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UNIVERSITY OF APPLIED SCIENCES

**SUSTAINABLE, HIGH-PERFORMANCE
BUILDING SOLUTIONS IN WOOD**

2020-1-LV01-KA203-077513

Group 6

DESIGN COORDINATION

Patrycja Owczarska : Karlis Dreimanis : Anastasiya Skvarniuk:

Viktorija Kuzminskaite : Simonas Opulskis : Piotr Zyguła:

19-05-2022

Karlis Dreimanis: Dubro Maija: Klara Burgstaller: Aneta Pogrzeba

23-03-2023



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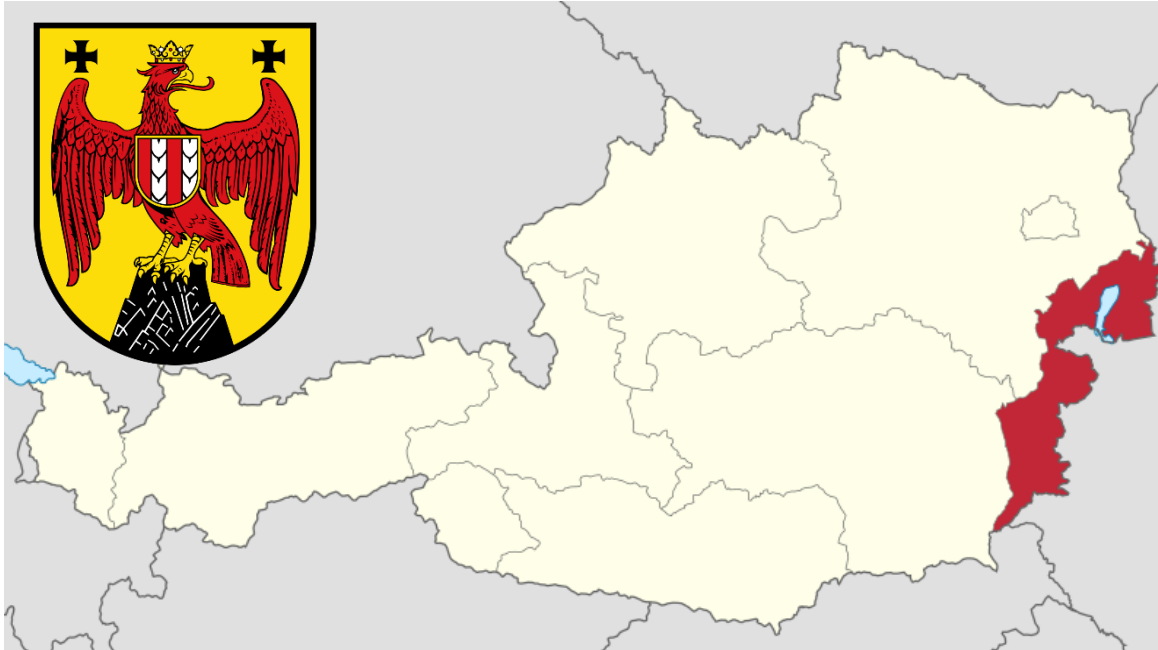


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Location

Burgenland



Stegersbach



Sources:

3) <https://es.wikipedia.org/wiki/Burgenland>

4) <http://www.fahnen-gaertner.com> - http://www.fahnen-gaertner.com/dl_center/index.php?fg_fahnenkatalog_ebook.pdf, Domena publiczna, <https://commons.wikimedia.org/w/index.php?curid=4990859>

5) <https://www.therme-stegersbach.com/stegersbach-infos/>



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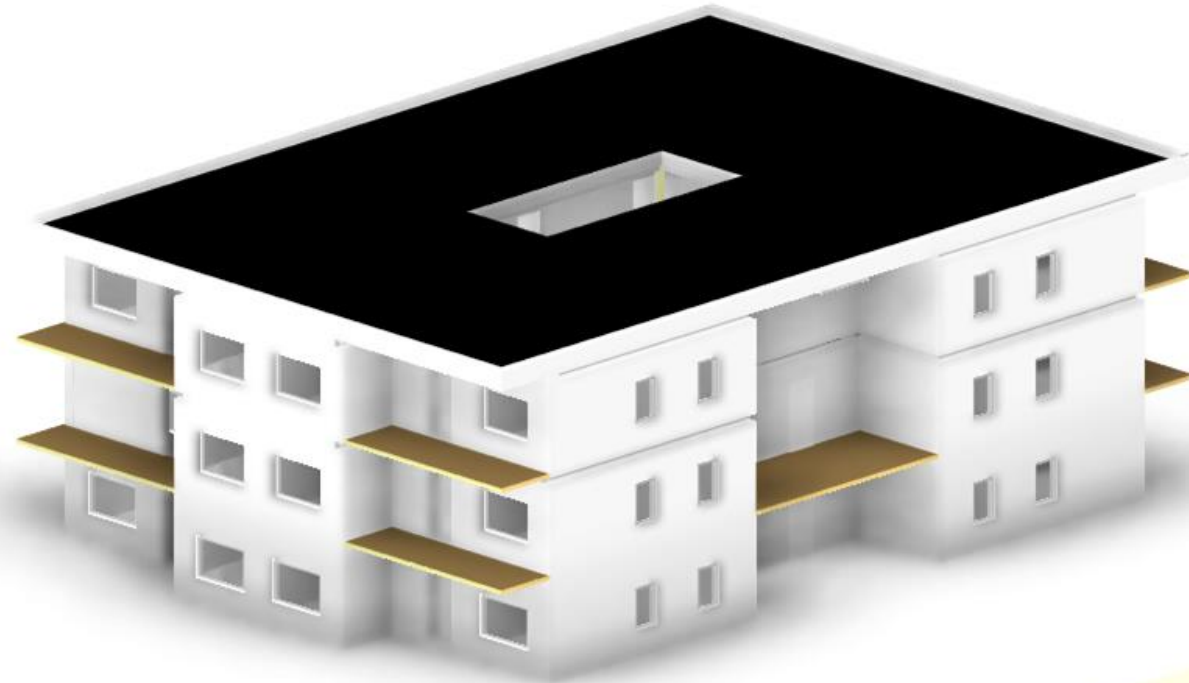
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Hard Facts:

- 5 Buildings
- each 3 storeys tall
- 7 flats on each floor with 46 m²
- Inner courtyard
- Balcony for each flat

