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ERASMUS+ Strategic Partnerships For Higher Education

SUSTAINABLE, HIGH-PERFORMANCE BUILDING SOLUTIONS IN WOOD

2020-1-LV01-KA203-077513

The Nest

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Idea behind the Nest

The Storks can use the same nest for several years→

idea from that is: sustainable homes for new families growing bigger in the Nest

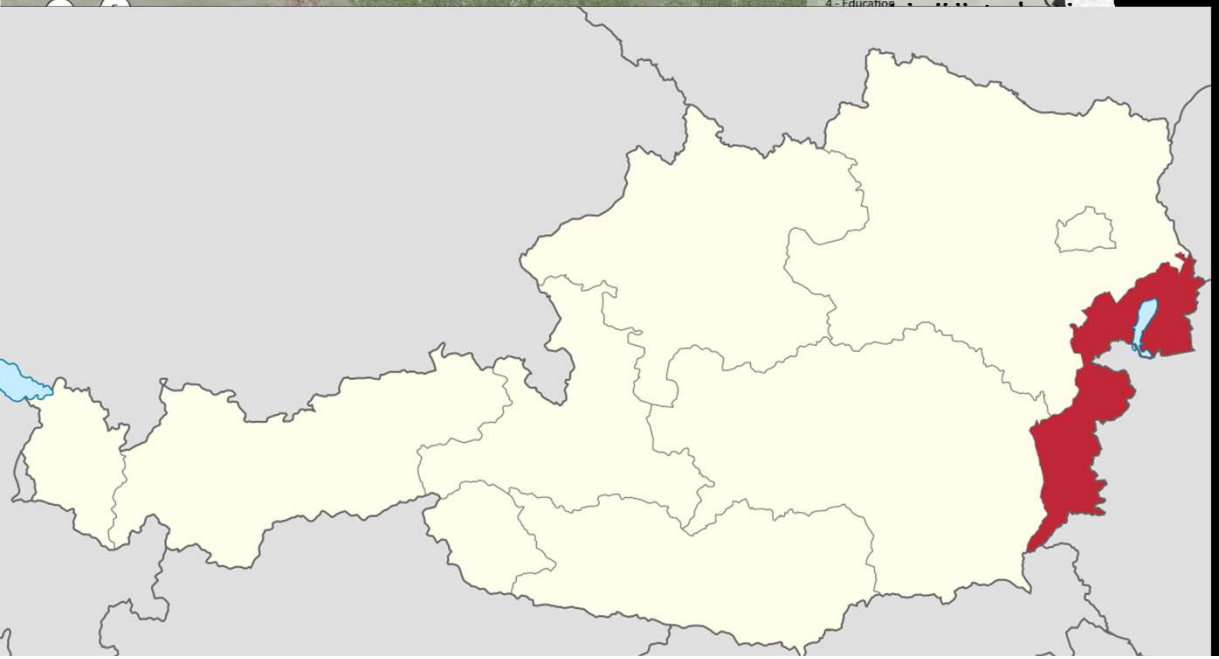
They usually lay 5 eggs thus 5 buildings

The Nest

- Apartments for young families 3-4 person
- 45 m2 apartments
- 5 buildings
- Total: 103 apartments
- 56 Parking spaces

Sources:

- State: Burgenland
- Town: Stegersbach



- Element factory: Hero Holzbau
- Located only 6km from the building site

Sources: https://www.hero-holzbau.at/fertighaus-nach-mass


4
3
1
5
2
4
6
LEGEND
1 - THE NEST
2 - Leisure Facilities
3 - Supermarket
4 - Education
5 - Public Transport
6 - Church
N
M 1:500

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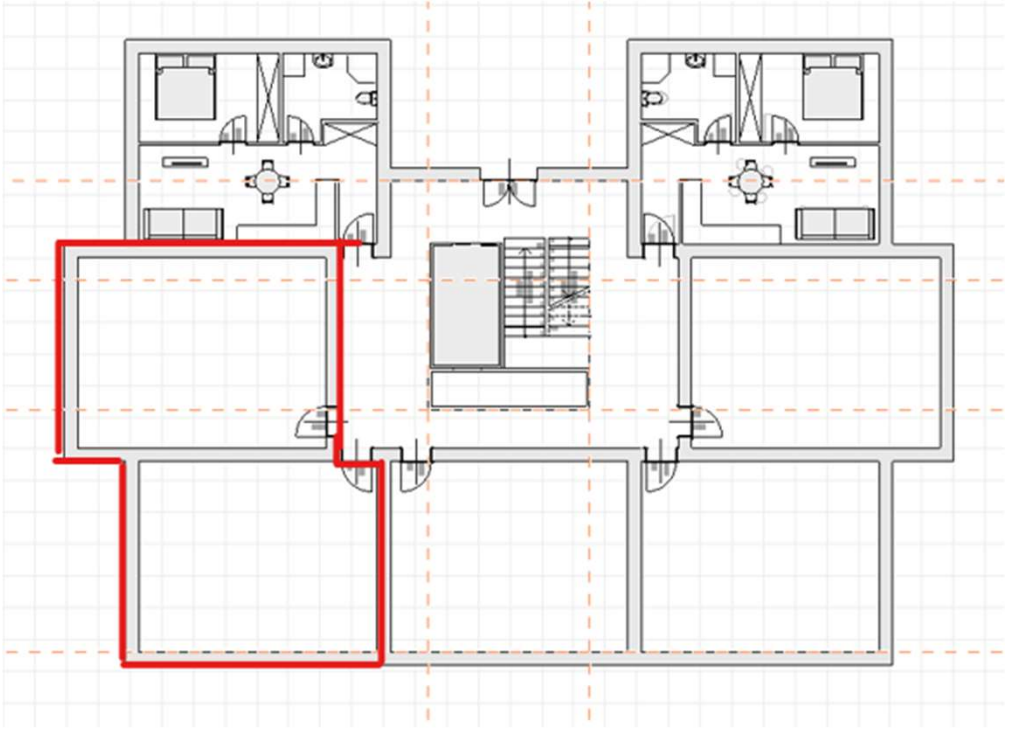
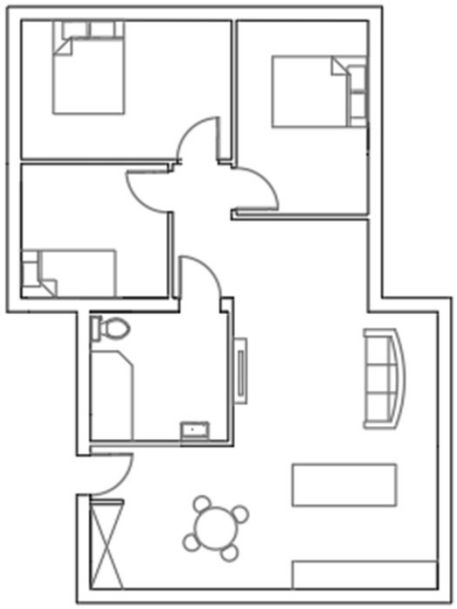
Ground floorplan

