



The project was co-founded by the European Union



Lead beneficiary: Ivano-Frankivsk National  
Technical University of Oil and Gas  
Project coordinator: Prof. Maksym Karpash  
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# ACTIVE HOUSE CONCEPT IN IVANO-FRANKIVSK PUBLIC BUILDING

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Project HUSKROAUA/1702/6.1/0075  
Cross-Border Network of Energy Sustainable Universities  
(NET4SENERGY)

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2014-2020

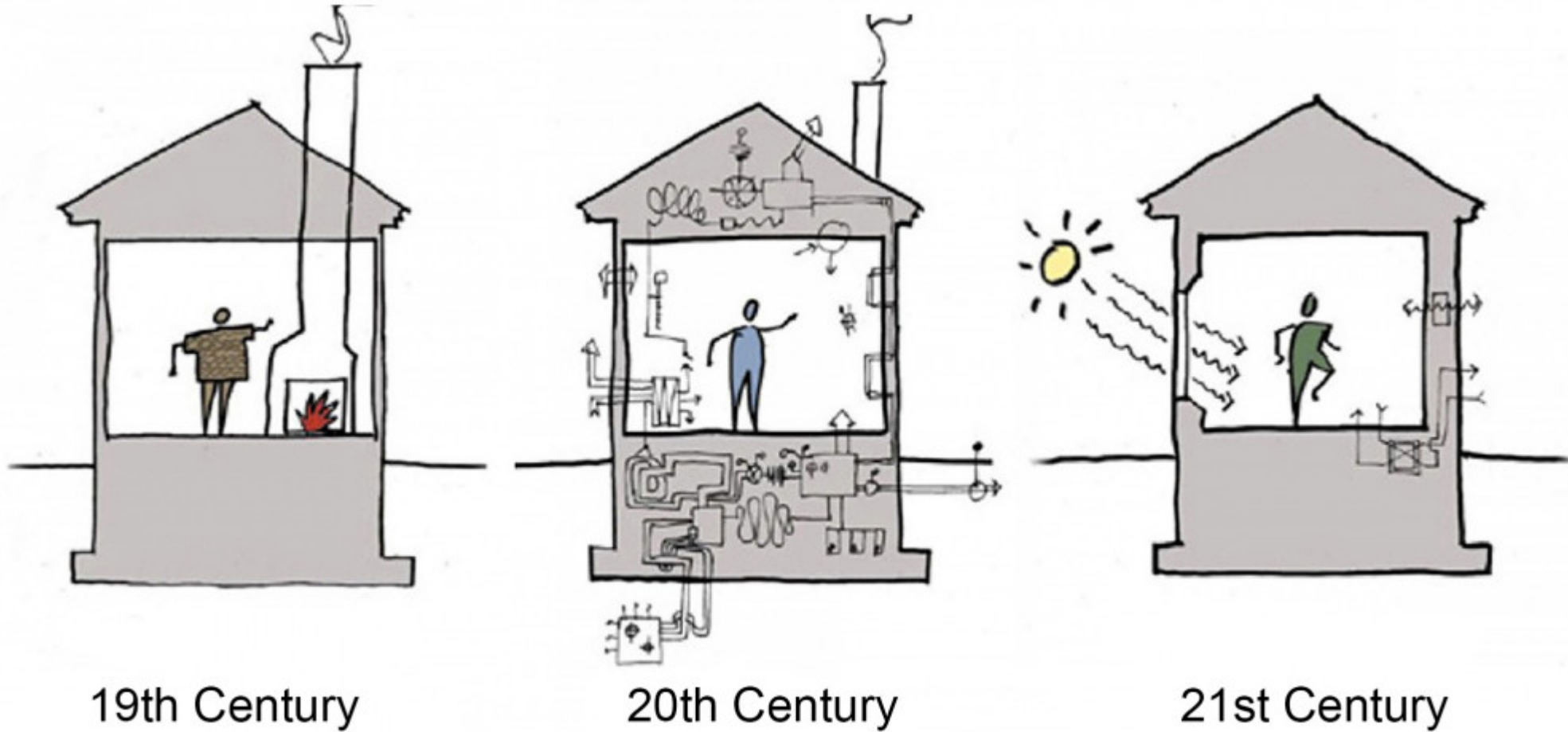
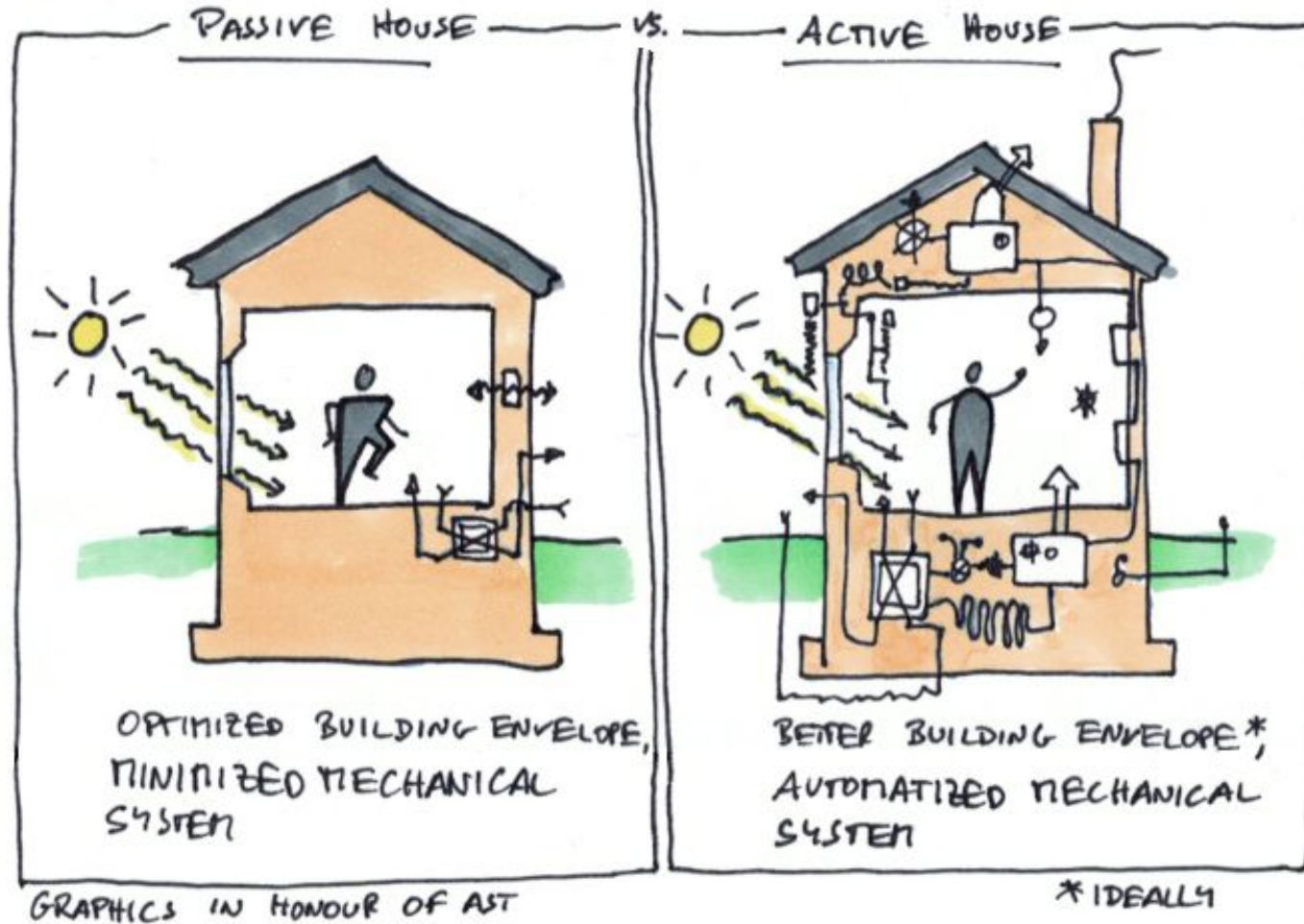