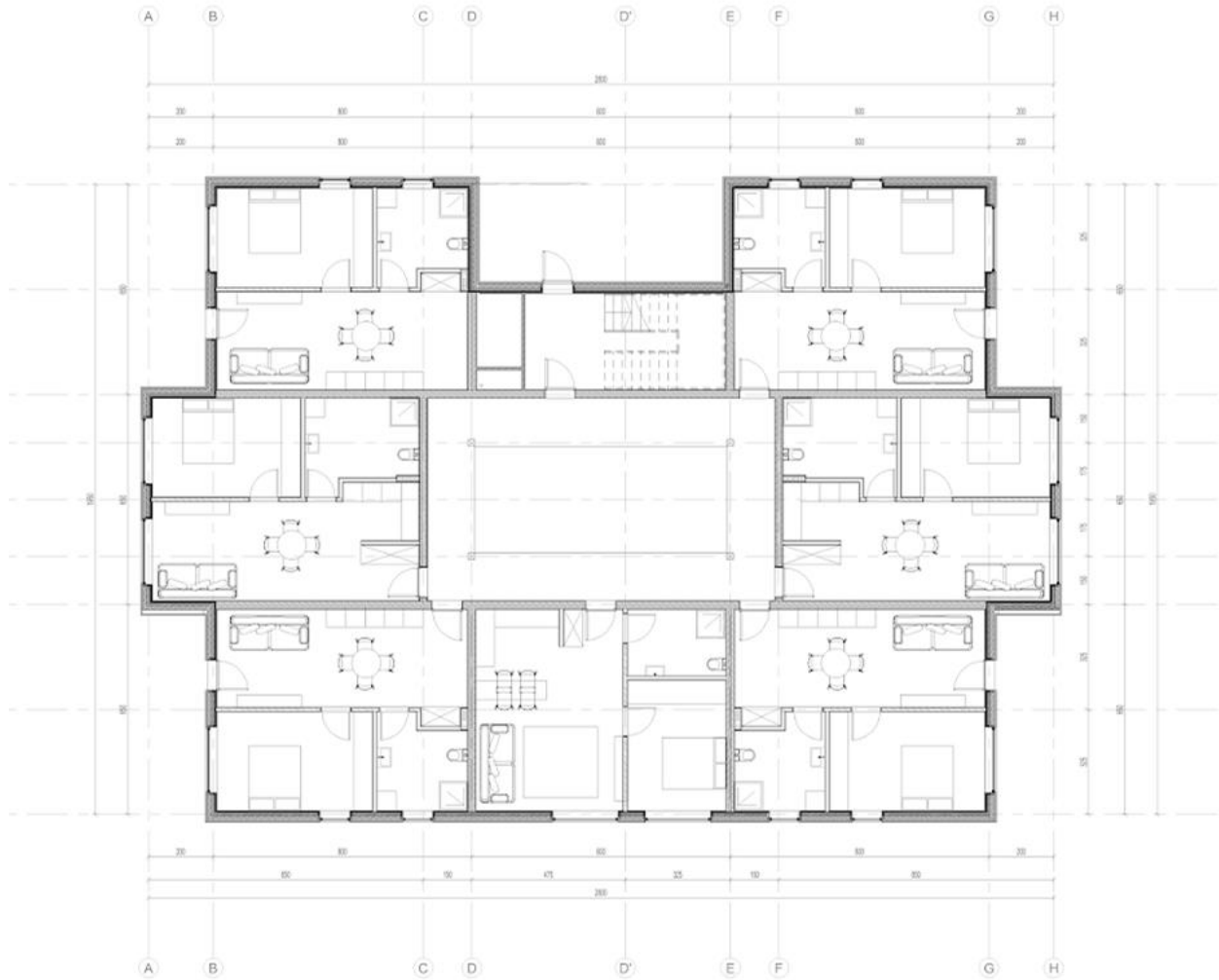




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Floor plan



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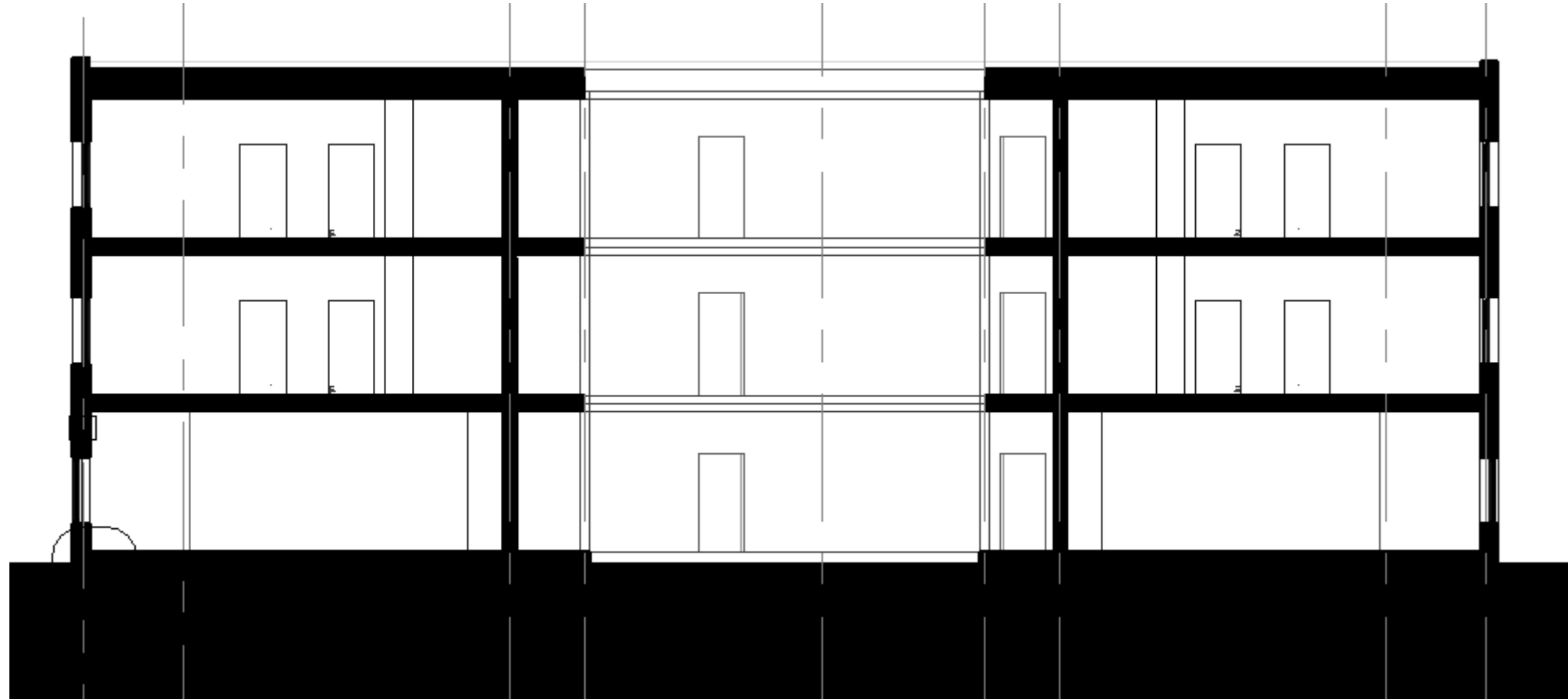
KVVK
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WOOD

