve 2021	a Basic Data 📙 Transmission 🧶 Sun
🖐 Engineering Systems	÷	Transmission Data U Calculation Outer Temperature
L Building Construction	Ξ	External Element Temperature
🛄 Visa ēka	Ξ	Matches outdoor air temperature? 💿 yes 🔿 no 🔞
North facade	=	Calculation month
Ārsiena PVC logi		Average Calculation Results per year
South facade	=	Temperature difference for heating (°C) 13.9
Arsiena		Temperature difference for cooling (°C) 16.9
Ieejas durvis	D	
🏐 Vecie koka logi	D	Save Save
PVC logi		Send a Message (question, suggestion, error report, etc.)
West facade	=	
Ārsiena	D	
🍑 PVC logi	N	
East facade		
Ārsiena	D	
PVC logi		
Horizontal surface	=	
Pagraba pārsegums	D	
l Bēniņu pārsegums	D	
Add New Building Eler	ment	
i A J J M 7		•

Figure 39 Heatmod 7.0: Setting different outside temperature for element.

🖻 Daudzdzīvokļu ēkas sagata	ive 2021	🔯 Basic Data 👔 Transmission 🧑 Sun
Findineering Systems	÷	Sun Shading List Shading Data
Building Construction		Transparent? 💿 yes 🔿 no 🔞
🛄 Visa ēka	8	Frame Area Portion F _F (-) 0.8
North facade	=	Is the Solar Energy Transmission Coefficient of the Transparent O yes Part Known?
🏐 Ārsiena		Glass Type Double glazing 🗸
PVC logi		Transmission Coefficient g_g (-) 0.75
South facade	-	
Arsiena	-0	
Wecie koka logi		Send a Message (question, suggestion, error report, etc.)

Figure 40 Heatmod 7.0: Parameters for solar heat gains thought one building element.

Daudzdzīvokļu ēkas sagatave 2021	-	Basic Data 🙀 Transmission 🧑 Sun	
		Sun Shading List Shading Data	
🚊 Building Construction 🗆		Guidance on Using Shading	
🛄 Visa ēka 🛛 🖂			
North facade 😑		🔍 Shade No.1 (Bez ēnojuma, F _{ēn} : 1)	
Ārsiena PVC logi		Add a New Shade Named:	
South facade 📃			
Arsiena			
🏐 Ieejas durvis 🛛 🖺		Send a Message (question, suggestion, error report, etc.)	

Figure 41 Heatmod 7.0: Elements solar shading list.

🔊 Daudzdzīvokļu ēkas sagatave 2	2021	💿 Basic Data 🛛 🙀 Transmission 🛛 🧿 Sun	*
Find the second state in the second state in the second state is a second state in the second state in th	Ŧ	Sun Shading List Shading Data	Į
🛄 Building Construction		Shade Bez ënojuma 💙	
🛄 Visa ēka	Ξ	a Shada Data	
North facade	E	ha	
🎯 Ārsiena	D		
PVC logi			
South facade	=	yes	
Arsiena	P		
🏐 Ieejas durvis			
🎱 Vecie koka logi	P		
PVC logi			
West facade	-		
🎱 Ārsiena			
🏶 PVC logi			
East facade		Edge Angle 0 🗸	
) Ārsiena	P	Shading Correction Factor Part F _p (-) 1	
I PVC logi	46	Barrier Angle 0 🗸	
Horizontal surface	-	Shading Correction Eactor Part F. (-)	
Pagraba pārsegums	<u>h</u>		
Bēniņu pārsegums		 Shading Calculation with Mobility Conditions 	
G Add New Building Elemen	t	Is There a Cover? O ves 🔍 no	
Add New Zone	-		-

Figure 42 Heatmod 7.0: Solar shading options for solar heat gain calculations.

🔯 Daudzdzīvoklu ēkas sagatav	e 2021	Edge Apple	
		Edge Aligie	
🖐 Engineering Systems	÷	Shading Correction Factor Part F _p (-)	1
Building Construction		Barrier Angle	0 🗸
		Shading Correction Factor Part F _I (-)	1 😣
III VISA eka	-		
North facade	E	Shading Calculation with Mobility Conditions	
🏐 Ārsiena		Is There a Cover?	
PVC logi	E		0 700 0 110
South facade	=	 Calculation Results 	
🏐 Ārsiena	D	Average Calculation Results	per year 🗸
i Ieejas durvis		Resulting Shading Reduction Factor	1
🏐 Vecie koka logi			
🗐 PVC logi		Effective Collecting Area A _{s,k} (m ²)	13.7
West facade	-	Received Solar Radiation	
🏐 Ārsiena	D	Heating period E _{s.k} (W/m ²)	47.8
🍑 PVC logi		Cooling period E . (W/m2)	47.9
East facade	=	cooling period E _{s,k} (w/m/)	47.0
Arsiena	D	 Solar Heat Gains 	
🏐 PVC logi	P b	Heating period $\Phi_{sol k}$ (W)	655.1
Horizontal surface	=		
Pagraba pārsegums	Pb	Cooling period $\Phi_{sol,k}(W)$	655.1
🏐 Bēniņu pārsegums			Save
(S) Add Now Building Flom	ant		



Figure 43 Heatmod 7.0: Summary of solar heat gains for one building element.



Literature

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[4] Latvian Building Code LBN 003-19 "Construction Climatology", Cabinet of Ministers of Latvia, 2019. [in Latvian]. [Online]. [Accessed 19.05.2022]. Available: <u>https://likumi.lv/ta/id/309453-noteikumi-par-latvijas-buvnormativu-lbn-003-19-buvklimatologija</u>