Image source: Albert, Righter and Tittmann Architects





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# RECONSTRUCTION PROJECT OF THE OLD BUILDING



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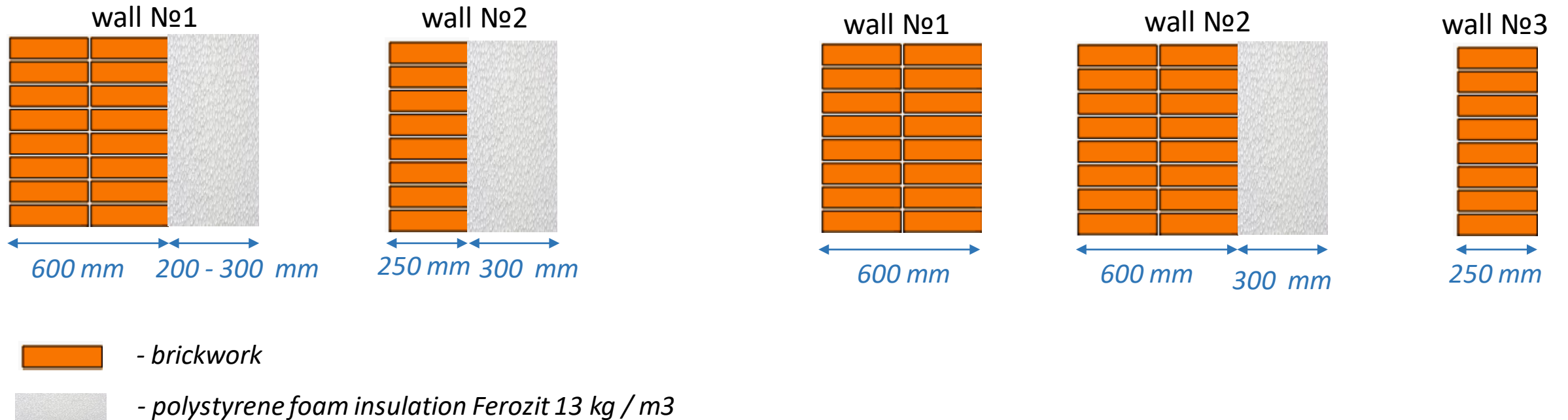
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# ENCLOSING STRUCTURES OF THE BUILDING