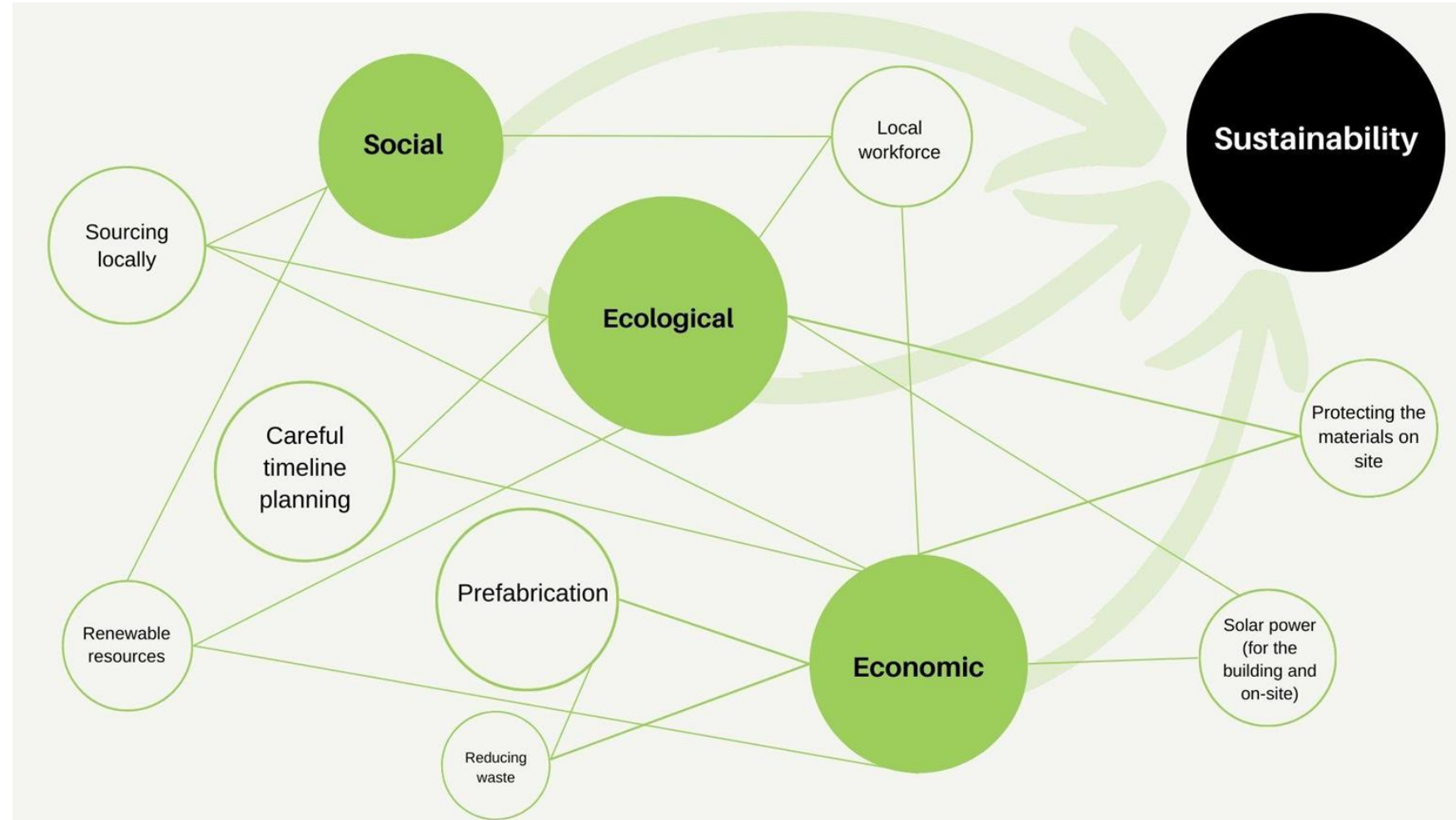




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Sustainability concept





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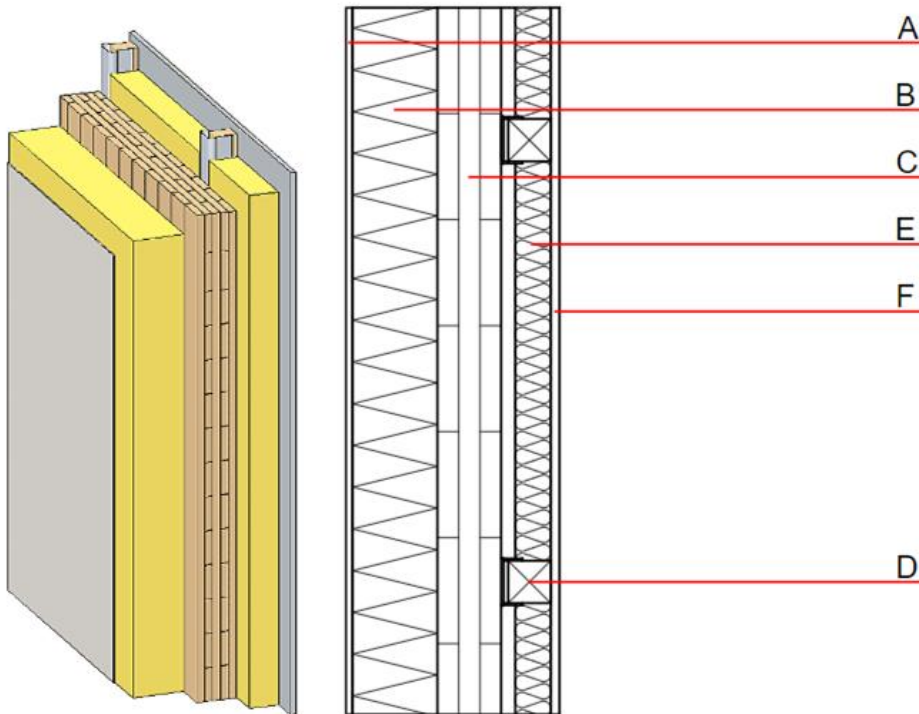
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Components



External walls



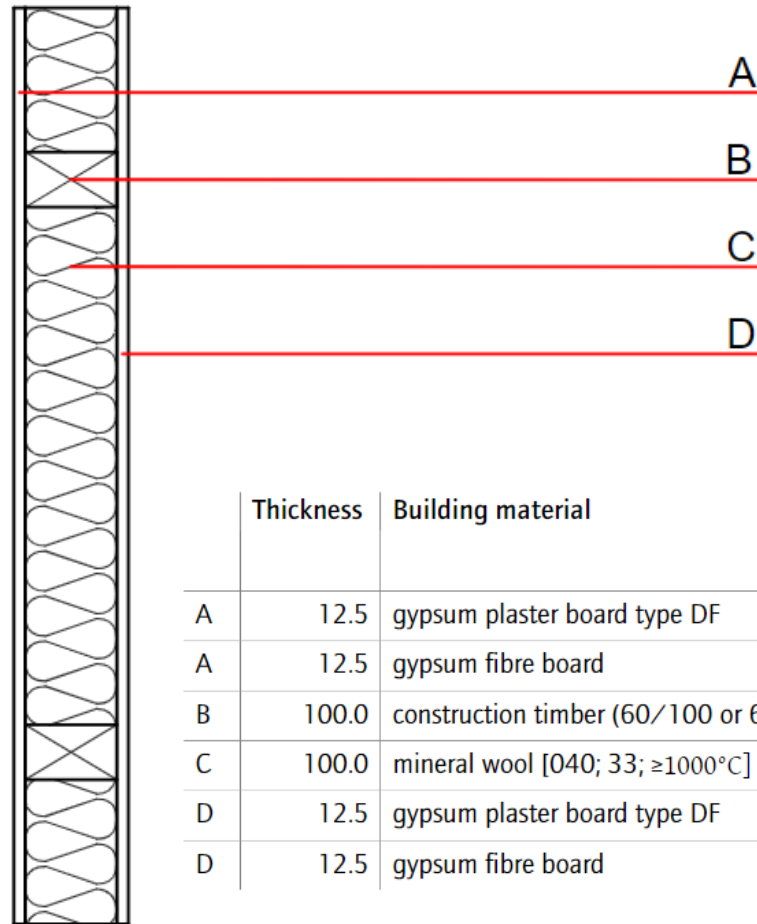
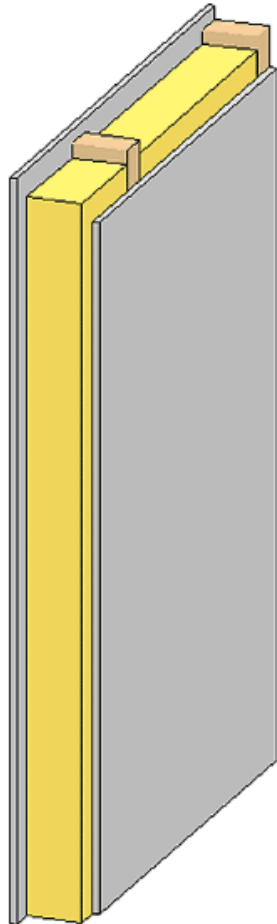
Regulation demands:		
Fire safety: OIB-Richtlinie 2	Sound: OIB- Richtlinie 5	U-value: OIB- Richtlinie 6
REI60	Rw=48 dB	0.35 W/m²K
Technical Information:		
REI90	Rw=48 dB	0.20 W/ m²K

	Thickness	Building material	Thermal performance				Reaction to fire EN
			λ	μ min – max	ρ	c	
A	7.0	plaster	1.000	10 - 35	2000	1.130	A1
B	120.0	mineral wool MW-PT [041; 155] ETICS insulation panel	0.041	1	155	1.030	A1
C	100.0	cross laminated timber	0.130	50	500	1.600	D
D	70.0	spruce wood battens (60/60) mounted on resilient clips; e=660	0.120	50	450	1.600	D
E	50.0	mineral wool [040; ≥ 16 ; <1000°C]	0.040	1	16	1.030	A1
F	12.5	gypsum plaster board type DF or	0.250	10	800	1.050	A2
F	12.5	gypsum fibre board	0.320	21	1000	1.100	A2



Design coordination

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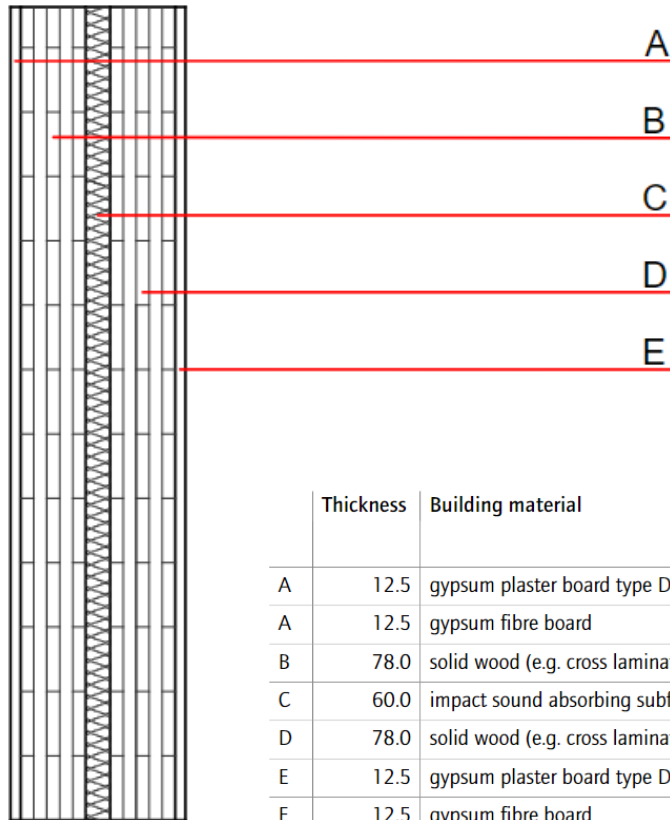
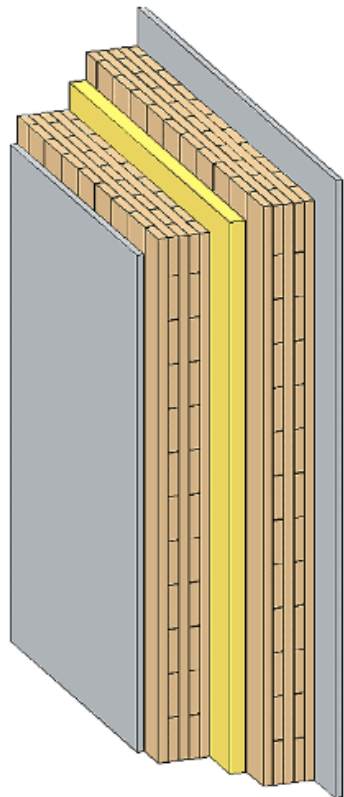
Partition wall