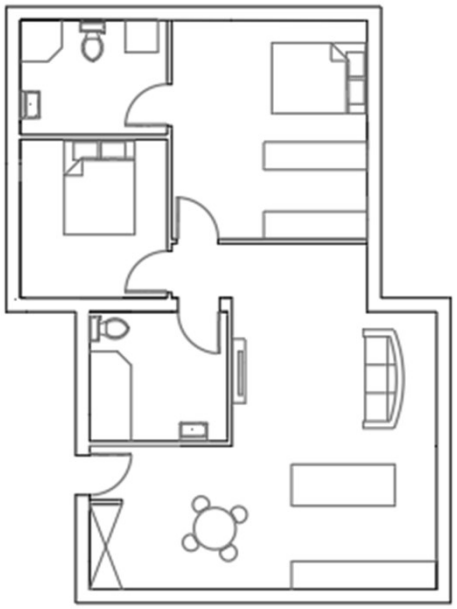
Sources:

First and Second floor plan

Merged apartment: 2x 45 m2 apartments into 90m2

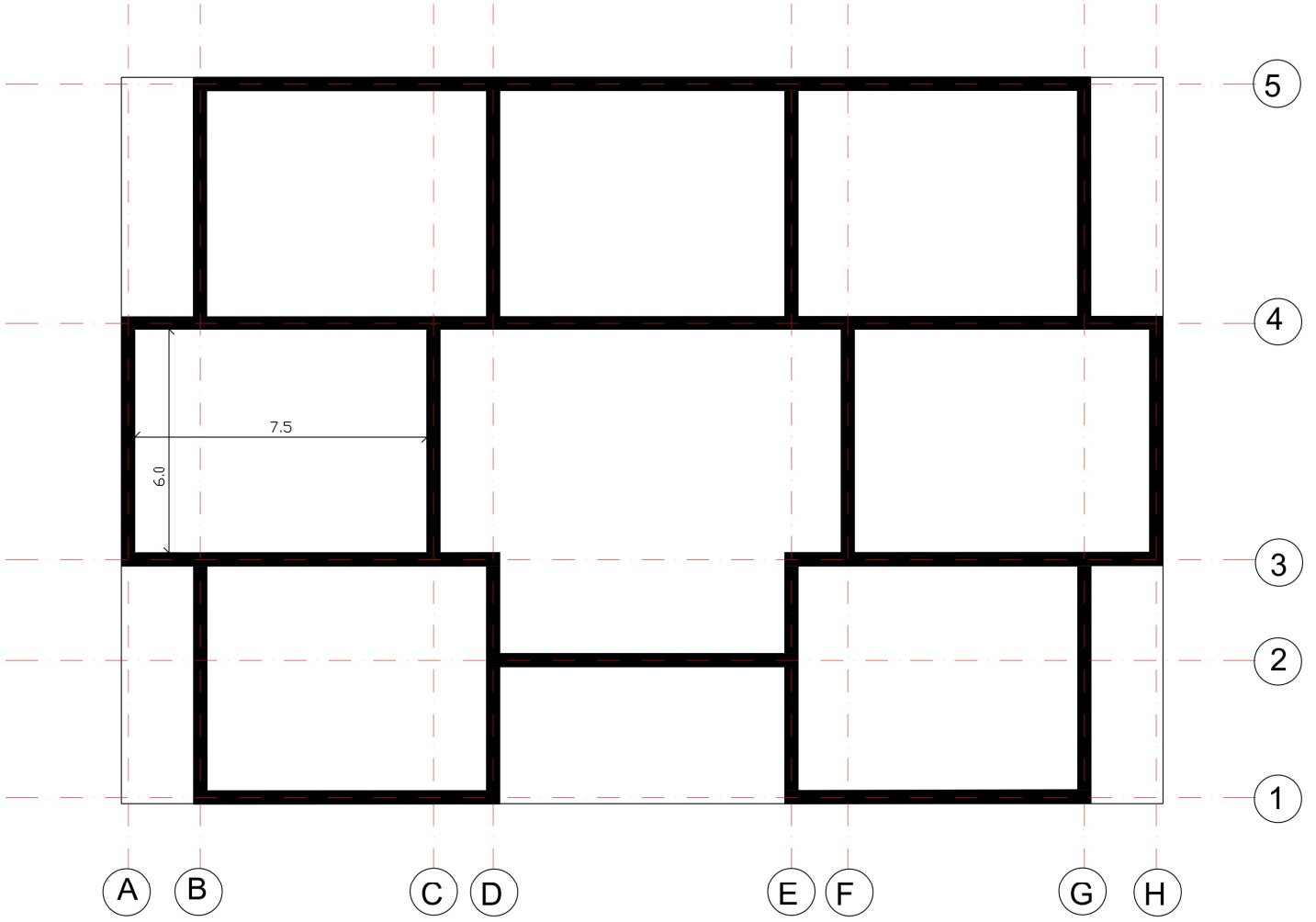


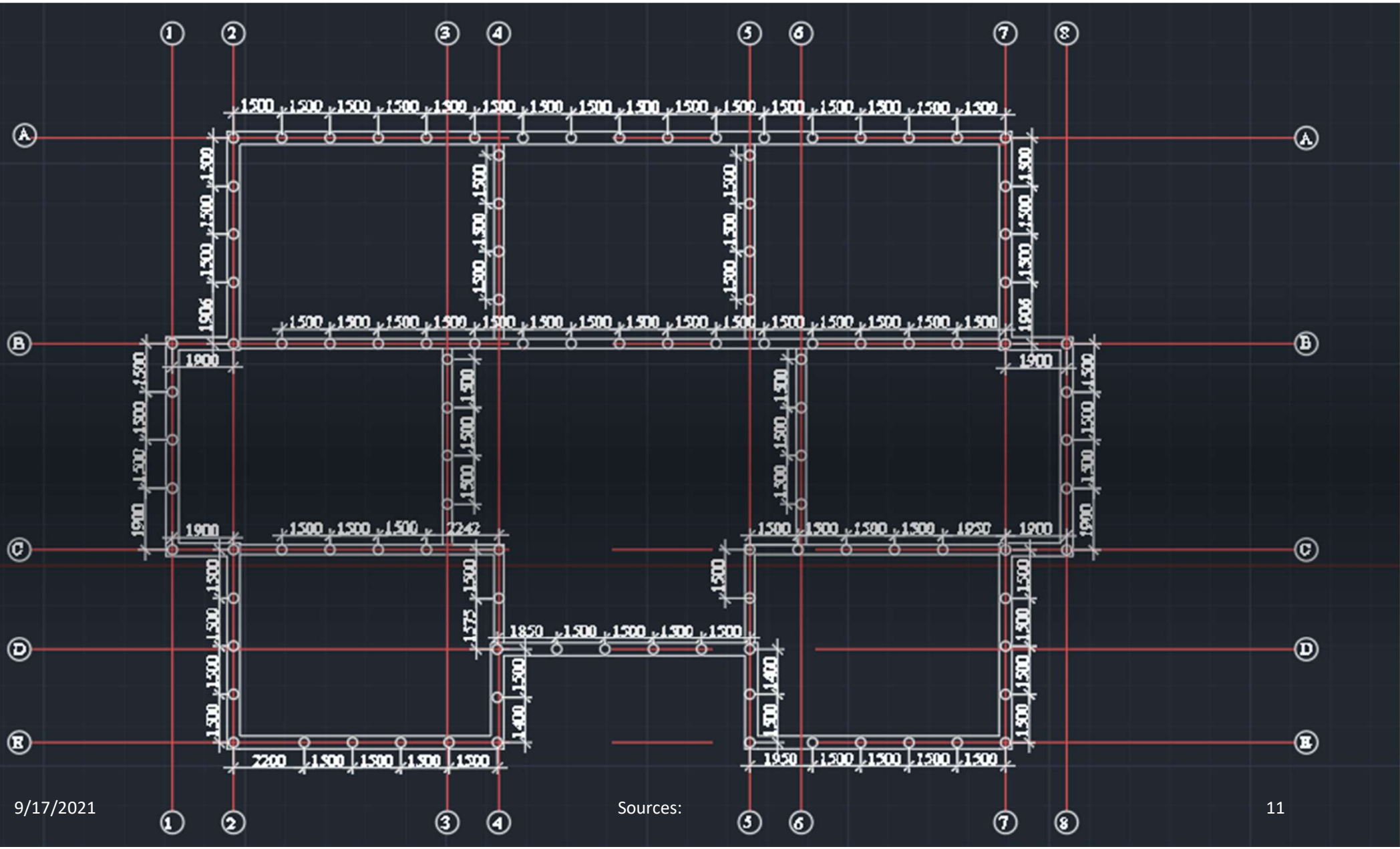




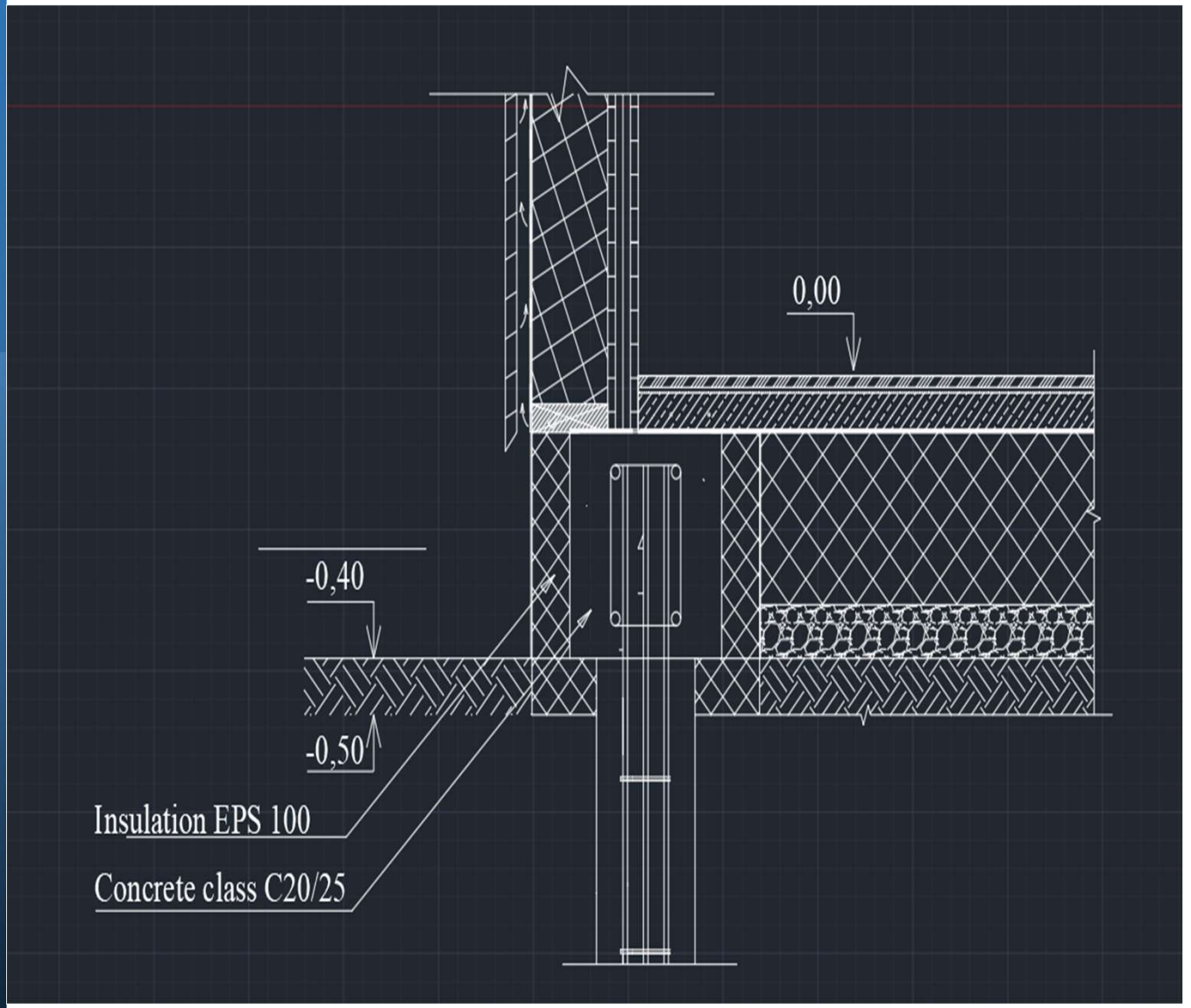

5
4
3
2
1
A
B
C
D
E
F
G
H
1.5
7,5
7.5
7.5
1.5
6.0
6.0
6.0
FPH 170
FPH 100
FPH 20

Static structure