## Outside walls

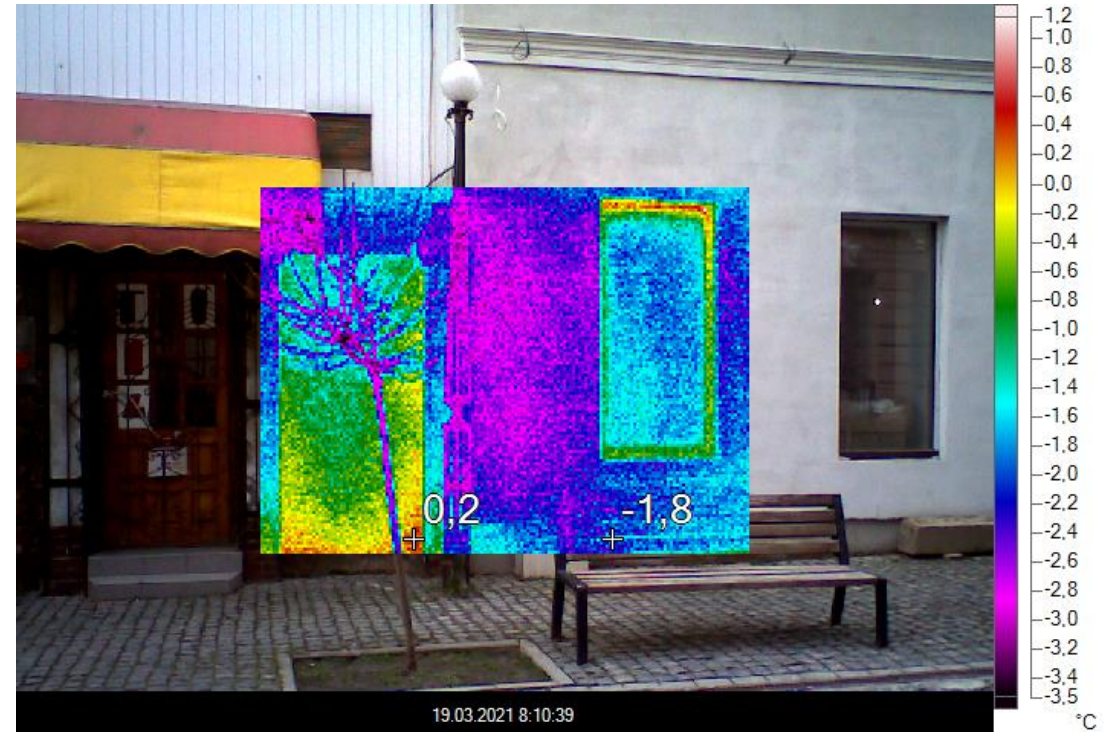
Bordered by outside air

Bordered by other buildings



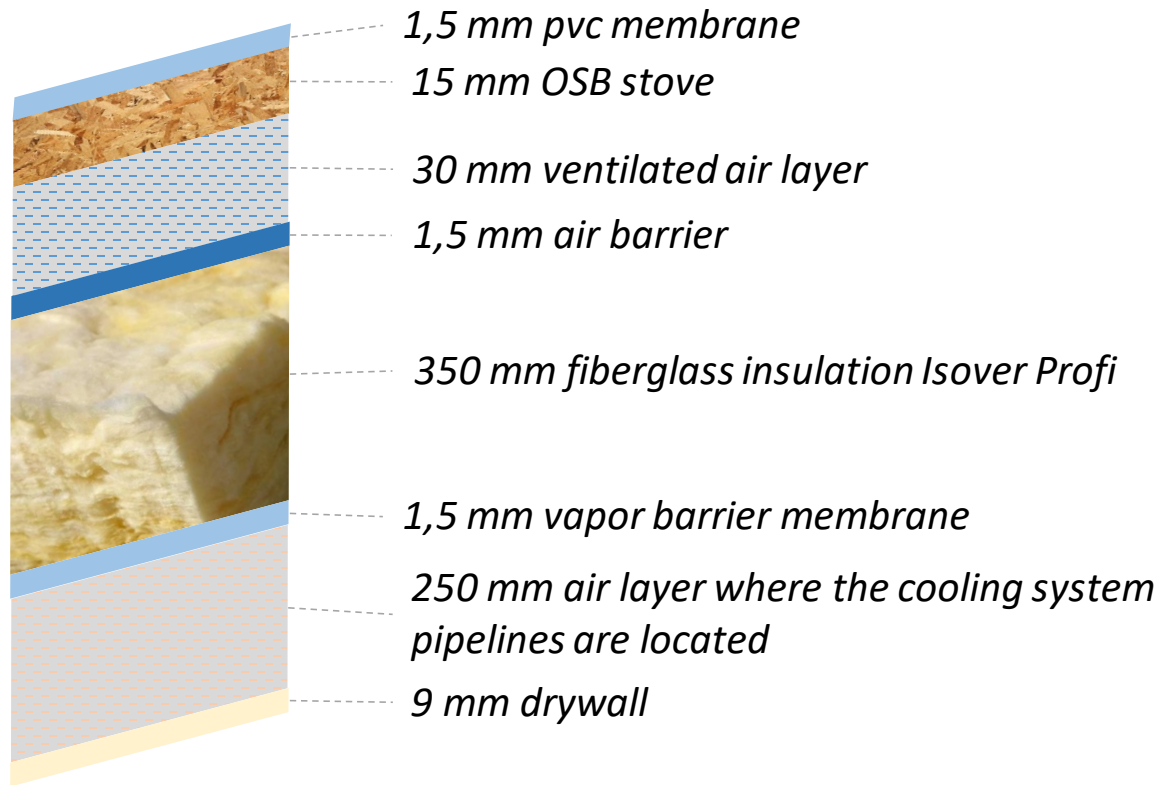
# ENCLOSING STRUCTURES OF THE BUILDING

Comparison of heat losses through the outer walls of two adjacent buildings

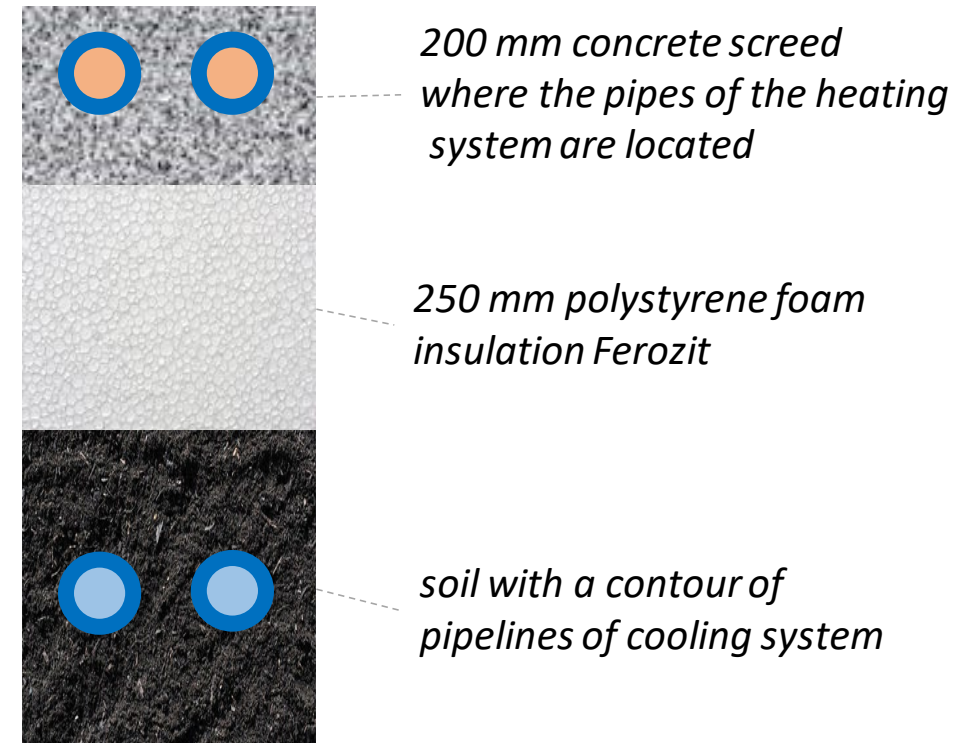


# ENCLOSING STRUCTURES OF THE BUILDING

## Roof

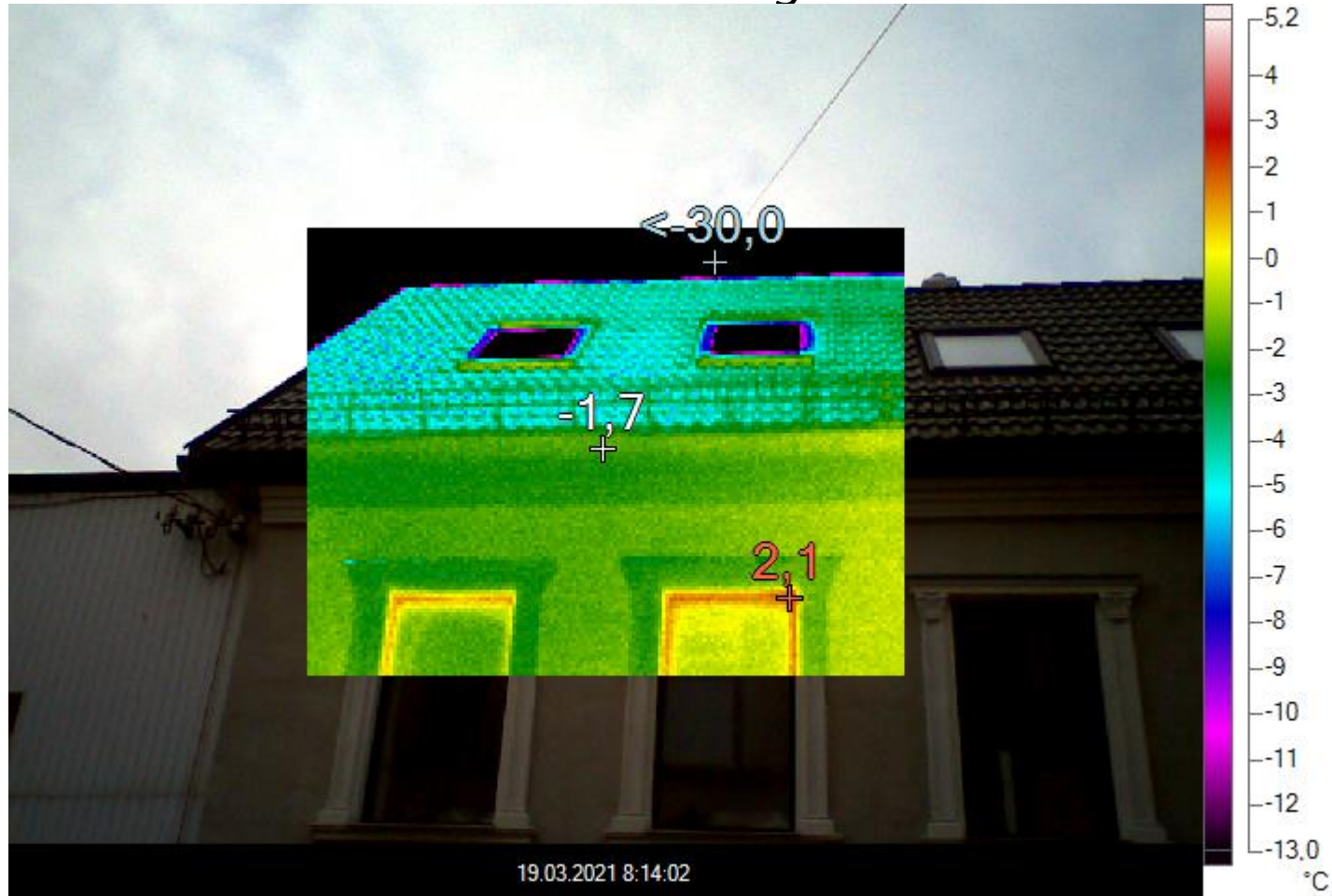


## Floor



# ENCLOSING STRUCTURES OF THE BUILDING

## *Thermal bridges*

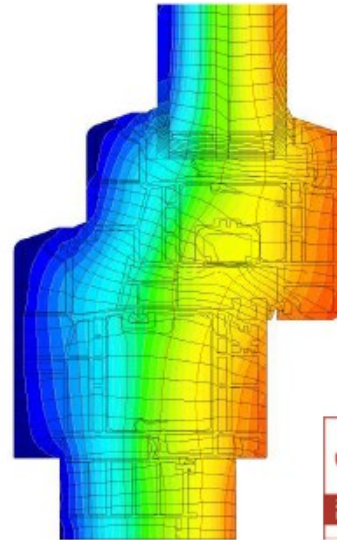