	Thickness	Building material	Thermal performance				Reaction to fire EN
			λ	μ min – max	ρ	c	
A	12.5	gypsum plaster board type DF	0.250	10	800	1.050	A2
A	12.5	gypsum fibre board	0.320	21	1000	1.100	A2
B	100.0	construction timber (60/100 or 60/160; e=*)	0.120	50	450	1.600	D
C	100.0	mineral wool [040; 33; $\geq 1000^\circ\text{C}$]	0.040	1	33	1.030	A1
D	12.5	gypsum plaster board type DF	0.250	10	800	1.050	A2
D	12.5	gypsum fibre board	0.320	21	1000	1.100	A2



Design coordination

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Internal walls [60dB]

Regulation demands:

Fire safety: OIB-Richtlinie 2	Sound: OIB-Richtlinie 5	U-value: OIB-Richtlinie 6
REI60	Rw=60 dB	0,9 W/m²K

Technical Information:

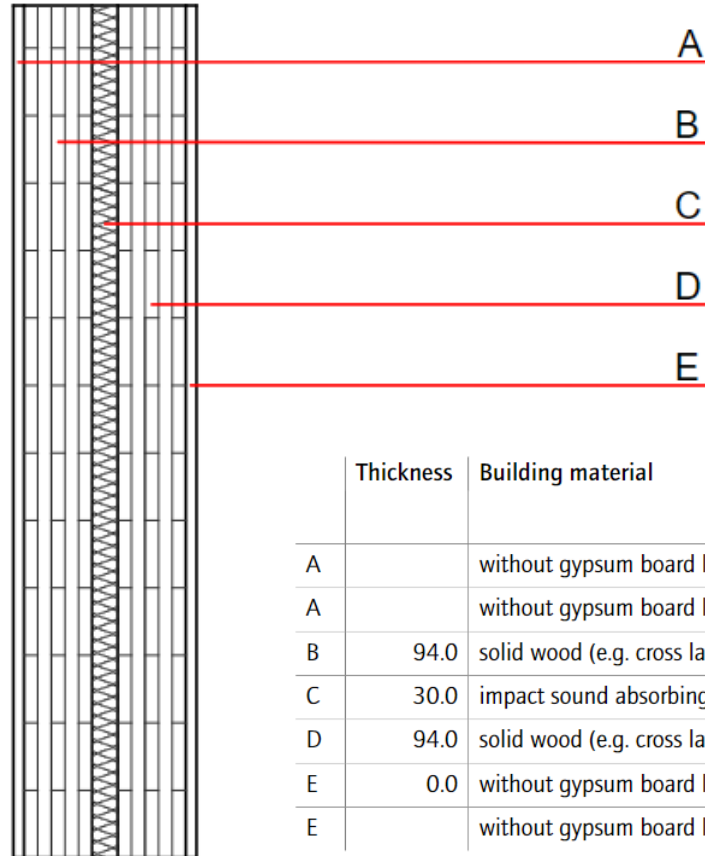
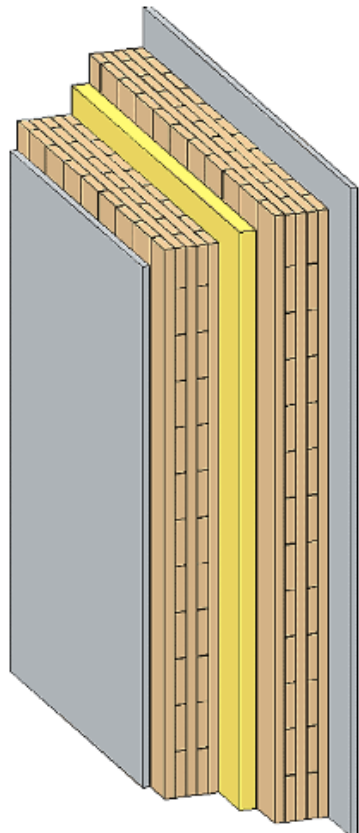
REI60	Rw=60 dB	0,29 W/ m²K
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	Thickness	Building material	Thermal performance				Reaction to fire EN
			λ	μ min – max	ρ	c	
A	12.5	gypsum plaster board type DF	0.250	10	800	1.050	A2
A	12.5	gypsum fibre board	0.320	21	1000	1.100	A2
B	78.0	solid wood (e.g. cross laminated timber)	0.130	50	500	1.600	D
C	60.0	impact sound absorbing subflooring MW-T	0.035	1	68	1.030	A1
D	78.0	solid wood (e.g. cross laminated timber)	0.130	50	500	1.600	D
E	12.5	gypsum plaster board type DF	0.250	10	800	1.050	A2
E	12.5	gypsum fibre board	0.320	21	1000	1.100	A2



Design coordination

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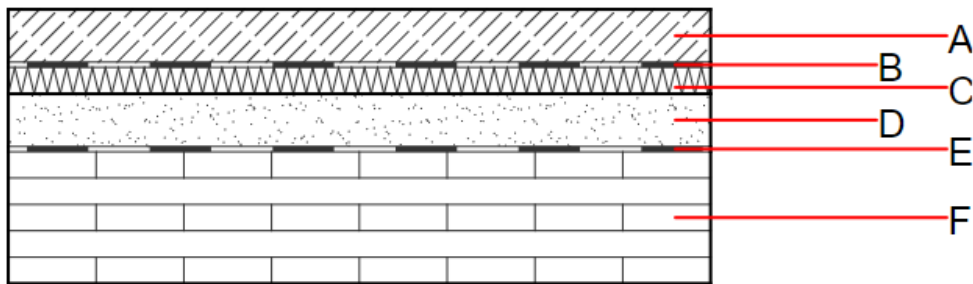
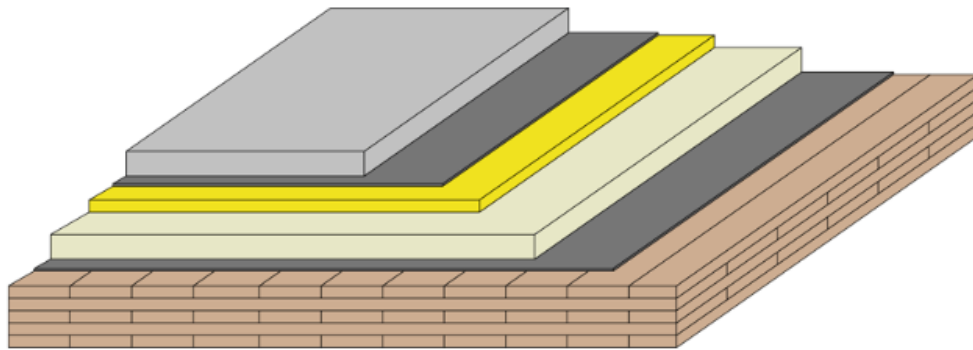
Internal walls [48dB]

Regulation demands:		
Fire safety: OIB-Richtlinie 2	Sound: OIB- Richtlinie 5	U-value: OIB- Richtlinie 6
REI60	Rw=47 dB	0.90 W/m²K
Technical Information:		
REI60	Rw=48 dB	0.39 W/ m²K

	Thickness	Building material	Thermal performance				Reaction to fire EN
			λ	μ min – max	ρ	c	
A		without gypsum board lining					
A		without gypsum board lining					
B	94.0	solid wood (e.g. cross laminated timber)	0.130	50	500	1.600	D
C	30.0	impact sound absorbing subflooring MW-T	0.035	1	68	1.030	A1
D	94.0	solid wood (e.g. cross laminated timber)	0.130	50	500	1.600	D
E	0.0	without gypsum board lining					
E		without gypsum board lining					



Intermediate floor



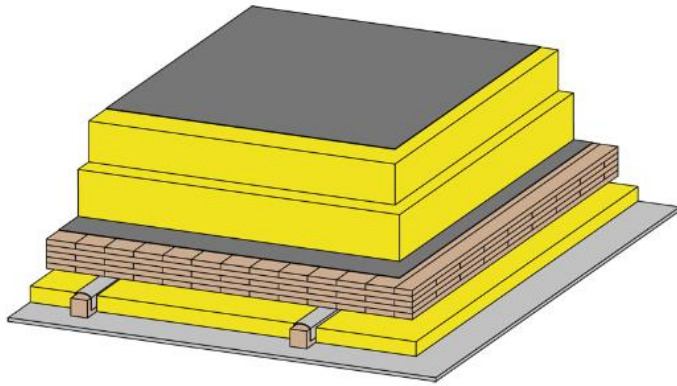
Regulation demands:

Fire safety: OIB-Richtlinie 2	Sound: OIB- Richtlinie 5	U-value: OIB- Richtlinie 6
REI60	Rw=48 dB	0.9 W/m²K

Technical Information:

REI60	Rw=54 dB	0,44 W/ m²K
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	Thickness	Building material	Thermal performance				Reaction to fire EN
			λ	μ min - max	ρ	c	
A	60.0	cement screed	1.330	50 - 100	2000	1.080	A1
B		plastic separation layer	0.200	100000	1400	1.400	E
C	30.0	impact sound absorbing subflooring MW-T [$s' = 35MN/m^3$]	0.035	1	120	1.030	A2
D	60.0	bonded chippings	0.700	1	1800	1.000	A1
E		trickling protection					E
F	140.0	cross laminated timber $\geq 140,0$; at least 5-layers, top layer at least 26 mm)	0.130	50	500	1.600	D



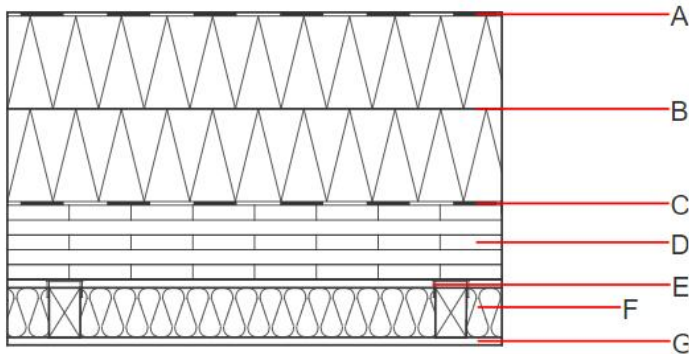
Flat roof

Regulation demands:

Fire safety: OIB-Richtlinie 2	Sound: OIB- Richtlinie 5	U-value: OIB- Richtlinie 6
REI60	Rw=48 dB	0,15 W/m²K

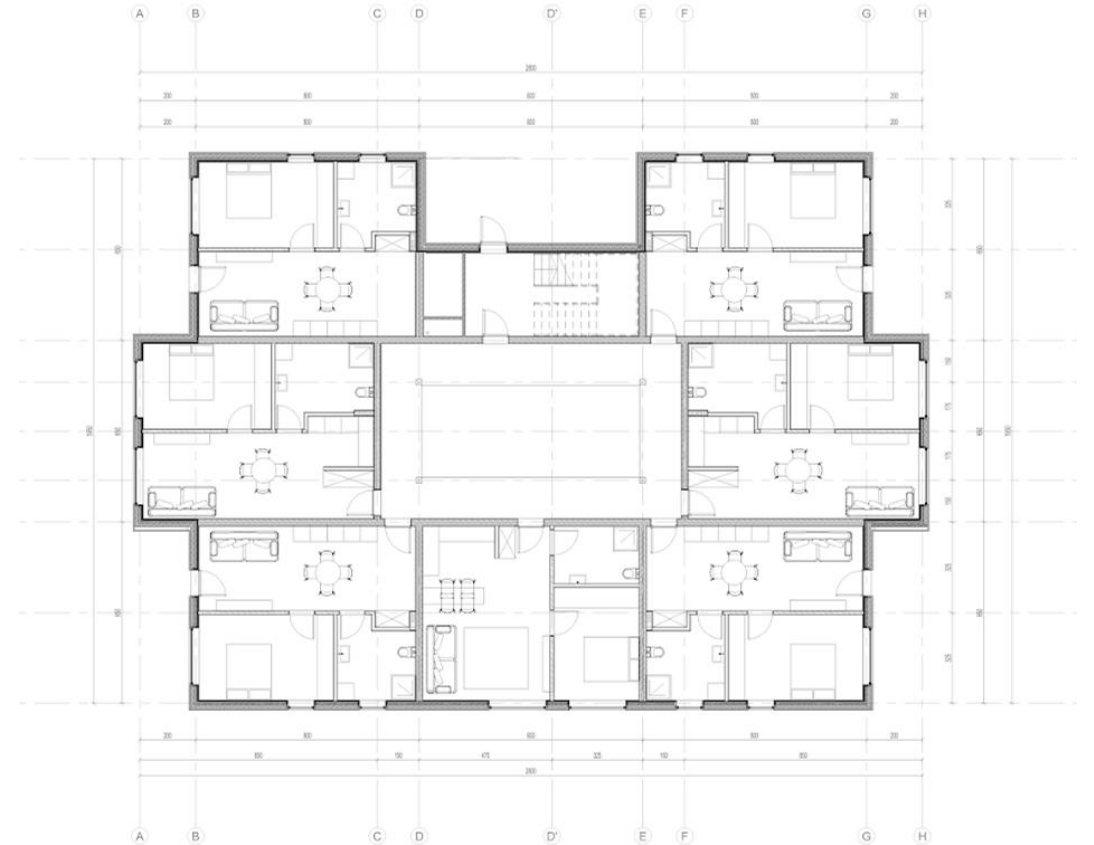
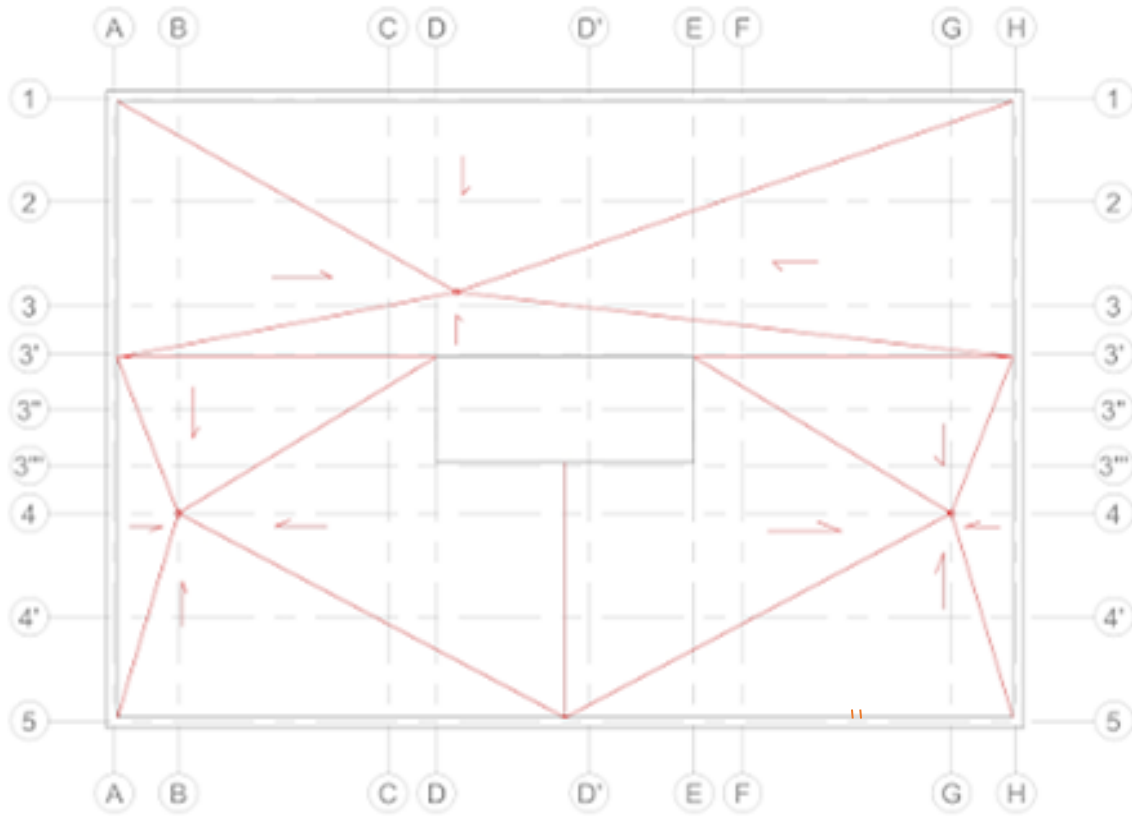
Technical Information:

REI60	Rw=48 dB	0,09 W/ m²K
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	Thickness	Building material	Thermal performance				Reaction to fire EN
			λ	μ min – max	ρ	c	
A		Plastic roofing membrane					E
B	300.0	mineral wool [040; 130; $\geq 1000^{\circ}\text{C}$]; pressure-resistant	0.040	1	130	1.030	A1
C		sealing sheet					
D	125.0	cross laminated timber $\geq 125,0$; at least 5-layers, top layer at least 27,5 mm	0.130	50	500	1.600	D
E	80.0	spruce wood ; battens on resilient clips (50/80; e=625)	0.120	50	450	1.600	D
F	80.0	mineral wool [040; 18]	0.040	1	18	1.030	A1
G	19.0	3-ply solid wood panel	0.110	50	400	2.500	D

Drainage system





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Windows



Regulation demands:

Fire safety:
OIB-Richtlinie
2

Sound:
OIB- Richtlinie 5

U-value: OIB- Richtlinie 6

REI60

Rw=38 dB

1.4 W/m²K

Technical Information:

REI60

Rw=45 dB

Up to 0,64 W/ m²K



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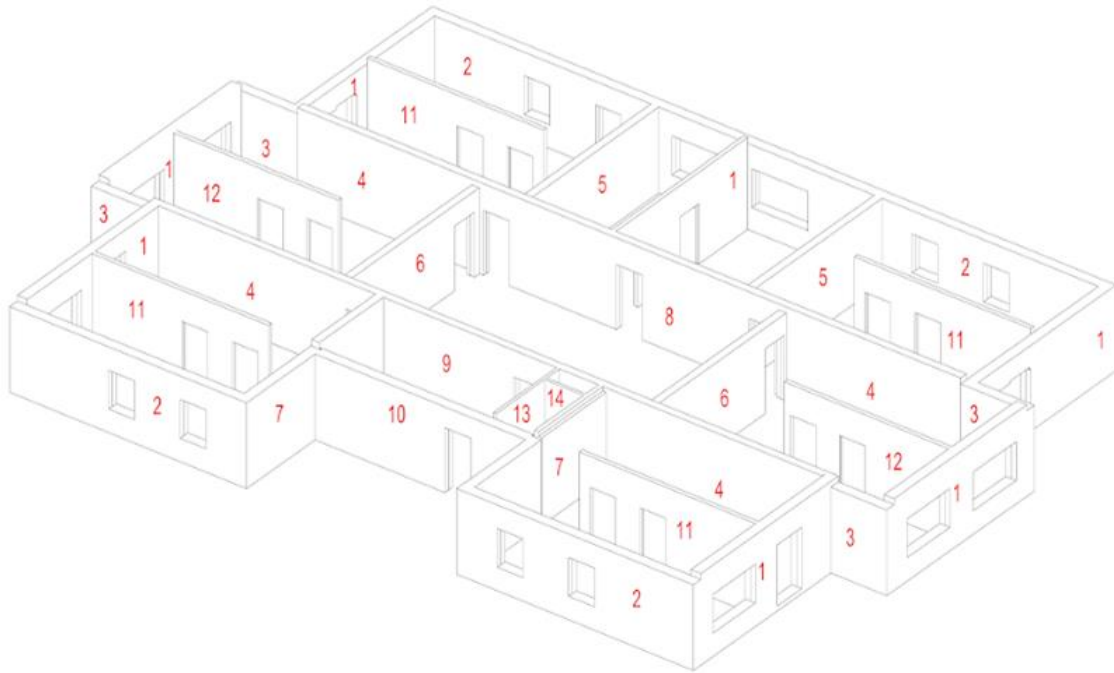


Superstructures assembly drawings

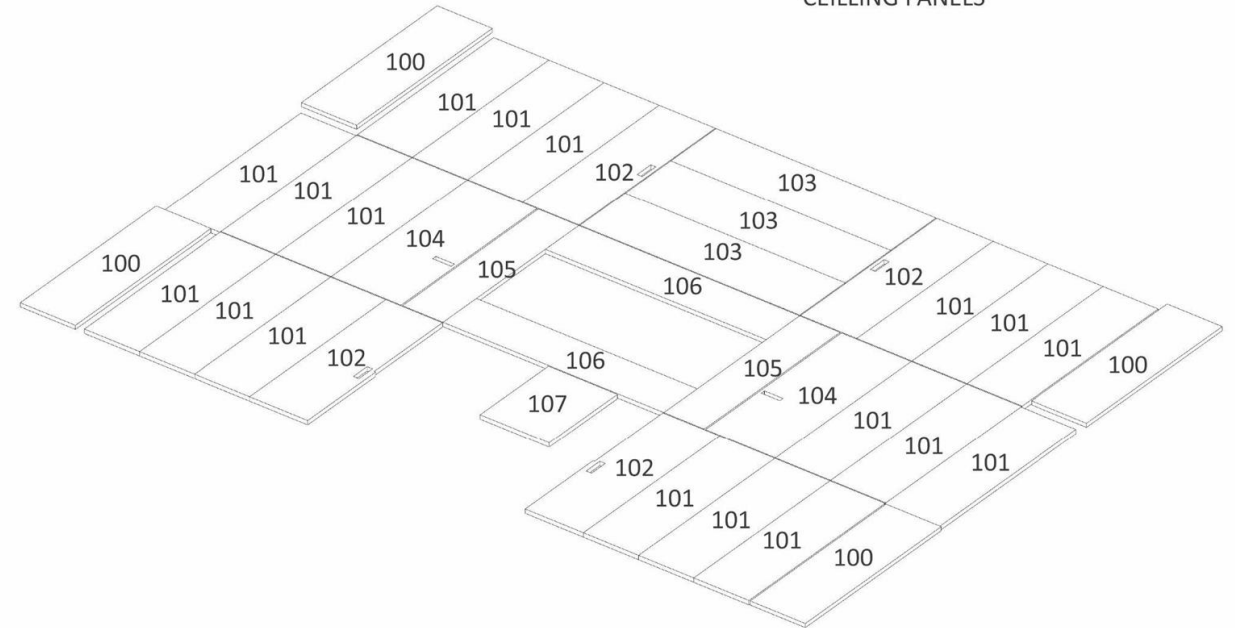
Design coordination

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First and second floors walls panels

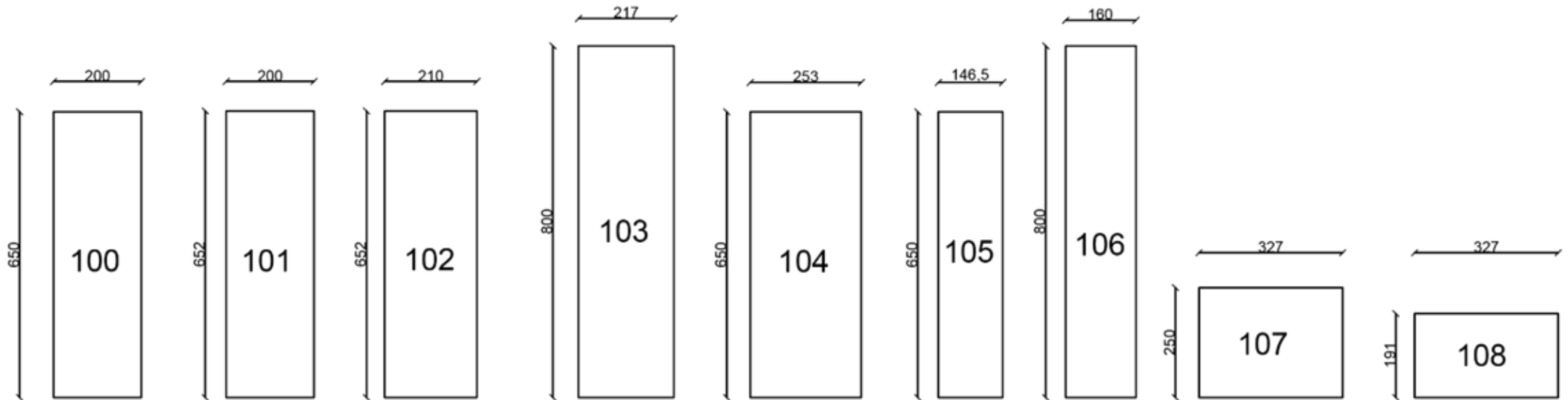


GROUND FLOOR AND FIRST FLOOR
CEILING PANELS





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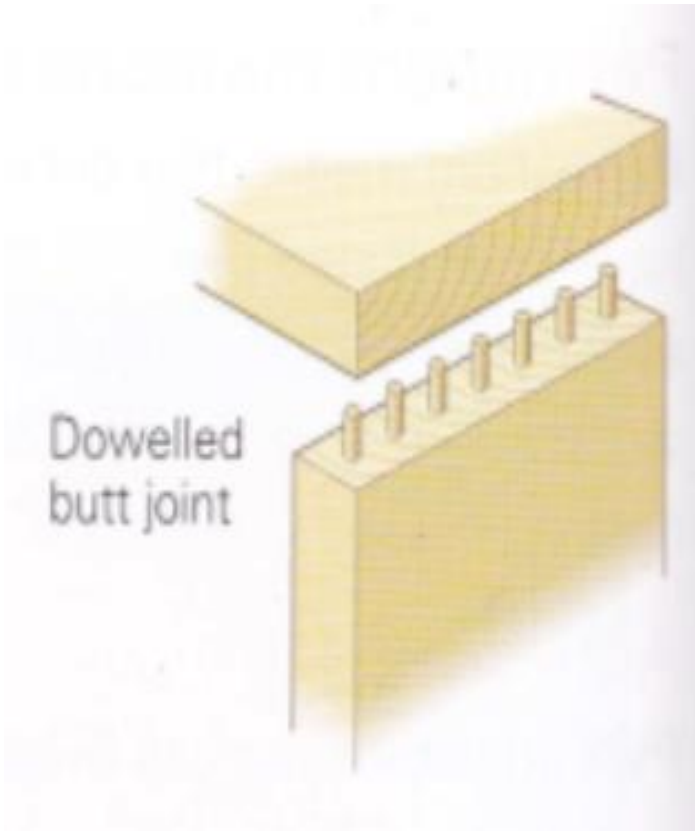
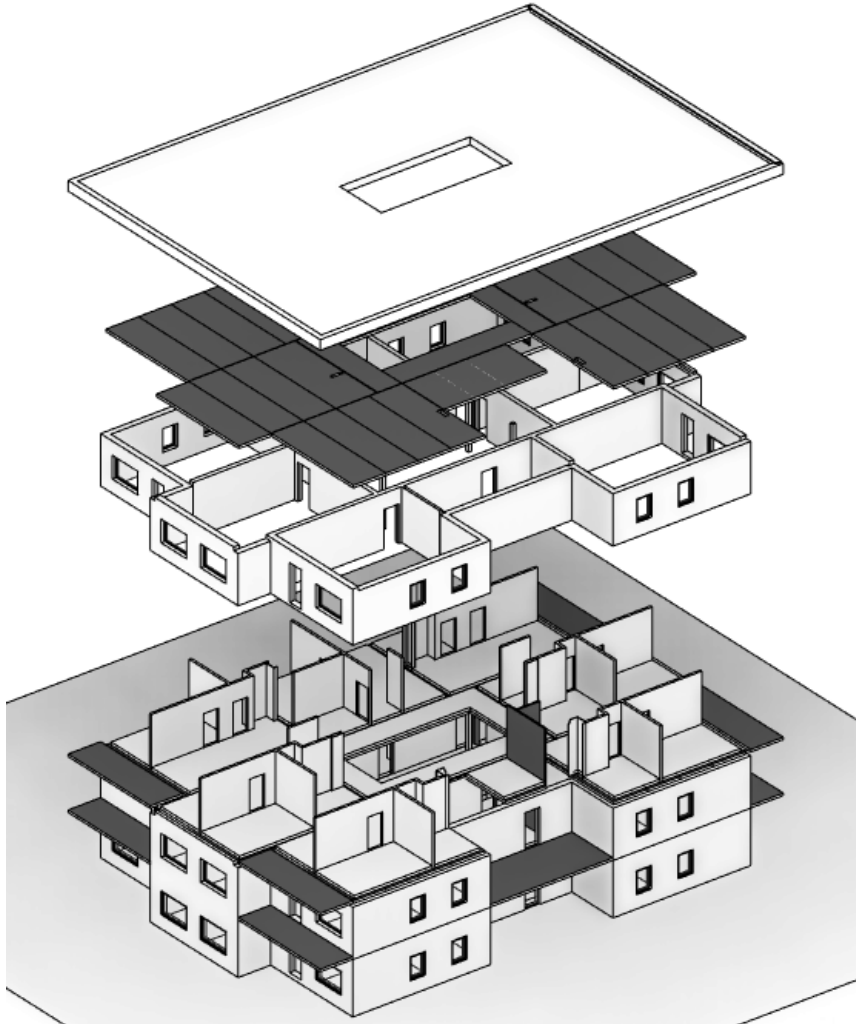
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Joining technology



Dowel Joint

Advantages:

- Dowel jointing is a fast process (once you get the hang of it)
- They provide you with a much neater, flusher finish than nails or screws would
- There's no need for screws or nails
- When it comes to woodworking, **dowel joints are the strongest type of joint**



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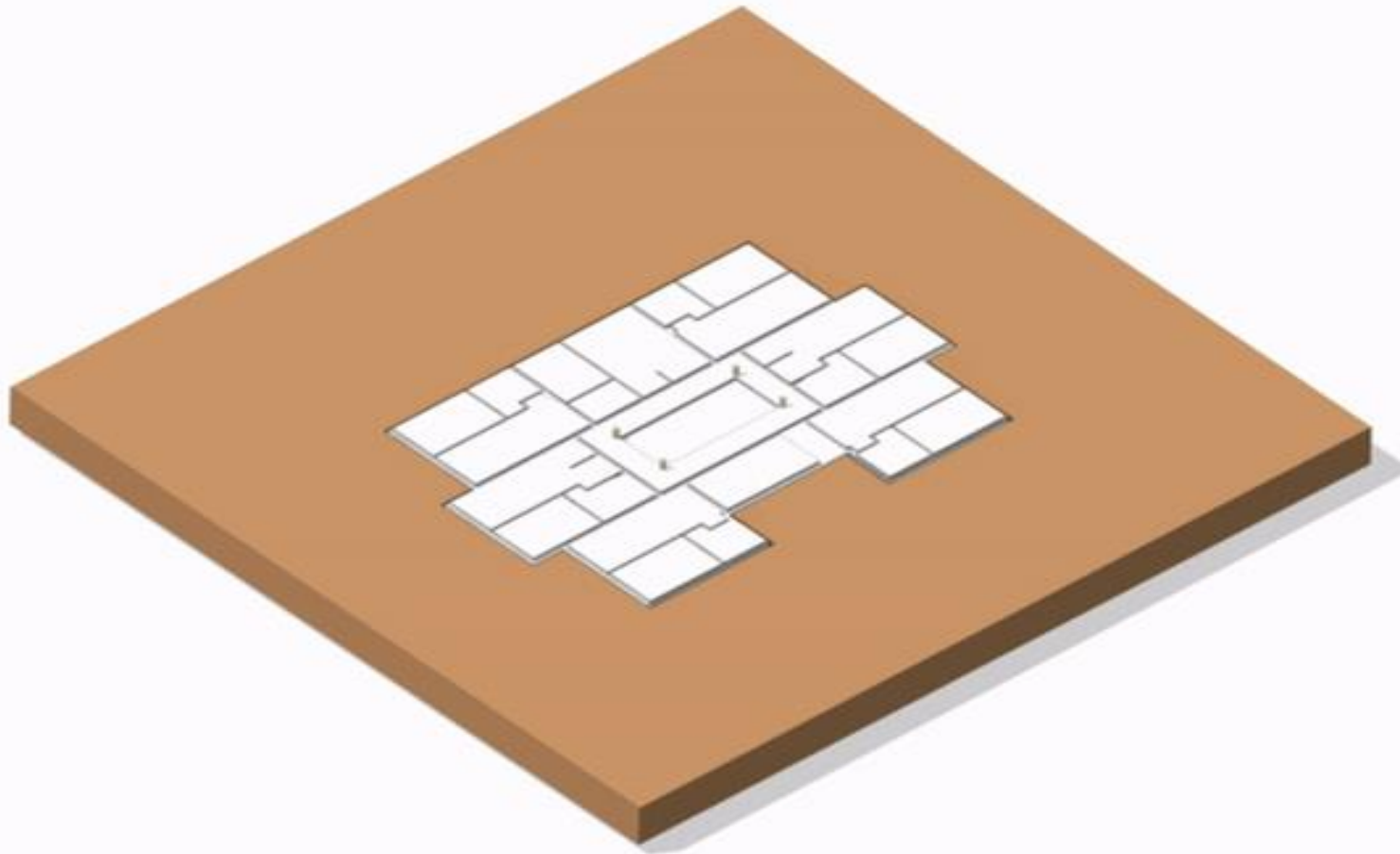
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Assembly Visualization



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Logistics



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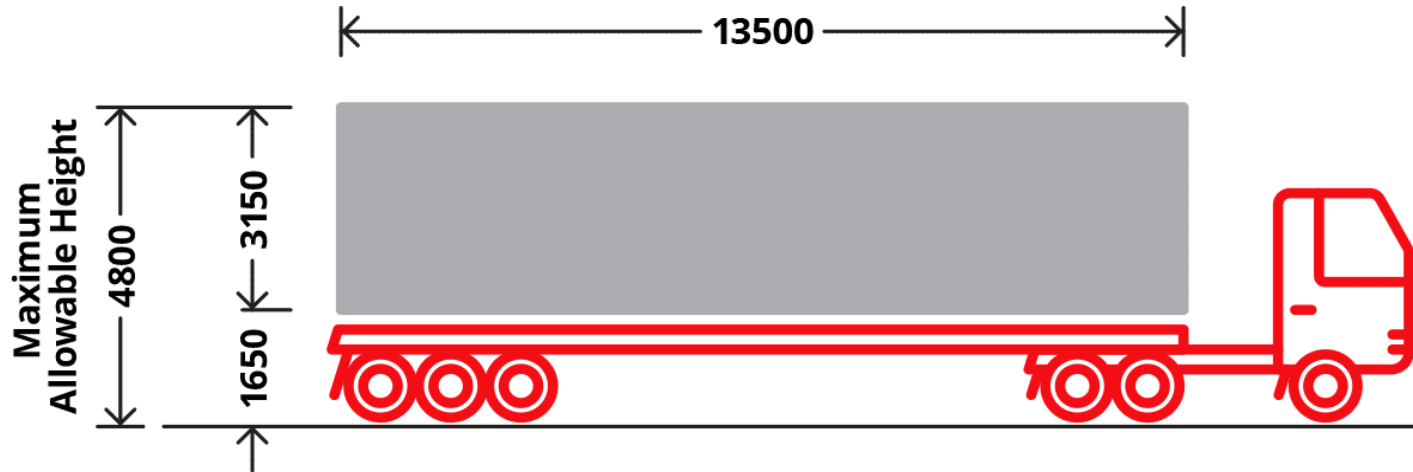
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Sources:

- 11) <https://wilcoprecast.co.nz/wp-content/uploads/2018/11/diagram-flat-deck.png>
- 12) https://upload.wikimedia.org/wikipedia/commons/thumb/1/1a/Internorm_Logo.svg/2560px-Internorm_Logo.svg.png
- 13) <http://construction-companies.liaa.gov.lv/skonto-prefab>



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Time table of construction

Construction Phase	Specific construction work	01.05.	08.05.	15.05.	22.05.	29.05.	05.06.	12.06.	19.06.	26.06.	03.07.	10.07.	17.07.	24.07.	31.07.	07.08.	14.08.	21.08.	28.08.	04.09.	11.09.	18.09.	25.09.	
Foundation	Site Preparation and Excavation	█																						
	Formwork and Reinforcement Installation			█																				
	Pouring of Concrete				█																			
	Curing and Finishing of Concrete					█																		
CLT Slab installations	Manufacturing and delivery			█																				
	Installation							█																
Interior design	HVAC installation										█													
	Electrical and plumbing rough-ins										█													
	Exterior cladding and roofing											█												
	Interior finishes														█									
	Final mechanical, electrical, and plumbing connections																							█
	Landscaping and site cleanup																							



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Cost estimation

	Sizes					Absorbing mat			Mineral wool			CLT price/m3	Price of CLT
	Height, m	length,m	thickness of CLT,m	Volume (CLT), m^3	Area of the surface, m2	Sound absorbing subflooring thickness, (m)	Price of sound absorbing mat /m2	Cost of absorbing mat	Mineral wool thickness, m	Mineral wool price per m2	Mineral wool price		
External walls	2.8	304.5	0.13	110.838	852.6	0	0	0	0.17	5.5	€797.18	€700.00	€77,586.60
Internal walls (60dB)	2.8	105	0.188	55.272	294	0.03	30	€8,820.00	0	5.5	€0.00	€700.00	€38,690.40
Internal walls (48dB)	2.8	156	0.188	82.1184	436.8	0.06	30	€13,104.00	0	5.5	€0.00	€700.00	€57,482.88
Partition walls	2.8	195.05	0	0	546.14	0	0	€0.00	0.1	5.5	€300.38	€700.00	€0.00
Roof		0	0.14	79.597	568.55			€0.00	0.38	5.5	€1,188.27	€700.00	€55,717.90
Intermediate floors		0	0.14	159.194	1137.1	0.035	30	€17,056.50	0	5.5	€0.00	€700.00	€111,435.80
TOTAL				487.0194				€38.980.50			€2.285.83		€340.913.58

Windows			Gypsum board		Foundation		Heating	Ventilation	Water	Sewage	Doors	Foam glass
Windows area,m2	Windows price/m2	Windows price	Gypsum fibre board price/m2	Gypsum board price	Foundation price/m2	Foundation price						
144	€200.00	€28,800.00	€0.00	€0.00	€100.00	€0.00						
0	€200.00	€0.00	€0.00	€0.00	€100.00	€0.00						
0	€200.00	€0.00	€0.00	€0.00	€100.00	€0.00						
0	€200.00	€0.00	€15.00	€32,768.40	€100.00	€0.00						
0	€200.00	€0.00	€0.00	€0.00	€100.00	€0.00						
0	€200.00	€0.00	€0.00	€0.00	€100.00	€56,855.00						
		€28,800.00		€32,768.40		€56,855.00	€63,541.67	€29,166.67	€28,819.44	€35,590.28	€32,400.00	€113,710.00

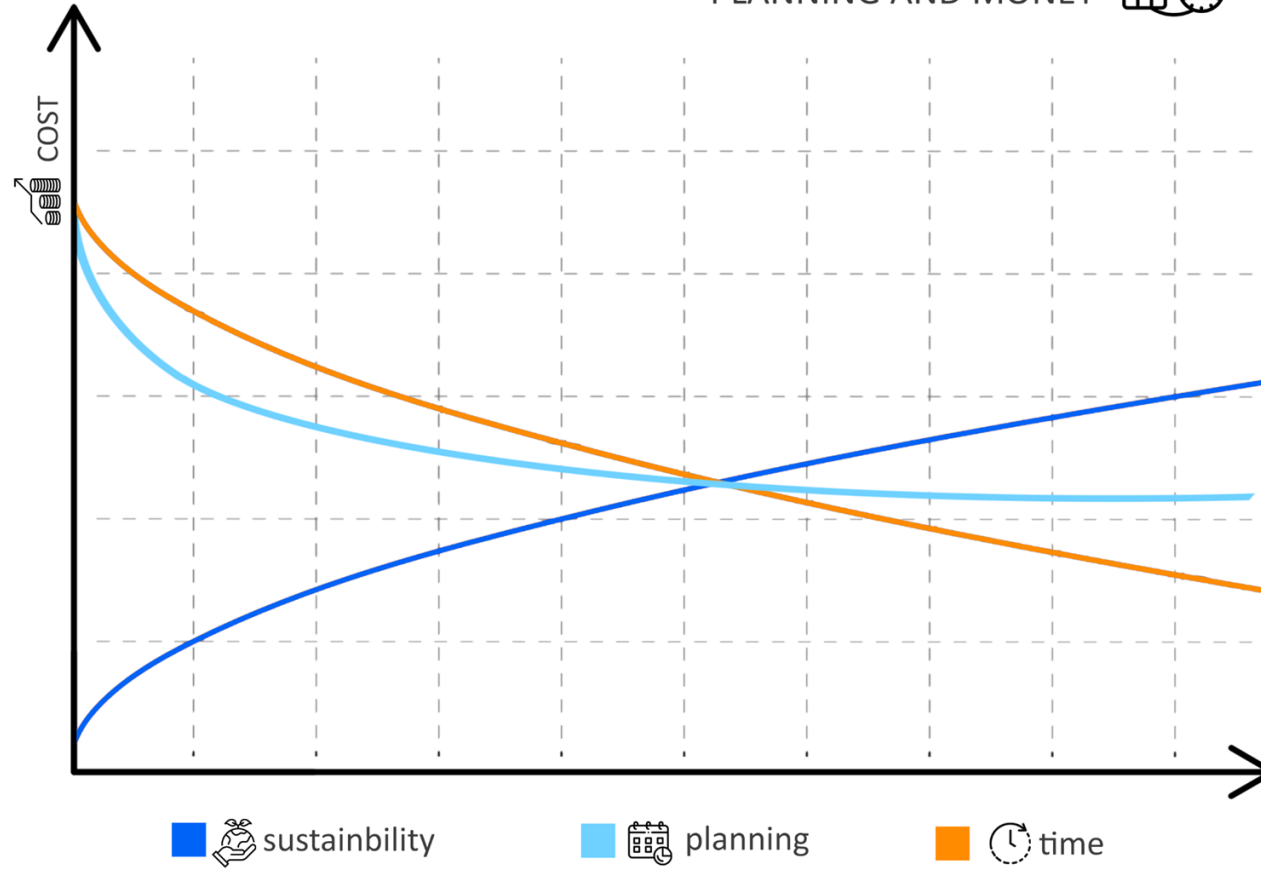
TOTAL MATERIAL COSTS	€803.831,36
TOTAL LABOUR COSTS	€660.000,00
TOTAL COSTS	€2.195.747,04
TOTAL COSTS/m2	€1.287,34



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CORRELATION BETWEEN TIME, SUSTAINABILITY, PLANNING AND MONEY





Our learning process

- team work = prefabrication process
- thorough planning is crucial for success
- building sustainably means being informed about the options



References

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