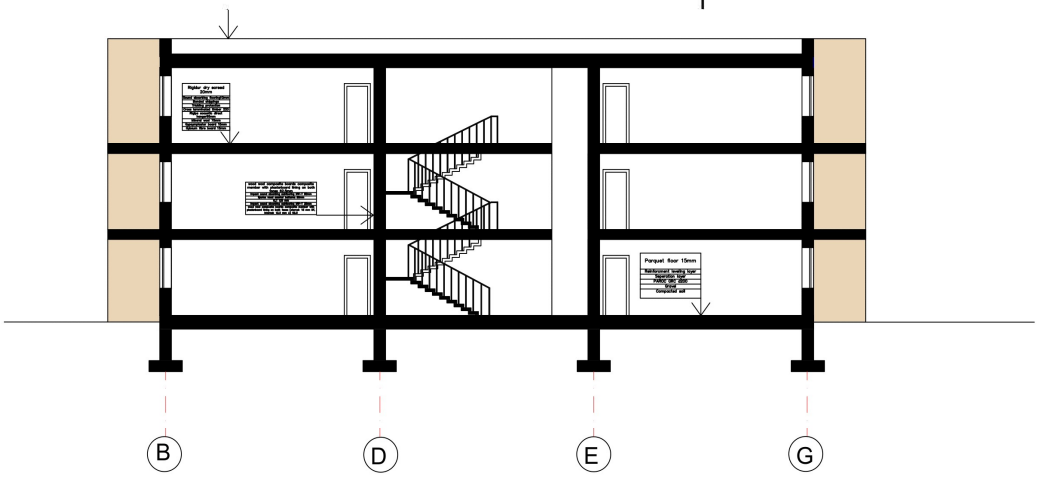

1 2 3 4 5 6 7 8
A B C D E
1500 1900 1950 2200 1850 1575 1400 2242

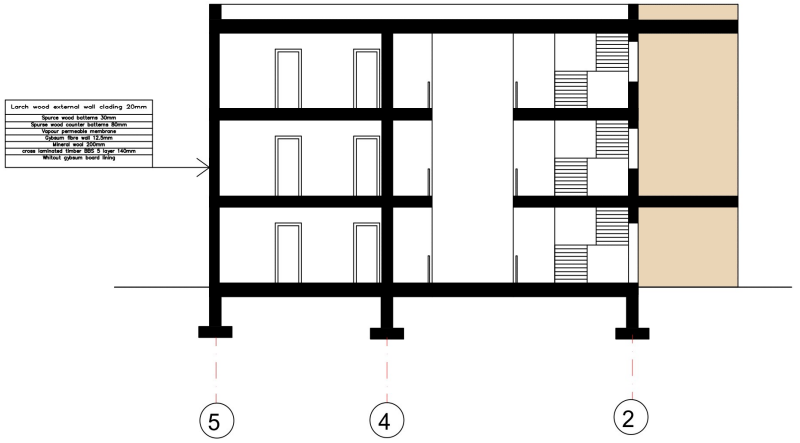
Foundation



Sheet metal roofing
Spurce wood batterns (30/50)
Spurse wood counter batterns 80mm
Softboard 22mm
Softboard insulation on top of batterns 240mm
Sealing sheet
cross laminated timber BBS 5 layer 180mm
spruce wood battens (60/60; e=625) mounted on resilient clips 70mm
mineral wool [040; 18] 50mm
gypsum plaster boards 15mm
gybsumfibre board 15mm

Larch wood external wall clading 20mm
Spurce wood batterns 30mm
Spurse wood counter batterns 80mm
Vapour permeable membrane
Gybsum fibre wall 12.5mm
Mineral wool 200mm
cross laminated timber BBS 5 layer 140mm
Whitout gybsum board lining