# ENCLOSING STRUCTURES OF THE BUILDING

## *Windows and doors*

REHAU GENE0 PHZ



ROTO Q LINE



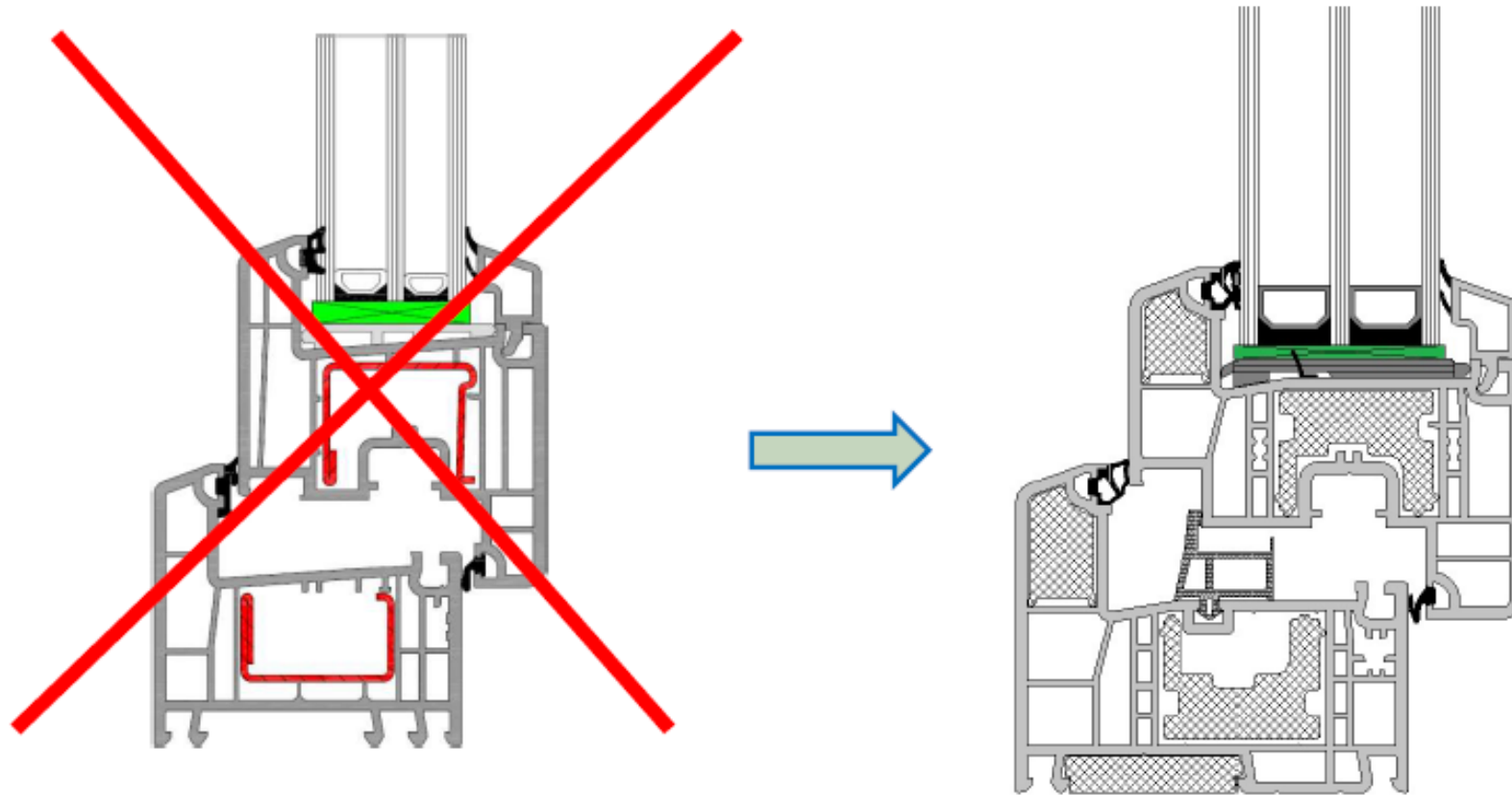
ALUTECH



4i – 16Ar – 4 – 16Ar – 4i  
4i – 8Ar – 4 – 8Ar – 4 – 8Ar – 4i

# ENCLOSING STRUCTURES OF THE BUILDING

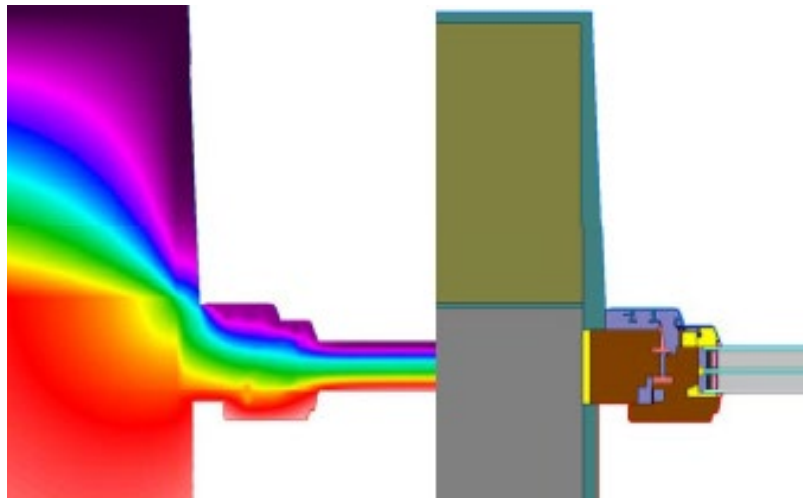
## *Windows*



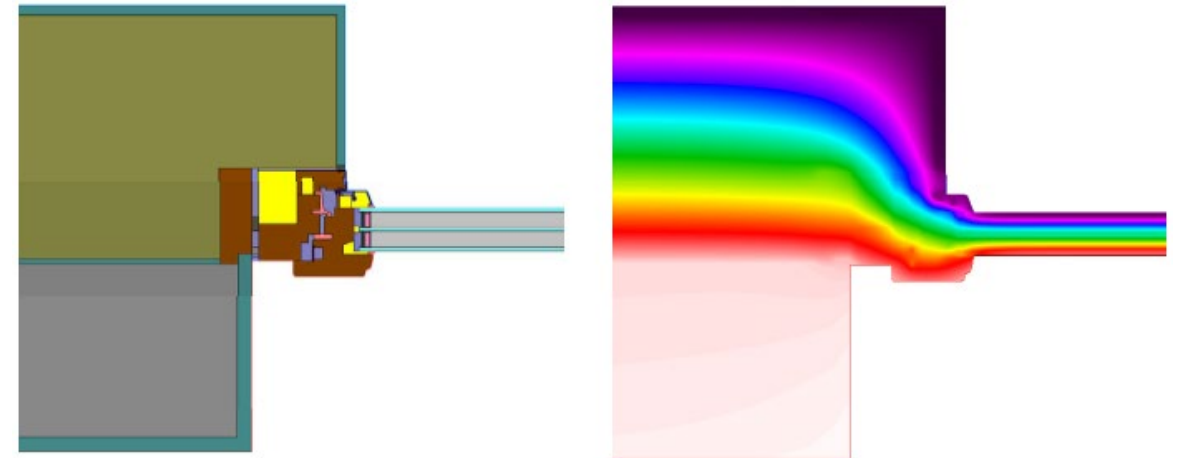
# ENCLOSING STRUCTURES OF THE BUILDING

## *Thermal bridges, window placement*

Classic