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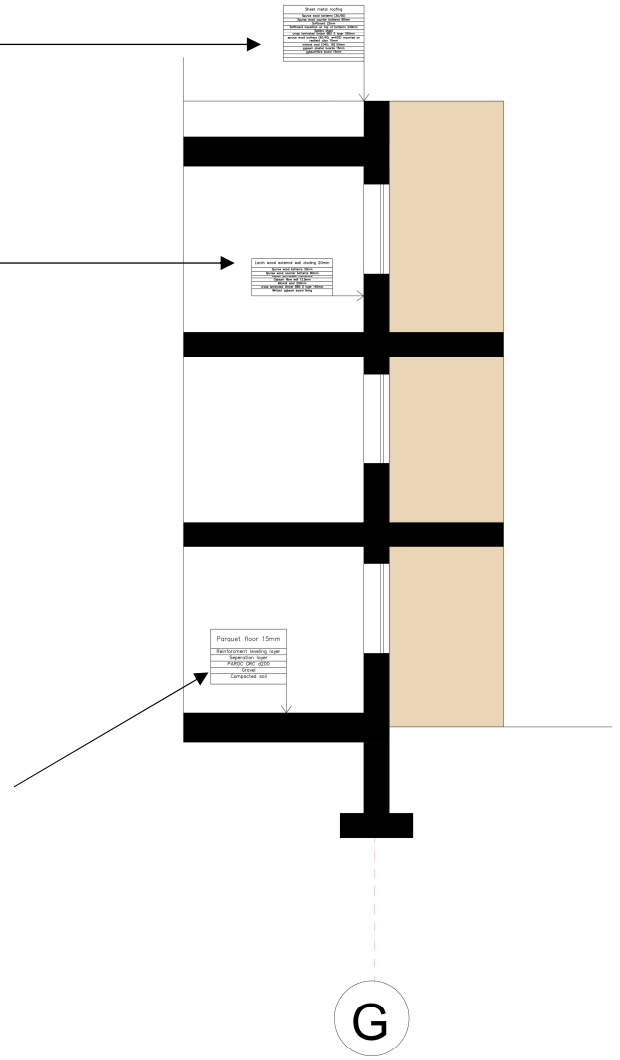
Whitout gybsum board lining

Parquet floor 15mm
Reinforcment leveling layer
Seperation layer
PAROC GRC d200
Gravel
Compacted soil



Sources:

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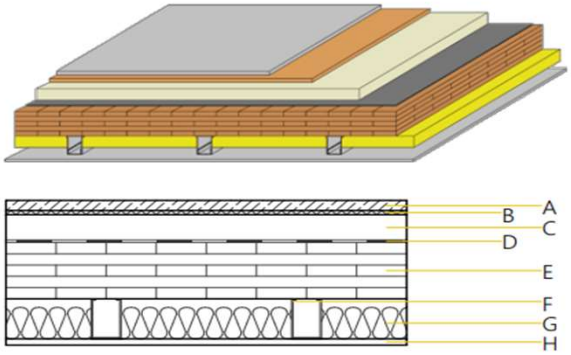
Intermediate floor

intermediate floor, solid wood construction, suspended, dry, with filling, other surface



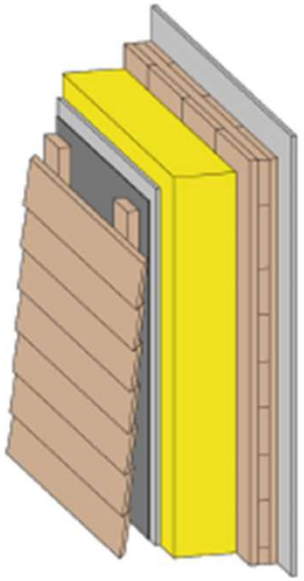
	Thickness	Building material	Thermal performance			
			λ	μ min – max	ρ	c
A	20.0	Rigidur dry screed	0.200	19	1200	1.100
B	10.0	impact sound absorbing subflooring MW-T [s'= 35 MN/m	0.035	1	120	1.030
C	60.0	bonded chippings	0.700	1	1500	1.000
D		trickling protection				
E	220.0	cross laminated timber BBS 7 layer	0.130	50	470	1.600
F	95.0	Rigips acoustic direct hanger with CD 60/27				
G	75.0	mineral wool [040; 18]	0.040	1	18	1.030
H	15.0	gypsum plaster boards Rigips RF or	0.250	10	900	1.050
H	15.0	gypsum fibre board Rigidur H	0.350	19	1200	1.100

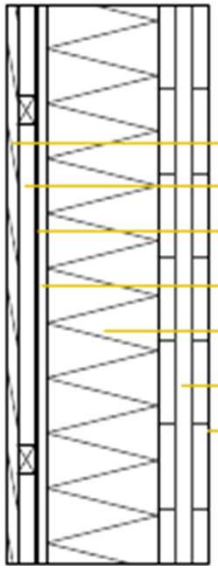
(from outside to inside, dimensions in mm)

Performance rating

Fire protection performance	REI	90
Thermal performance	U Diffusion	
Acoustic performance	R_w ($C;C_{tr}$) $L_{n,w}$ (C_I)	65(-4;-12) dB 49(2)

external wall, solid wood construction, ventilated, without dry lining, with cladding, wooden surface





	Thickness	Building material	Thermal performance			
			λ	μ min – max	ρ	c
A	20.0	larch wood external wall cladding	0.155	150	600	1.600
B	30.0	spruce wood battens	0.120	50	450	1.600
C		vapour-permeable membrane sd≤0,3m				
D	12.5	gypsum fibre board	0.320	21	1000	1.100
E	200.0	mineral wool [035; 130;1000°C]	0.035	1	130	1.030
F	140 .0	cross laminated timber	0.130	50	500	1.600
G		without gypsum board lining				

(from outside to inside, dimensions in mm)

Performance rating

Fire protection performance	REI from inside REI from outside	60 90
Thermal performance	U Diffusion	0.15 W/(m^{2}K) suitable
Acoustic performance	R_w (C;C_{tr}) $L_{n,w}$ (C_i)	41 dB

Sources:

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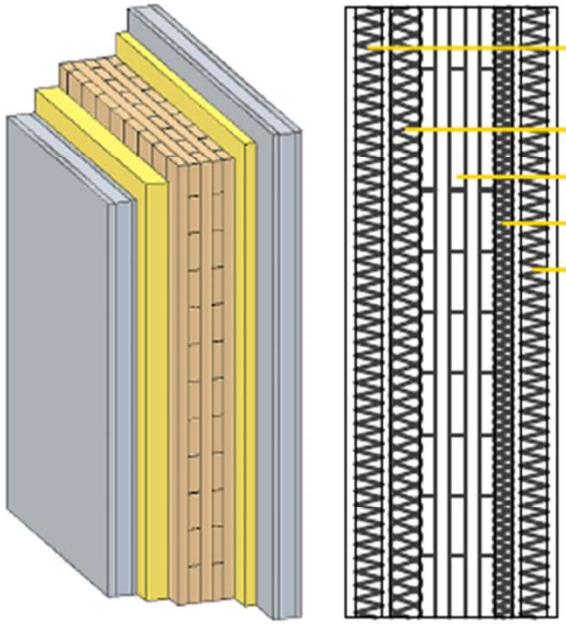
compartment wall, solid wood construction, without dry lining, single-layer, other surface



	Thickness	Building material (from outside to inside, dimensions in mm)	Thermal performance λ	μ min – max	ρ
A	62.5	wood wool composite boards composite member with plasterboard lining on both faces	0.090	2 - 5	
B	50.0	impact sound absorbing subflooring MW-T	0.036	1	
C	140.0	solid wood (e.g. cross laminated timber)	0.130	50	
D	25.0	impact sound absorbing subflooring MW-T	0.036	1	
E	62.5	wood wool composite boards composite member with plasterboard lining on both faces (eternal: 15 mm DF, internal: 12.5 mm A)	0.090	2 - 5	

Performance rating

Fire protection performance	REI	90
Thermal performance	U Diffusion	0.23 W/(m²K) suitable
Acoustic performance	R_w ($C;C_{tr}$) $L_{n,w}$ (C_I)	63 dB

Sources:

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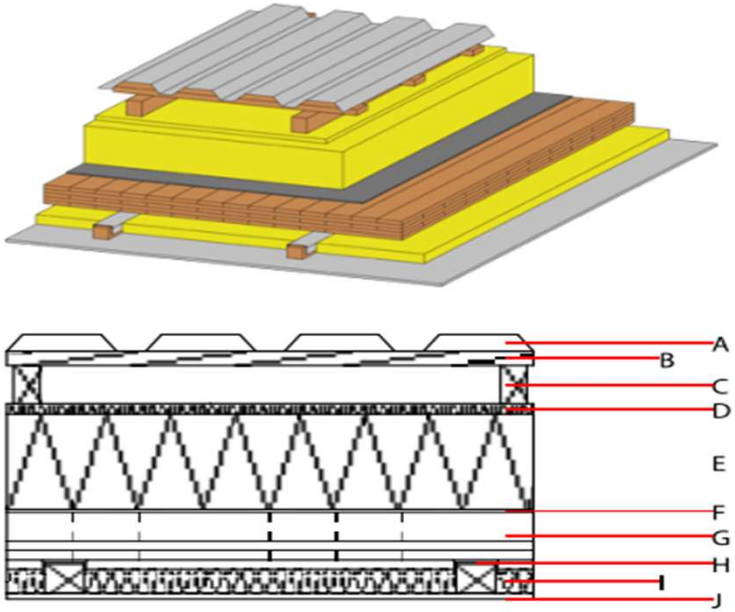
Flat roof - fdmhbi01a-01

flat roof, solid wood construction, ventilated, without dry lining, suspended, other surface

Performance rating

Fire protection performance	**REI**	60
maximum span = 4 m; maximum load $E_{d,fi}$ = 7,92 kN/m²		
Classified by IBS		
Thermal performance	**U**	0.11 W/(m²K)
	Diffusion	suitable
Calculated by HFA		
Acoustic performance	**R_w ($C;C_{tr}$)**	57 dB
	$L_{n,w}$ (C_I)	
Assessed by IFT		
Mass per unit area	**m**	115.40 kg/m²
Calculation based on gypsum plaster board type DF		



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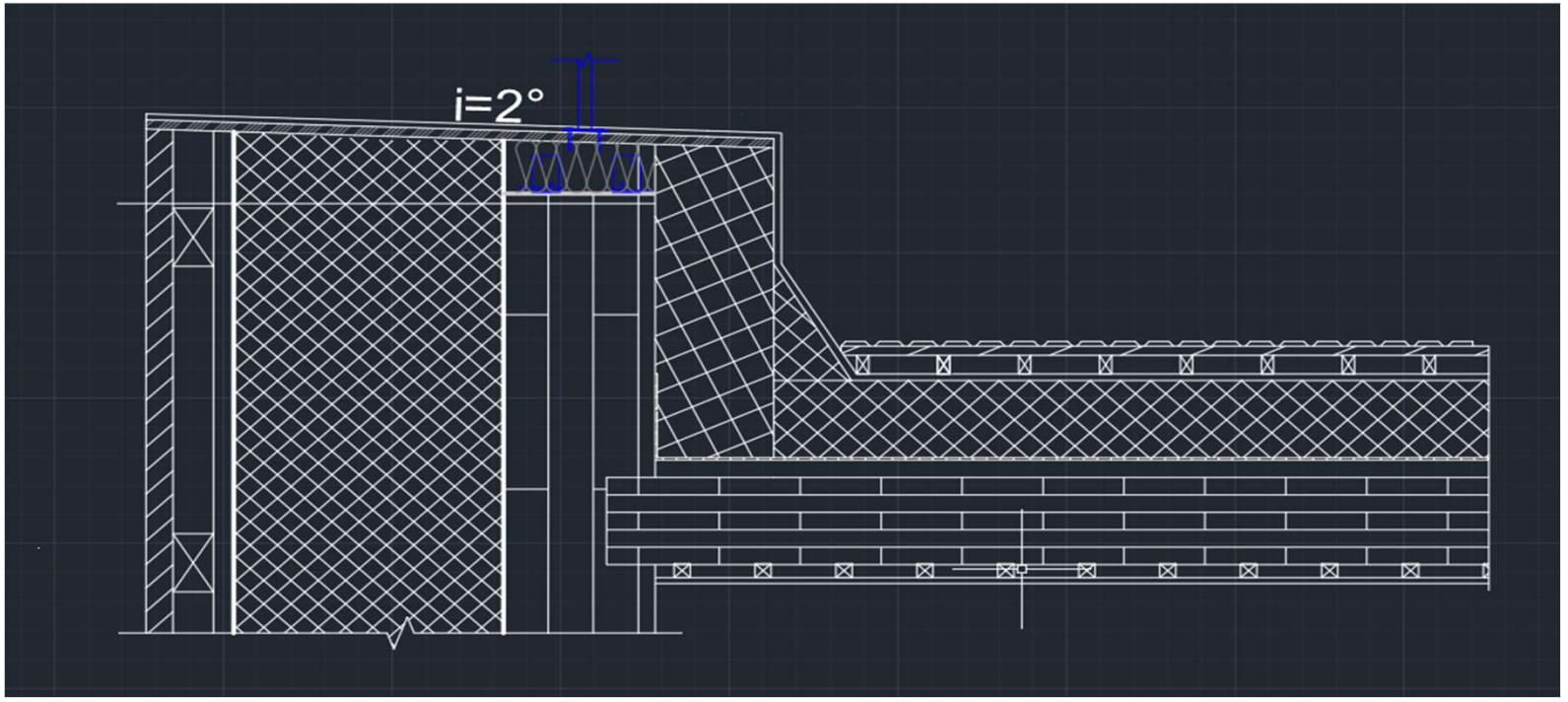
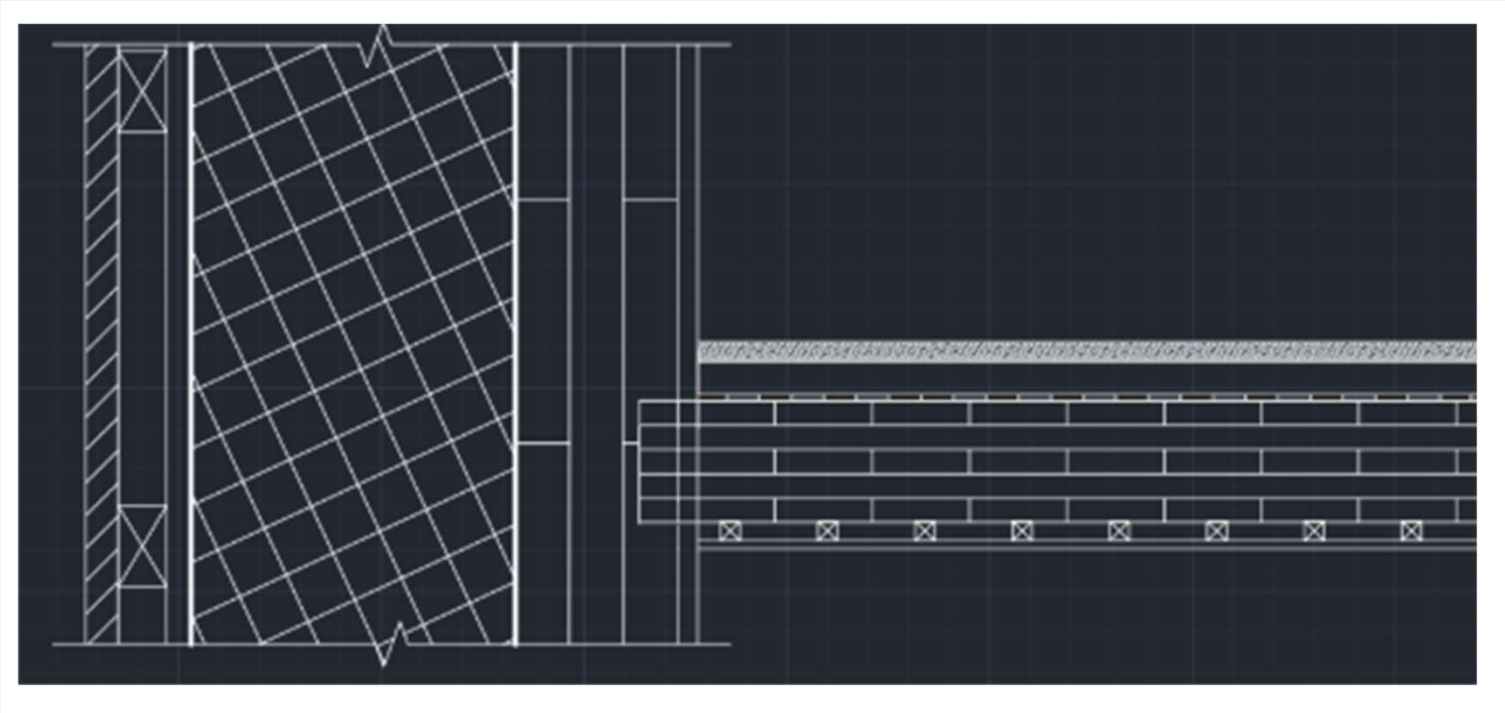
Roof - exterior wall detail





Inner storey overlay

Results of the basic load calculattions

Live Load:

- 2 kN/m2 for floors and stairs
- 2,5 kN/m2 for balconies

Dead Load:

- 2 kN/m2

Snow loads:

- Sk = 1,09 kN/m2
- S = 0,698 kN/m2

Wind Loads

- Qb (reference pressure) = 347,54 Pa
- Qp= 0,8kN/m2

CTL Connection system

X-RAD

- excellent static performance
- reduction of assembly time

Sources:

Fire Protection

- Structures have 60 minutes fire resistance requirements in Austria.
- There are always two exit ways from the apartments: staircase or fire latters from the window
- CLT is great because of the cross lamination in terms of its properties: it is a very lightweight, fire-resistant, strong and rigid building material.