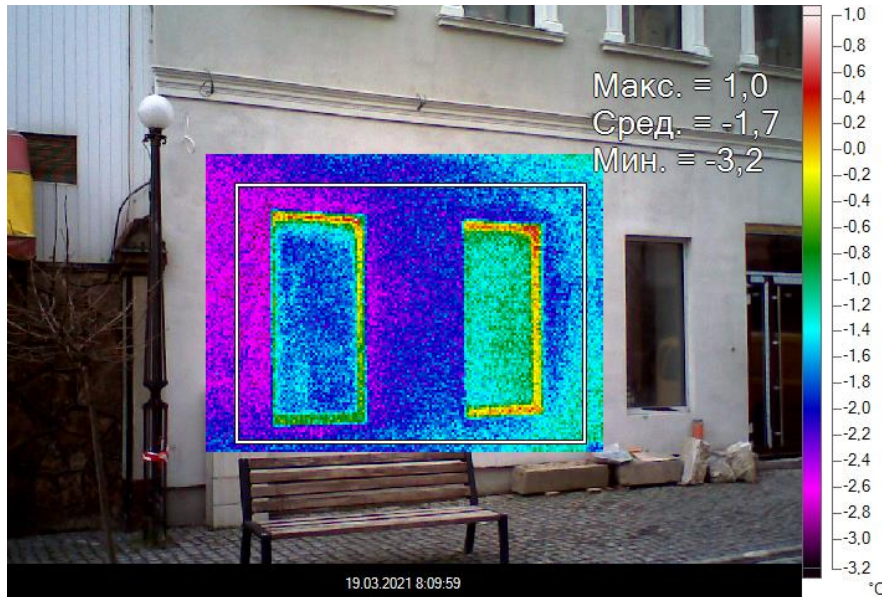
Window behind the wall



# ENCLOSING STRUCTURES OF THE BUILDING

## *Thermal bridges, window placement*

The difference between the maximum and minimum value of the surface temperature is below 5 °C.  
Conclusion - window thermal bridges are not so essential



# ENCLOSING STRUCTURES OF THE BUILDING

## *Thermal bridges*



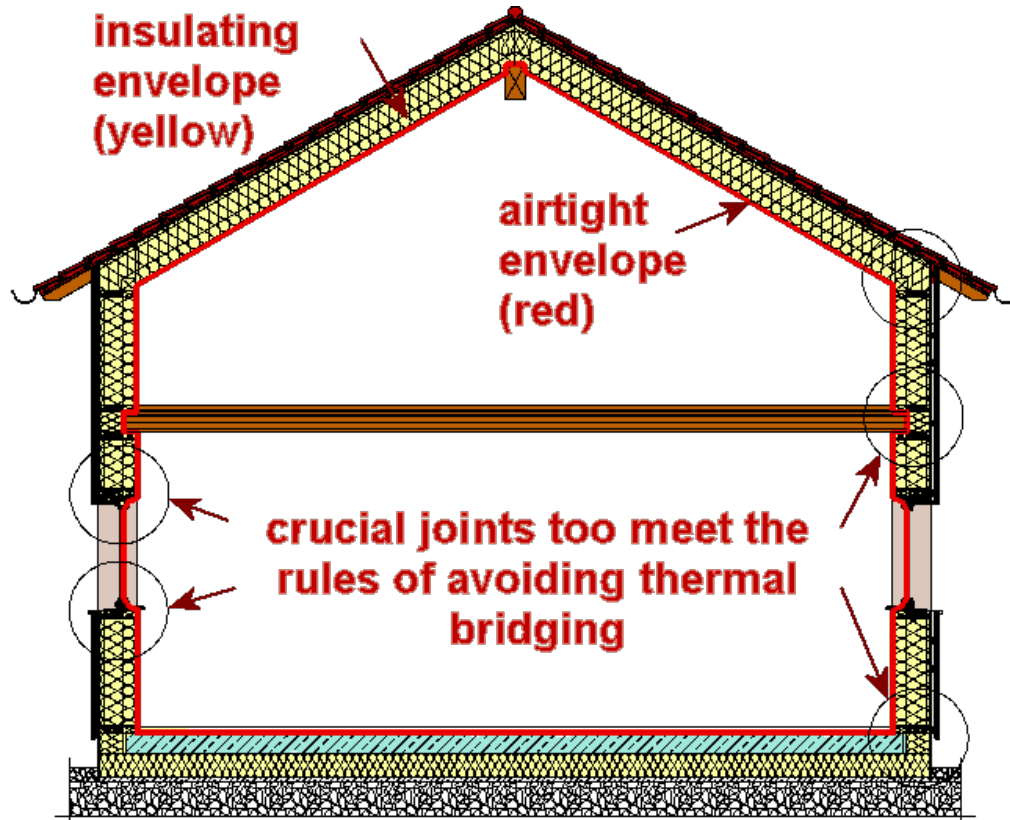
# ENCLOSING STRUCTURES OF THE BUILDING

## *Thermal bridges*



# ENCLOSING STRUCTURES OF THE BUILDING

## *Thermal bridges*



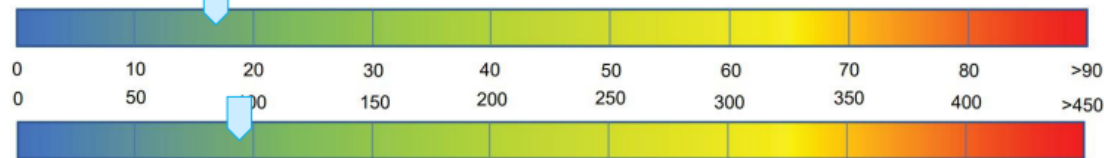
Design without thermal bridges significantly improves the quality of structures. This increases the durability of structures and saves thermal energy for heating.

In the Passive House heat losses through the thermal bridges are also greatly reduced. As usual, they are so minor that you don't need to take them into account.

# ENERGY CONSUMPTION

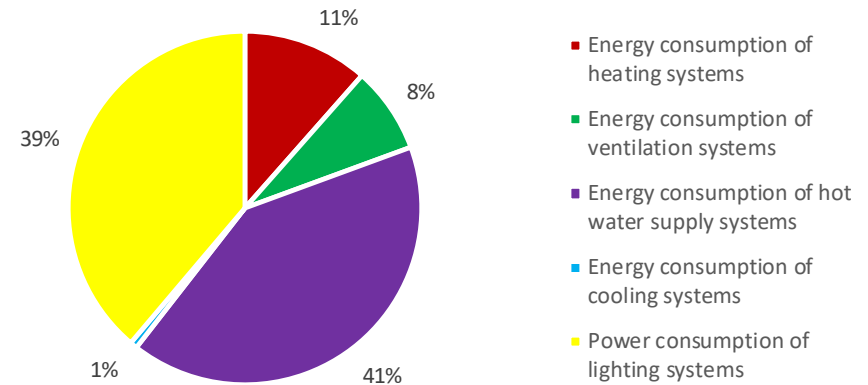
Scale of energy efficiency classes	Energy efficiency class
High level of energy efficiency	
<b>A</b> < 17,4 kWh / m <sup>3</sup>	A
<b>B</b> < 27,8 kWh / m <sup>3</sup>	
<b>C</b> ≤ 34,8 kWh / m <sup>3</sup>	
<b>D</b> ≤ 41,8 kWh / m <sup>3</sup>	
<b>E</b> ≤ 47 kWh / m <sup>3</sup>	
<b>F</b> ≤ 52,2 kWh / m <sup>3</sup>	
<b>G</b> > 52,2 kWh / m <sup>3</sup>	
Low level of energy efficiency	
Specific energy consumption for heating, hot water supply, building cooling, kWh / m <sup>3</sup>	6,7

Specific greenhouse gas emissions, kg / m<sup>2</sup> per year: 17,5



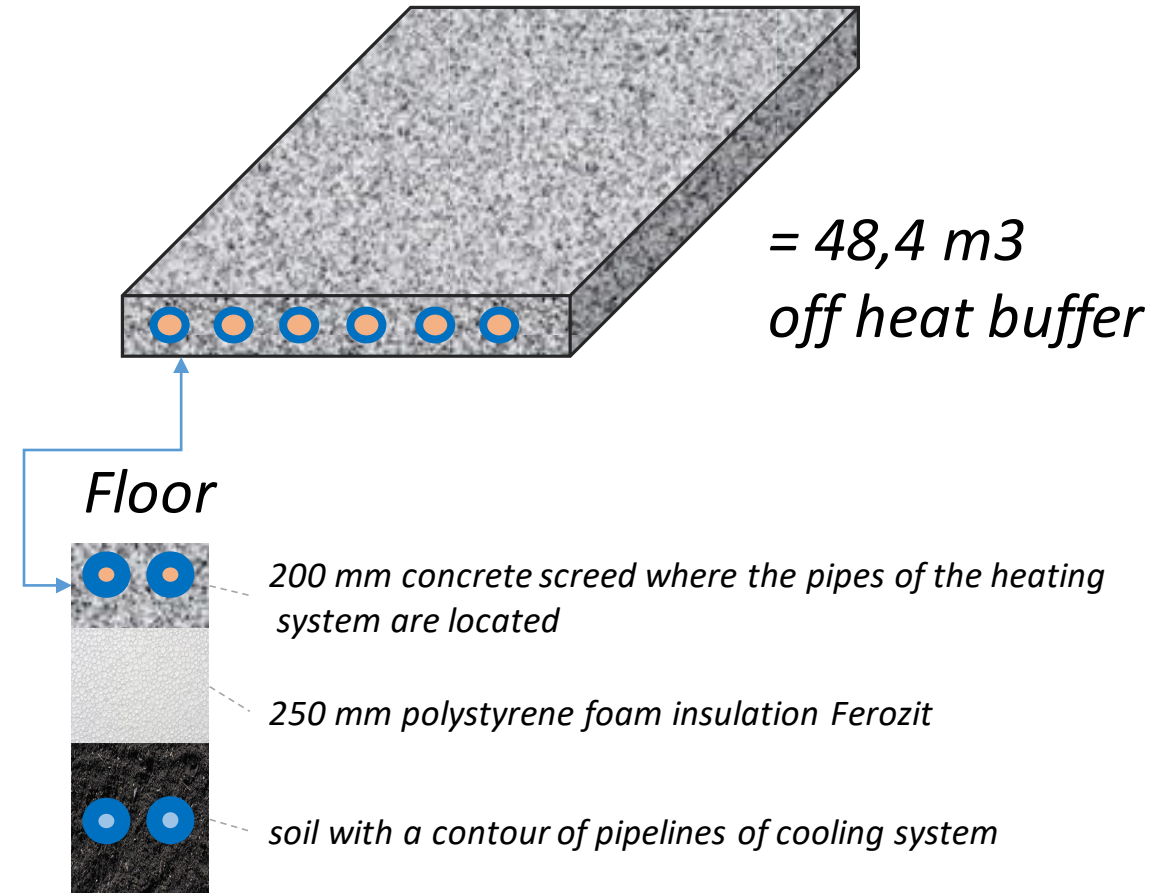
Specific consumption of primary energy, kWh / m<sup>2</sup> per year: 95,8

Type of consumption	Estimated consumption for the year	
	thousand kWh	кВт·год/м <sup>2</sup> [kWh / m <sup>3</sup> ]
Energy consumption of heating systems	3,5	[1,4]
Energy consumption of ventilation systems	2,4	[1]
Energy consumption of hot water supply systems	12,5	[5,2]
Energy consumption of cooling systems	0,2	[0,07]
Power consumption of lighting systems	11,8	[4,9]
<b>TOTAL:</b>	<b>30,4</b>	<b>[12,57]</b>

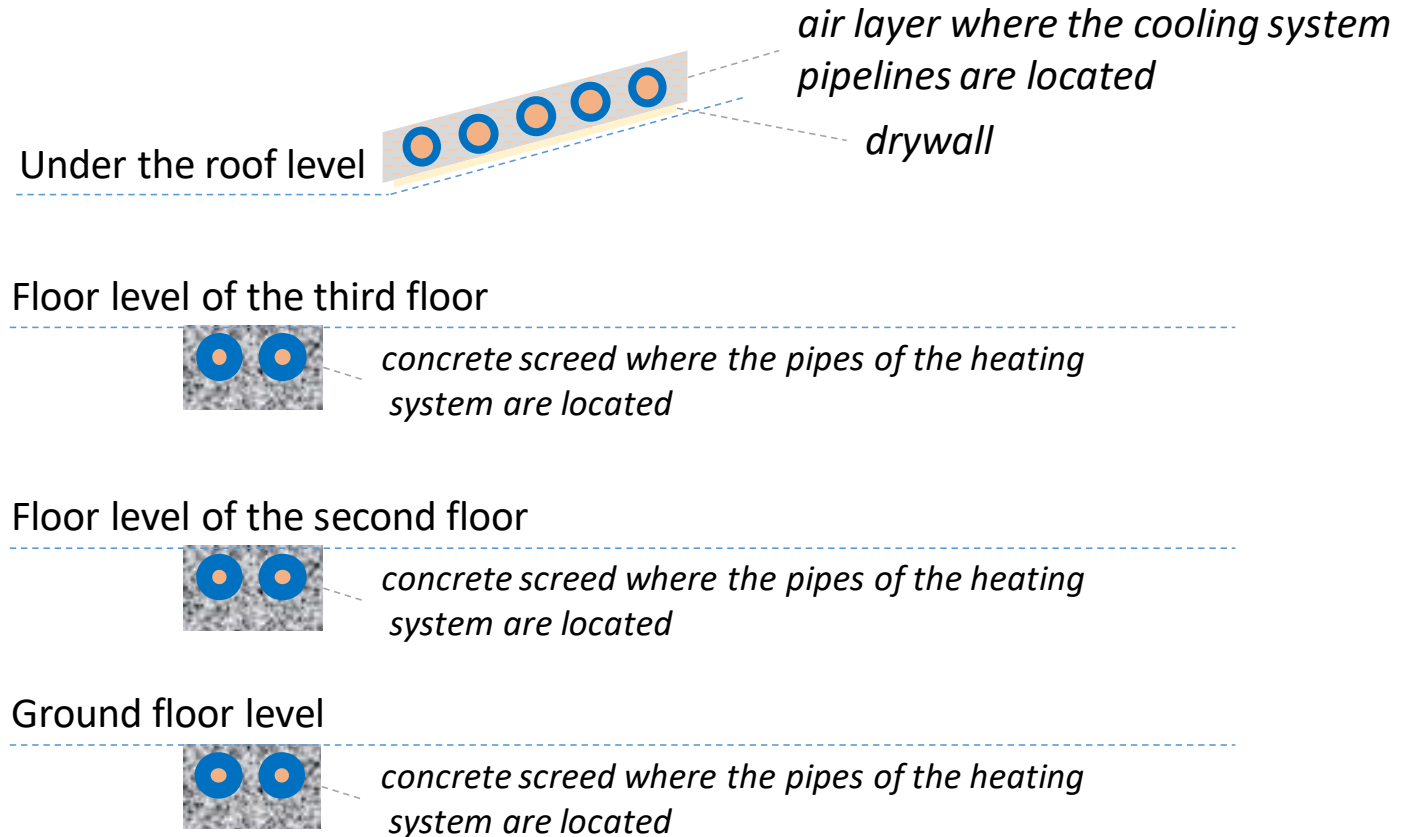




# KNOW-HOW 1 - HEATED FLOOR AS A HEAT BUFFER

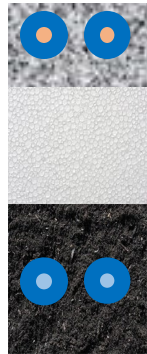


# KNOW-HOW - INTEGRATED HEATING AND COOLING SYSTEM



# KNOW-HOW 2 – GROUND WATER PIPE HEAT EXCHANGER FOR COOLING SYSTEM

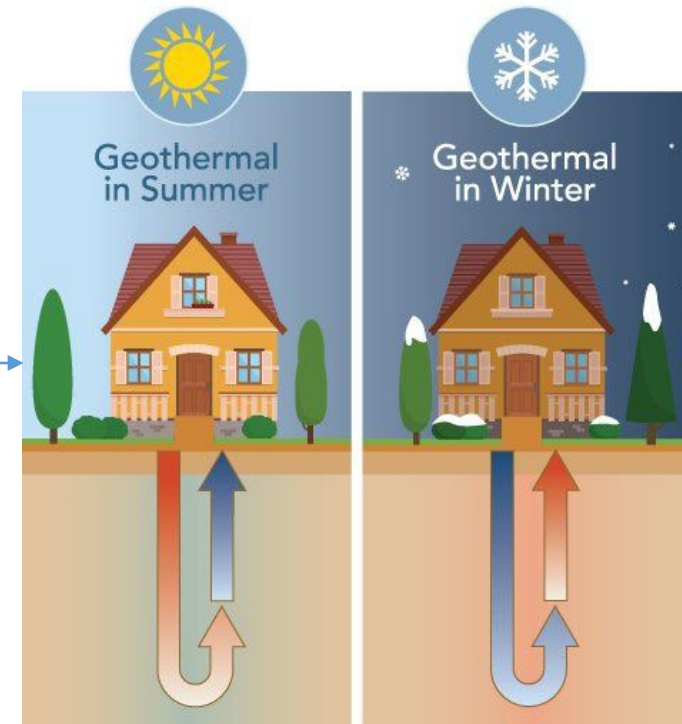
## Floor



200 mm concrete screed where the pipes of the heating system are located

250 mm polystyrene foam insulation Ferozit

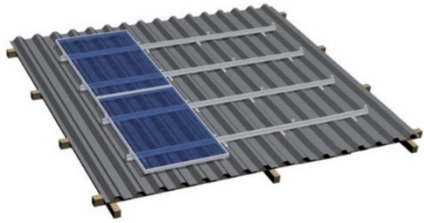
soil with a contour of pipelines of cooling system



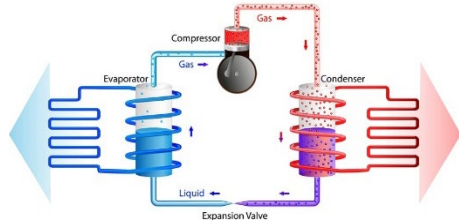
# KNOW-HOW 3 - HEATING SYSTEM WITH THE POSSIBILITY OF MODERNIZATION

## GENERATION SYSTEM

*System with solar panels to power the heat pump*



**Heat pump**



**Solid fuel boiler**



**Electric boiler**



**Storage tank**



**Energy distribution and transportation subsystem**



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# Thanks for your attention !

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