Economical

- The use of wooden structures significantly speeds up the construction process.
- Wooden materials used in this construction are local
- With good design and the right choice of materials, it is possible to build wooden houses that will last for centuries, so that the carbon footprint of one house is small.
- Regular maintenance is an important part of sustainable construction and every building needs maintenance to last. When building materials are easy to repair and recycle, the house is also more environmentally friendly to maintain.

Sustainability and efficiency with our CLT-elements

- We will have temporary unloading areas on the site for the elements to be storaged→This will be consulted with Hero Holzbau before the elements go into manufacturing
  - They will cut the installation holes for the electrical wires and plumping pipes
- Good planning makes the least waste material:
  - At the beginning of project it is important to take into consideration the maximum and minimum lengths of CLT
  - When materials are delivered to the construction site according to plan and are the right length, the amount of recyclable construction waste on the site is reduced as well as costs.
  - Excess waste should be sorted and recycled systematically. Successful waste logistics keeps the site clean, costs low and is part of sustainable development

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Summer→ PV-panels on roof

Daytime passive:

- Loggias for shading

Daytime active:

- Getting energy from PV-panels
- Accumulator to store energy

Summer nights:

- Controlled ventilation to regulate the air
- Openable windows

Winter →electricity gain PV-panels on facade

Daytime passive:

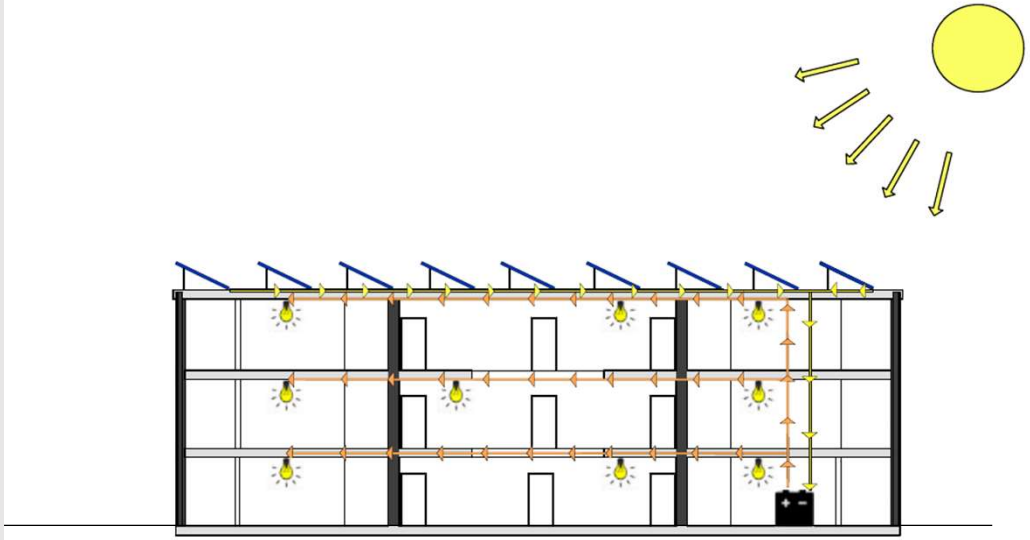
- Good insulation
- Lots of glass to capture sun´s heat

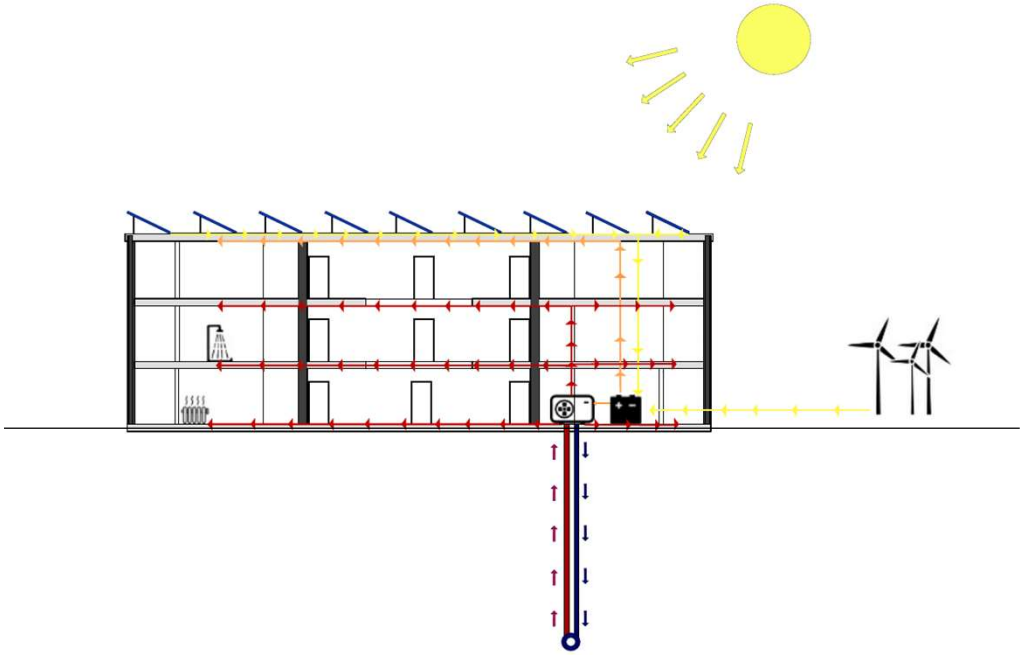
Daytime active:

Energy won from PV-panels used to generate heating systems (heat pump)

Night time active:

Warmth from heat storage/collector





Dismantling concept

Materials that can be used again

- wood beams, wooden panels and wooden floors (as such or after processing)
- Concrete can be crushed into a fine stone that can be used, among other things in road constructions.
- Steel can be melted and used again almost indefinitely
- Old window glass can be used to make thermal insulation (for example glass wool and foam glass)

Materials that can be recycled

- Wood and wood - based products can be reused, recycled or used after its first life cycle as a source of energy.
- Crushed concrete is also suitable as a raw material for new concrete.

THANK YOU!

Sources: