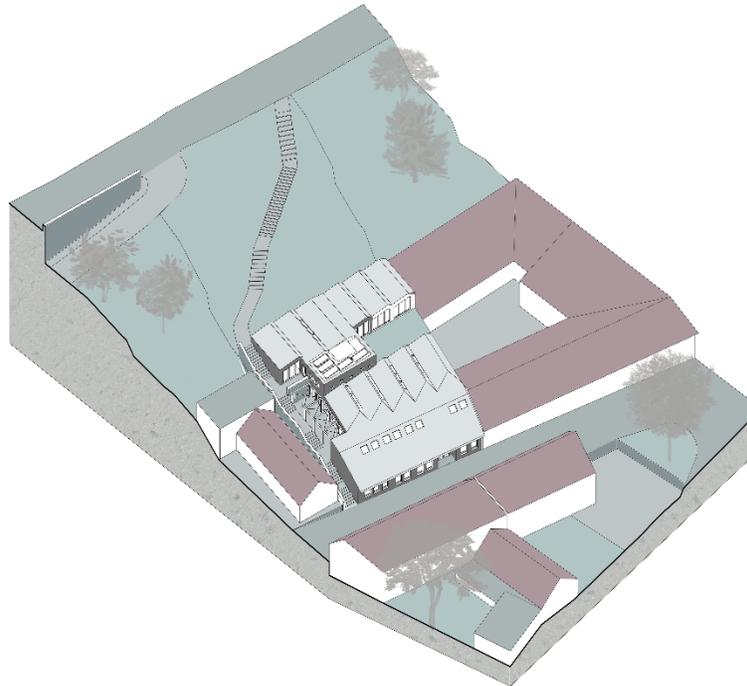




BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
FACULTY OF ARCHITECTURE
DEPARTMENT OF URBAN PLANNING AND DESIGN

DIPLOMA PROJECT

ELEVATE SCHOOL OF MUSIC



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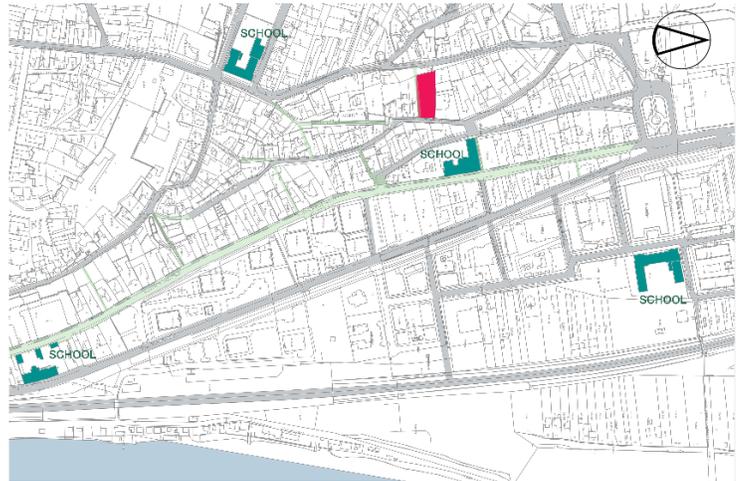
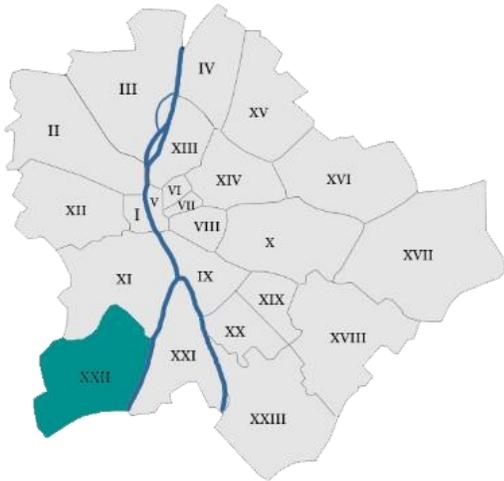
2020

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1. Program and Design Overview

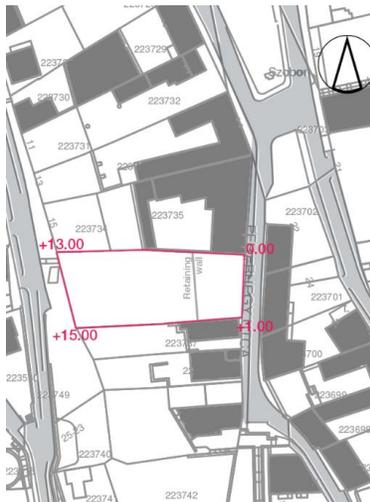
Site



The designed project is located in XXII District of Budapest, Hungary called Budafok-Tétény. The population of the district is 54515 (2017). The district is well-connected to the city centre by public transportation (trams, buses, train) as well as private cars/ taxis.

The chosen site is located in the city centre on the calm street. The address is **Budapest, Fehérhegy u. 4, 1222**. It is in close proximity to four schools and next to a residential area.

Budafok-Tétény is a born place of the well-known Budafok Dohnányi Orchestra. Thus, it was decided to design music school to provide a comfortable place to learn, practice and improve the music skills of children. The school is designed based on the 2.2 places/1000 people ratio. The final project is the **Music school for 120 pupils**.



The chosen plot has a steep inclination with a 15 m height difference between the west and east sides of it. **Plot size** is 19x49 m. There is an existing retaining wall that divides plot to 2 main areas. The height of the retaining wall is approximately 6 meters. Beyond the wall, two cellars are. The size: 4x8 m and 4x30 m.

Kálváriahegy u (west of the site) is included in the road network. Thus, it is a convenient spot to bring children to school by car. Fehérhegy u leads to a dead end. The main entrance to the building is facing East (Fehérhegy u) what provides extra safety for kids. Moreover, the bus stop is located 120m to the east, the tram stop – 200m to the east.

Public stair will be arranged through the plot to connect Kálváriahegy u and Fehérhegy u. This will improve the circulation of the whole area.

The plot is surrounded by 1-storey height buildings with a pitched roof. To integrate the project into the neighbourhood, the main elevation that is facing the east is keeping the same height.

The existing retaining wall and cellar are integrated into the project concept. The whole building is becoming a “cascade” of retaining walls with landings between them. Altogether, there are 4 levels:

1st level – main elevation and Fehérhegy u.

2nd level – small terrace that creates a visual connection to the multifunctional hall of the building

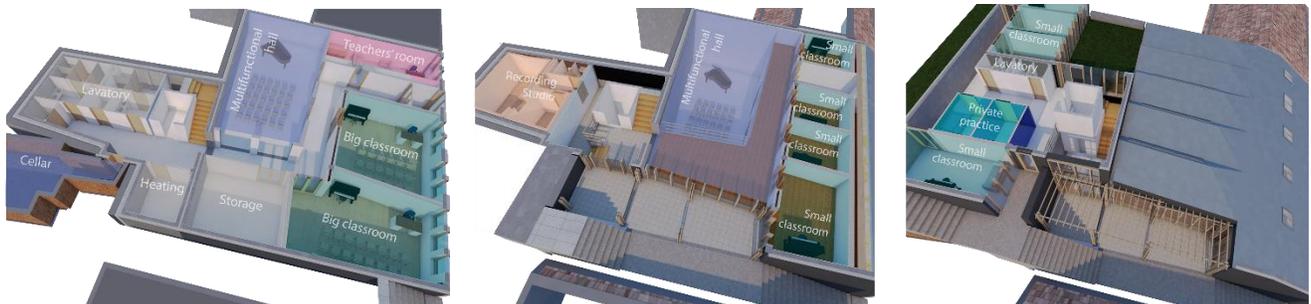
3rd level – additional access to the building and private courtyard from where the city can be observed

4th level – public area designated to create extra activities (playground) and viewpoint to the city centre and Danube



Materials: Foundations, walls and columns are made of reinforced concrete. Folded roof and pitched roof are made of CLT (timber).

Limitations: 2 neighbour buildings (1-storey height with pitched roof), 15m height difference on the site, retaining wall, cellars inside the hill.



Functional division:

Ground floor: 2 big classrooms, teachers’ room, multifunctional hall, storage, lavatory, heating room, cellar

1st floor: recording studio, balcony to the multifunctional hall, 4 small classrooms

2nd floor: 4 small classrooms, 2 individual cabins for practice, lavatory, private courtyard

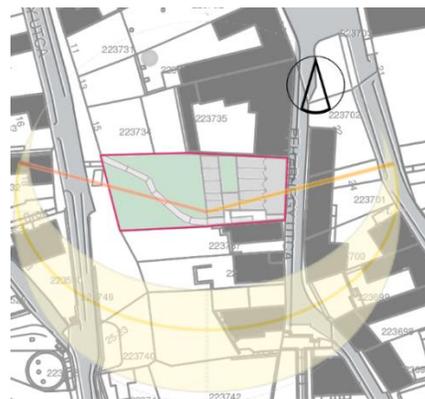
Soil mechanics and hydrogeology

The bearing soil layer is limestone maximum soil stress - 350kN/m². Ground water level is significantly lower than the bottom level of foundation (-9.0 m). Drainage and channels along the site border are provided to avoid accumulation of the water.

Climate in Budapest

Season	Dry Bulb Temp [C]	Wet Bulb Temp [C]	Relative Humidity [%]
Summer	33	19	38
Winter	-13	-13	100

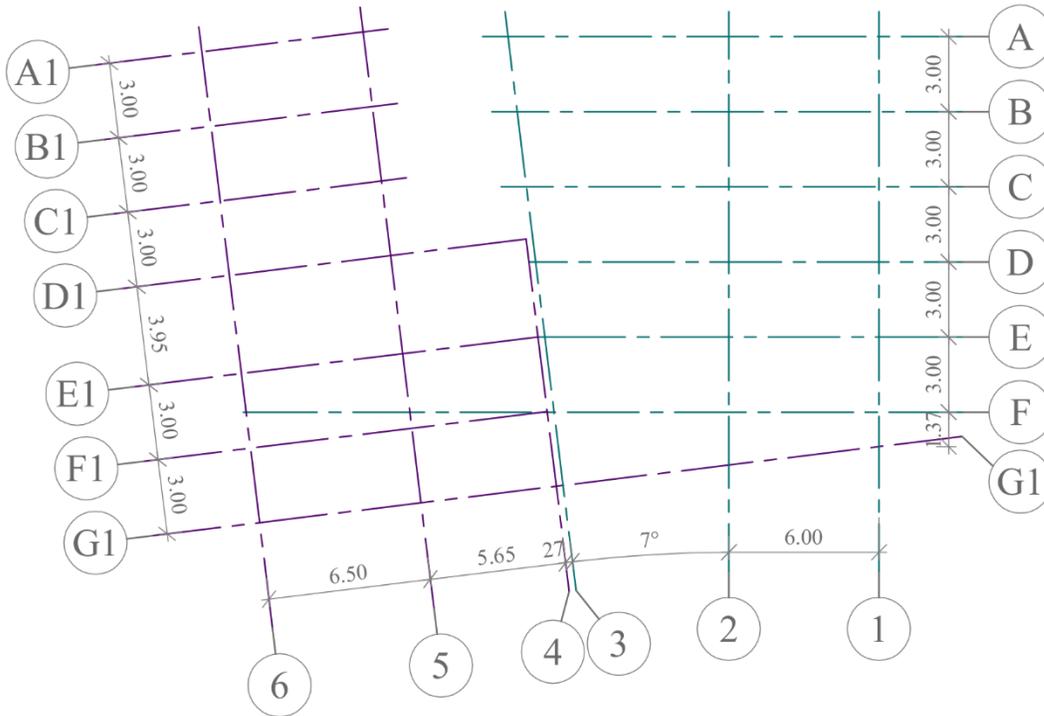
Exposure to the sun



2. Structural system

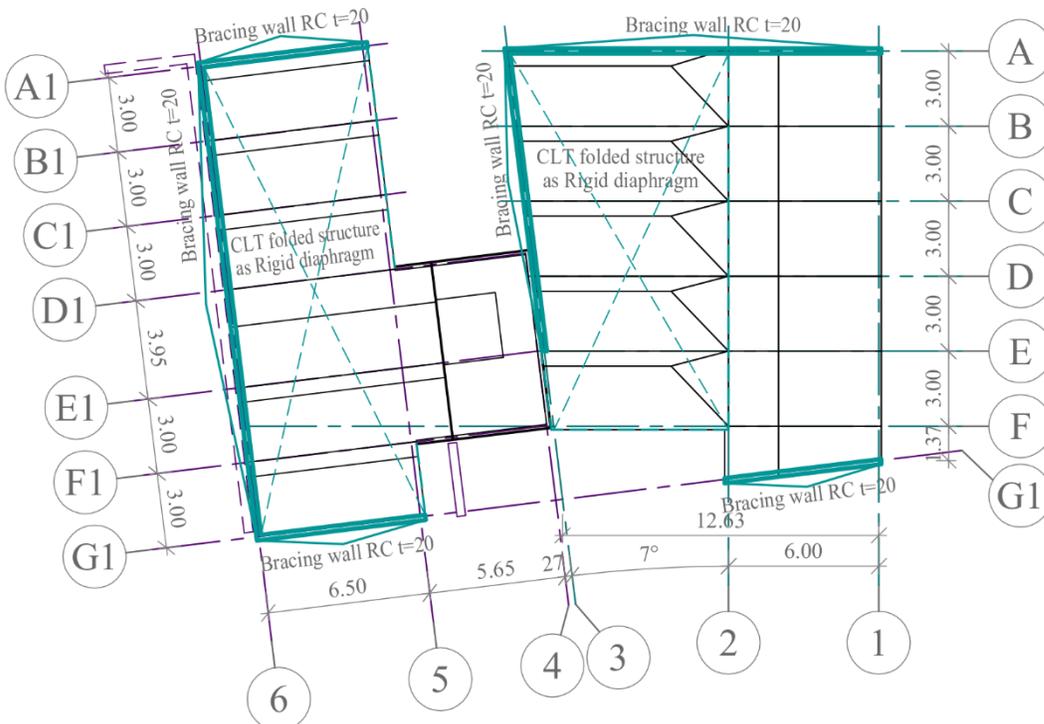
The integrated grid system consists of two systems with 7 degrees turn between them. The main directions are chosen according to the main road and existing retaining wall.

Grid system (M1:300)



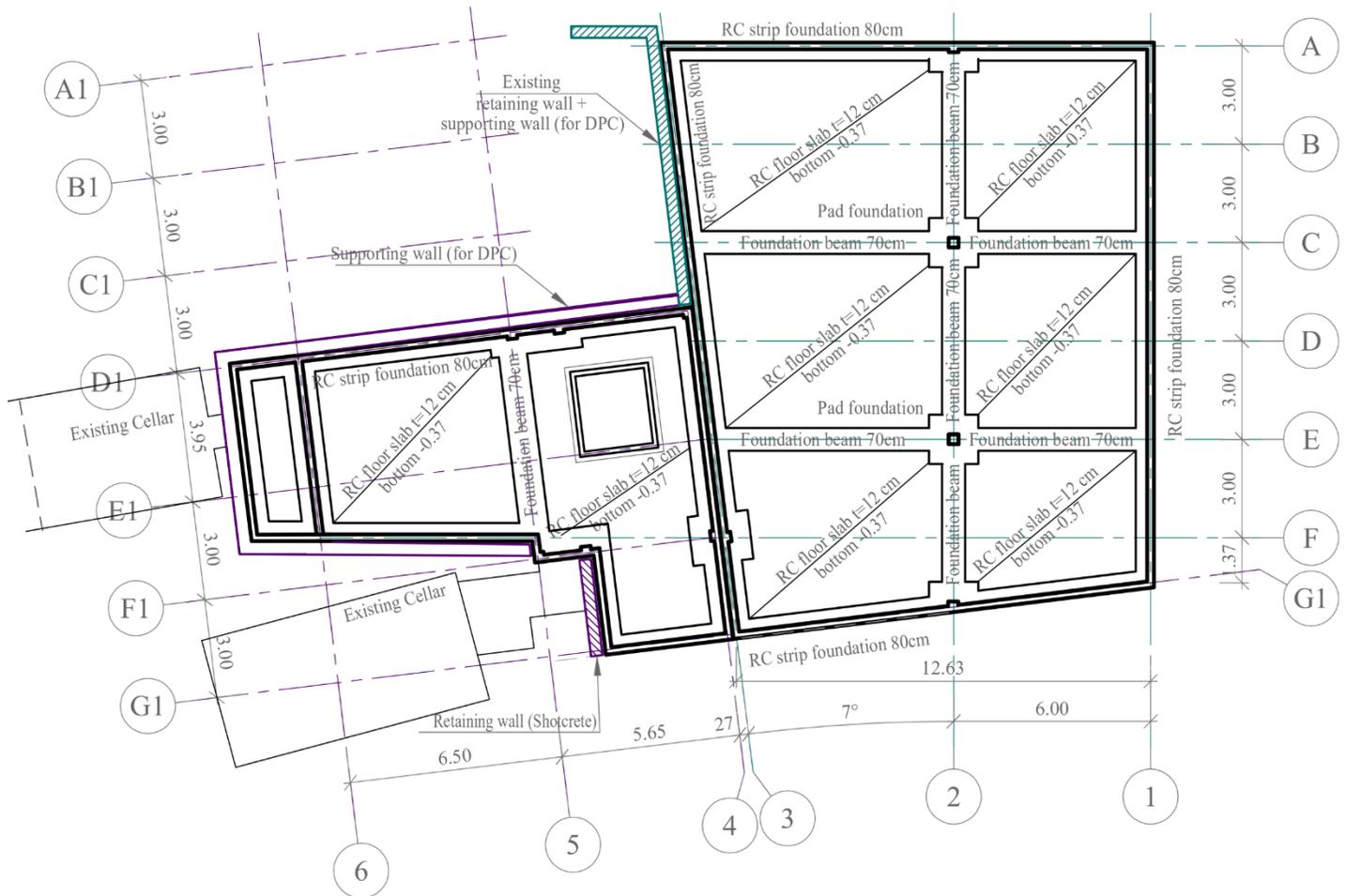
Structurally, the building is separated into two parts with a dilatation joint between axis 3-4. Each part has a separate stability system represented by reinforced concrete walls with 20 cm thickness. Folded roof structures between axis 2-3 and 5-6 are acting as a rigid diaphragm.

Bracing system (M1:300)



There is an existing retaining wall that is partially kept. It is anchored to the soil and the buttresses are removed. New retaining wall is provided with shotcrete technology (Between axis F-G1 and 4-5). The limestone is a strong soil that can be supported vertically by itself during the construction. The rest of the contour that is connected to the soil has the supporting wall to place DPC.

Foundation plan (M1:200)



Foundation: centrally and eccentrically loaded strip foundation (supported by foundation beams to provide system stability), pad foundations under the columns.

Reinforced concrete floor slab (thickness is 12 cm) at -0.37 elevation (bottom level)

Foundation under 2nd floor study units are slab foundation between A1-D1 supported by the soil (thickness is 30 cm), between E1-G1 is slab foundation supported by a row of piles and beneath wall (thickness is 45 cm) (see Figure “2nd floor M1:200)

1st floor (M1:200)

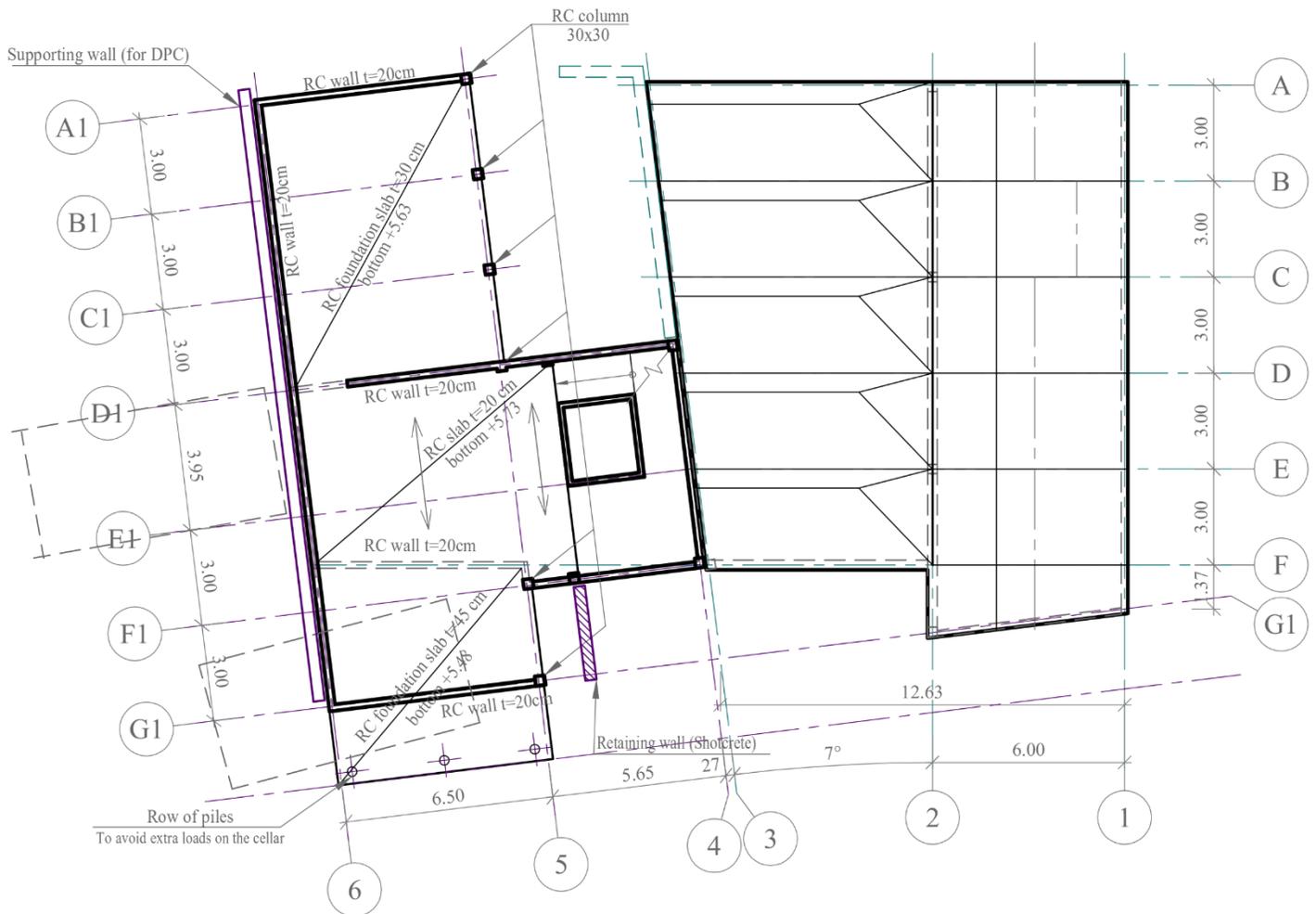


Reinforced concrete slab – thickness 20 cm – supported by reinforced concrete walls (20 cm) and columns (30x30 cm) + beams (30x40 cm). (see Figure 1st floor M1:200)

To support slab between axis 2-3 and E-F, edge beam is provided.

Elevator walls are made of reinforced concrete with a thickness 15 cm.

2nd floor (M1:200)

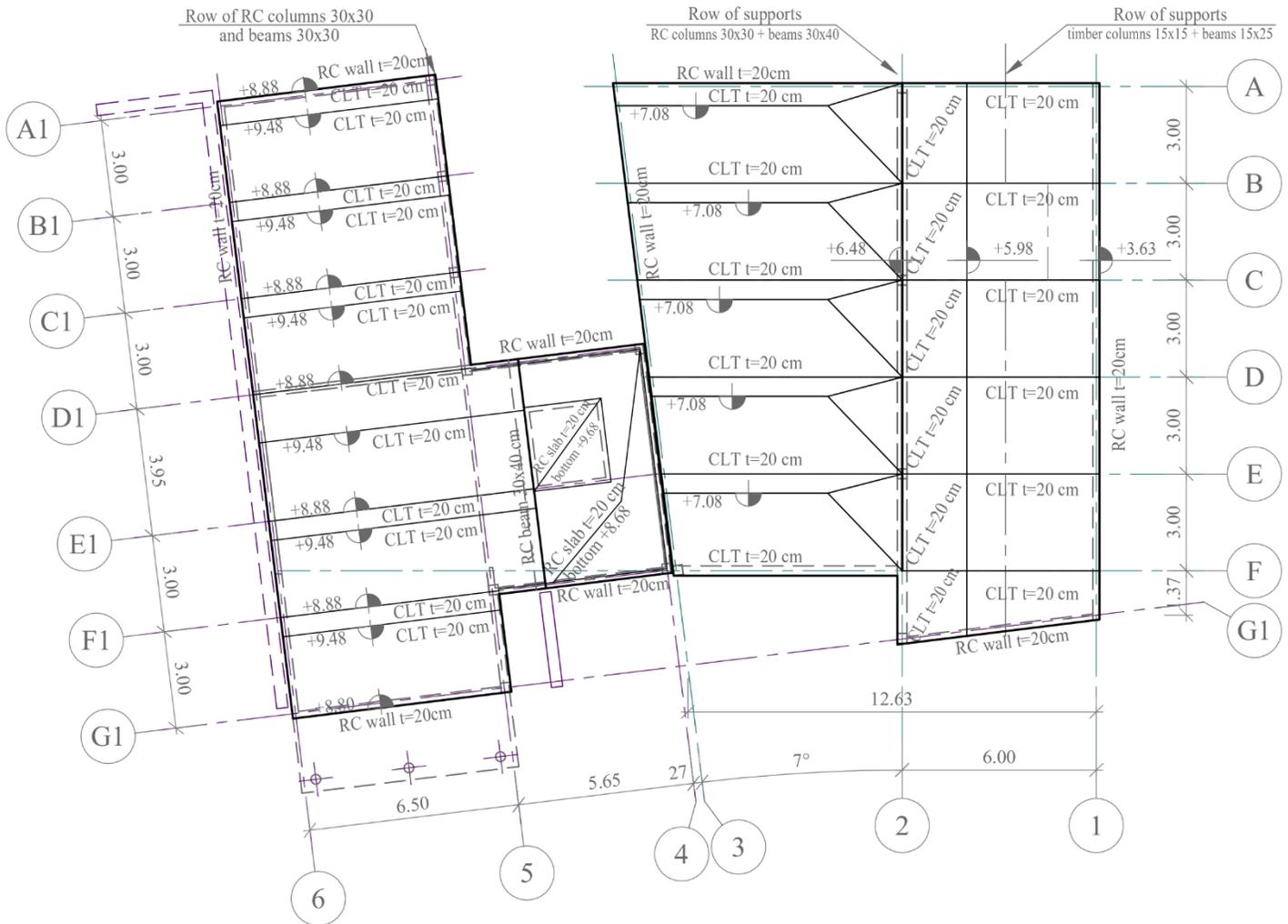


Reinforced concrete slab – thickness 20 cm – supported by reinforced concrete walls (20 cm) (see Figure 2nd floor M1:200)

o support slab between axis 2-3 and E-F, edge beam is provided. Foundation under 2nd floor study units are slab foundation between A1-D1 supported by the soil (thickness is 30 cm), between E1-G1 is slab foundation supported by a row of piles and beneath wall (thickness is 45 cm).

Elevator walls are made of reinforced concrete with a thickness 15 cm.

Roof structures (M1:200)



A pitched roof between 1-2 axis is made of CLT panels (thickness is 20 cm). It is supported by RC wall along axis 1, RC columns (30x30 cm) + beams (30x40 cm) along axis 2 and an extra line of supports in between provided by timber columns (15x15 cm)+ timber beams (15x25 cm).

Folded structures between axis 2-3 are made of CLT panels (thickness is 20 cm). It is supported by the RC wall along axis 3 and RC columns (30x30 cm) + beams (30x40 cm) along axis 2. Two rebars d16 mm are provided along axis E, D, C, B to make the roof rigid diaphragm to transfer horizontal forces to the bracing (shear) walls.

Folded structures between axis 5-6 are made of CLT panels (thickness is 20 cm). It is supported by the RC wall along axis 6 and RC columns (30x30 cm) + beams (30x30 cm) along axis.

3. Building constructions

Building risk class

Building risk class is MR (Medium Risk) – determined according to Hungarian regulations based on highest elevation of the building (m), lowest building level (m) and capacity of the highest elevation (person).

	A	B	C	D	E
1	Risk class of risk unit	Very Low Risk	Low Risk	Medium Risk	High Risk
2	The highest elevation of the risk unit, and in case of a structure with viewing platform and scaffold, the walking surface height (m) that is suitable for occupation by humans,	0.00–7.00	7.01–14.00	14.01–30.00	>30.00
3	Elevation (m) of lowest building level of risk unit	0.00–3.00	-3.01–6.00	-6.01–9.00	> -9.00
4	The capacity of the highest elevation of the risk unit, as well as the viewing platform, canopy structure construction, scaffold-like structure and in case of a level, the capacity of the structure (persons)	1-50	51-300	301-1 500	>1 500

Fire-protection – Requirements

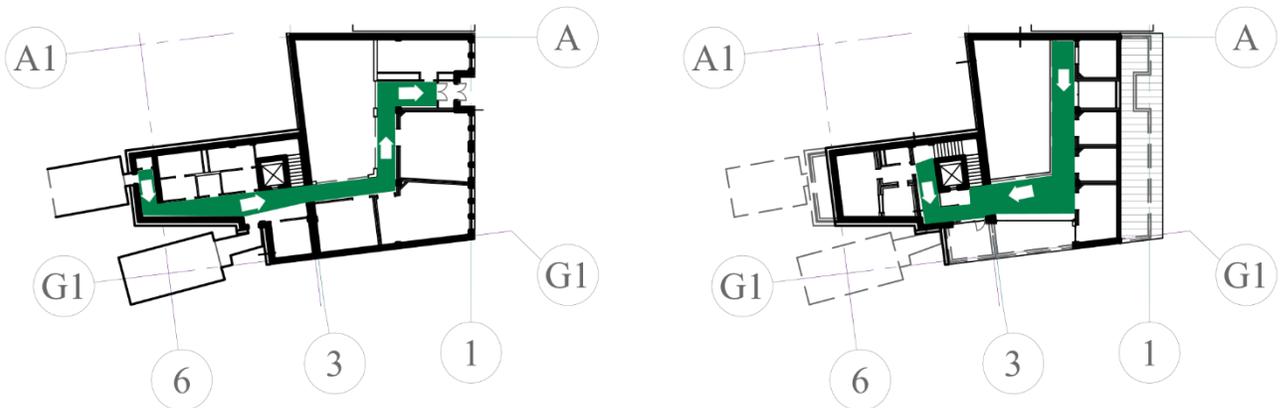
According to risk class LR (Low Risk):

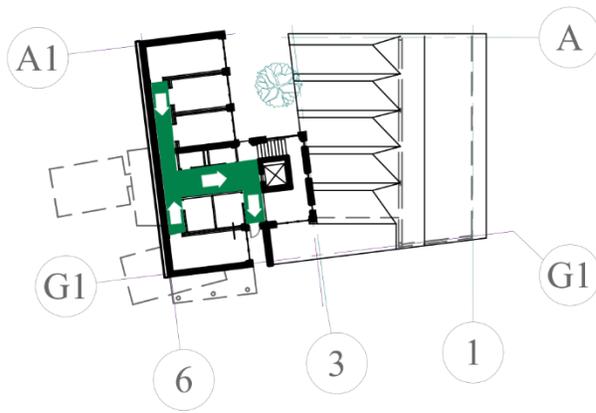
- Weight-bearing walls and bracings – REI45
- Basement level weight-bearing walls and bracings – REI45
- Basement pillars – R45
- Basic fire-break structure – REI120

All walls which are connected to the existing neighbour buildings are made of reinforced concrete 20cm thick. It fully responses to the fire regulation requirements. Next to existing buildings the walls are designed with non-removable formwork of 6cm crust panels connected by reinforcement.

Evacuation route

Evacuation path goes through the exit door at every level. Maximum distance does not exceed 50m.





Sound insulation

Airborne sound:

- Approximated noise – mid-quiet environment in urban area – 65dB
- Allowed equivalent sound pressure level – educational institution – 40dB
- Allowed equivalent sound pressure level – multipurpose hall – 30dB (20dB)
- Sound reduction index between outside/multipurpose hall $> 65\text{dB} - 20\text{dB} = 45\text{dB}$
- Sound reduction index between music classrooms $> 55\text{dB}$

Airborne sound reduction index:

- 20 cm Reinforced concrete wall: $R'_w = 54\text{ dB}$
- 20 cm CLT + 3 cm Honeycomb acoustic infill FERMACELL: $R'_w = 47\text{ dB}$
- Drywall partition wall between classrooms KNAUF W115: 2+2 Diamant 12,5 plasterboard (15 kg/m^2) $2 \times \text{CW100}$: $R'_w = 72\text{ dB}$
- Cabins for individual practice M-Pod next generation by Amadeus Acoustic Solutions: $> 39\text{dB}$ and $< 58\text{dB}$. The fully glazed acoustic doorset. This not only attenuates sound but due to the glass type works extremely well within the low frequency range.

Impact noise:

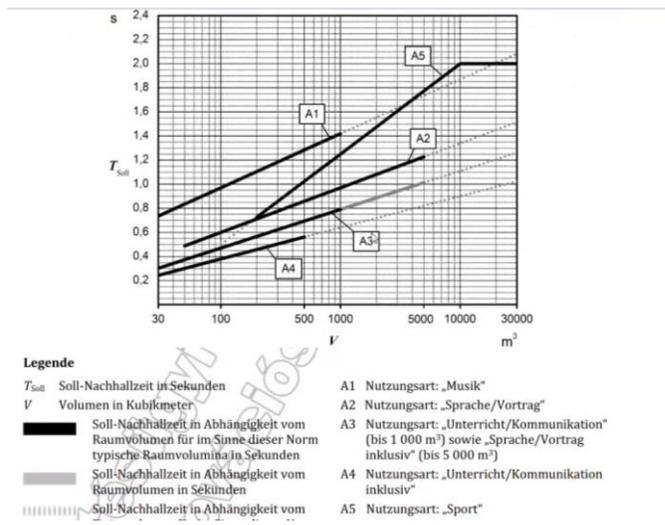
Floating floor solves issue about the impact noise between the flats.

Staircase cores are made of reinforced concrete. The structures are the combination of reinforced concrete walls and reinforced concrete columns + beams. The flights and landings are separated from the walls next to the flats to avoid impact noise transfer. Floating floor solves the issue with impact noise. Special connection with Elastic Rubber bed to decrease transferring of impact noise.

Elevator shafts are made of reinforced concrete. The thickness of the wall is 15 cm and it is separated from other structures to avoid the vibrations and Impact noise transferring. The gap is $\sim 2\text{cm}$.

Acoustics

Reverberation time according to DIN 18041



Multifunctional hall

Multifunctional hall is designed to accommodate examinations, graduation ceremony and small concerts, as well as community events and lectures if needed. Because of this, the reverberation time is changeable depending on the specific event. $T_{60}=1.32$ s is required for concert hall.

Reverberation time without measures:

Event hall - initial		Equivalent sound absorption surface: $A_i \cdot \alpha_i$ (sound absorption capability)					
Area:	Type of surface	125	250	500	1000	2000	4000
135.74 m ²	RC wall	2.71	4.07	4.07	4.07	5.43	9.50
73.27 m ²	Partition wall	10.99	7.33	4.40	2.93	2.93	3.66
47.52 m ²	Glass	7.13	2.38	1.43	1.43	0.95	0.95
40 m ²	Floor tile	0.40	0.40	0.40	0.80	0.80	0.80
45 m ²	Floor parquet	4.05	2.70	2.25	2.25	2.25	1.80
115 m ²	Ceiling	17.25	12.65	11.50	8.05	6.90	8.05
30 m ²	seating	4.80	7.20	16.80	20.70	24.30	23.40
		47.33	36.73	40.84	40.23	43.56	48.17

581 m ³	Sabine-formula: $T = 0.161 V/A_s$	1.98	2.55	2.29	2.33	2.15	1.94
	Tmean	2.31 s					

Reverberation time with measures:

Event hall		Equivalent sound absorption surface: $A_i \cdot \alpha_i$ (sound absorption capability)					
Area:	Type of surface	125	250	500	1000	2000	4000
135.74 m ²	RC wall	2.71	4.07	4.07	4.07	5.43	9.50
26.28 m ²	Partition wall	3.94	2.63	1.58	1.05	1.05	1.31
47.52 m ²	Glass	7.13	2.38	1.43	1.43	0.95	0.95
40 m ²	Floor tile	0.40	0.40	0.40	0.80	0.80	0.80
45 m ²	Floor parquet	4.05	2.70	2.25	2.25	2.25	1.80

115 m ²	Ceiling	17.25	12.65	11.50	8.05	6.90	8.05
46.99 m ²	Back and side - curtain	1.41	21.15	30.54	26.31	27.72	33.36
30 m ²	seating	4.80	7.20	16.80	20.70	24.30	23.40
		41.69	53.17	68.57	64.66	69.41	79.18

581 m ³	Sabine-formula: $T = 0.161 V/As$	2.24	1.76	1.36	1.45	1.35	1.18
	T _{mean}	1.41	s				

Adding movable absorbing panels, the reverberation time can reach T₆₀= 0.80 s that is suitable for speech.

Big classroom

T₆₀=0.7s Parquet floor covering. Sound absorbing ceiling. Unparallel walls.

Reverberation time with measures:

Big classroom	Equivalent sound absorption surface: $A_i * \alpha_i$ (sound absorption capability)						
Area:	Type of surface	125	250	500	1000	2000	4000
33.3 m ²	Partition wall	5.00	3.33	2.00	1.33	1.33	1.67
18 m ²	RC	0.36	0.54	0.54	0.54	0.72	1.26
10.8 m ²	Diffusors	2.48	2.59	3.78	2.48	2.16	0.00
36 m ²	Parquet floor	3.24	2.16	1.80	1.80	1.80	1.44
36 m ²	Suspended ceiling	16.20	19.80	21.60	32.40	30.96	27.00
9.9 m ²	Glass	1.49	0.50	0.30	0.30	0.20	0.20
		28.76	28.92	30.02	38.85	37.17	31.56

108 m ³	Sabine-formula: $T = 0.161 V/As$	0.60	0.60	0.58	0.45	0.47	0.55
	T _{mean}	0.51	s				

Small classroom

T₆₀=0.4s Parquet floor covering. Sound absorbing ceiling. Unparallel ceiling.

Reverberation time with measures:

Small classroom	Equivalent sound absorption surface: $A_i * \alpha_i$ (sound absorption capability)						
Area:	Type of surface	125	250	500	1000	2000	4000
11.7 m ²	Partition wall	1.76	1.17	0.70	0.47	0.47	0.59
7.2 m ²	Diffusors	1.66	1.73	2.52	1.66	1.44	0.00
2.7 m ²	Curtains	0.08	1.22	1.76	1.51	1.59	1.92
12 m ²	Parquet floor	1.08	0.72	0.60	0.60	0.60	0.48
12 m ²	Suspended ceiling	5.40	6.60	7.20	10.80	10.32	9.00
16.2 m ²	Glass	2.43	0.81	0.49	0.49	0.32	0.32
		12.40	12.24	13.26	15.52	14.75	12.31

32.4 m ³	Sabine-formula: $T = 0.161 V/As$	0.42	0.43	0.39	0.34	0.35	0.42
	T _{mean}	0.36	s				
	T _{mean without curtains}	0.42	s				

Recording Studio

$T_{60}=0.2-0.3s$ Carpet floor covering. Sound absorbing ceiling. Unparallel ceiling. Extra sound insulation.

Reverberation time Control room:

Recording / Control	Equivalent sound absorption surface: $A_i * \alpha_i$ (sound absorption capability)						
Area:	Type of surface	125	250	500	1000	2000	4000
18.5 m ²	Partition wall	2.78	1.85	1.11	0.74	0.74	0.93
4.5 m ²	Diffusors	1.04	1.08	1.58	1.04	0.90	0.00
6.3 m ²	Carpet floor	0.63	2.52	3.91	4.41	3.97	5.54
6.3 m ²	Suspended ceiling	2.84	3.47	3.78	5.67	5.42	4.73
		7.28	8.92	10.37	11.86	11.03	11.19
14.49 m ³	Sabine-formula: $T = 0.161 V/As$	0.32	0.26	0.22	0.20	0.21	0.21
	T_{mean}	0.21 s					

Reverberation time Live room:

Recording / Live	Equivalent sound absorption surface: $A_i * \alpha_i$ (sound absorption capability)						
Area:	Type of surface	125	250	500	1000	2000	4000
29.68 m ²	Partition wall	4.45	2.97	1.78	1.19	1.19	1.48
10.8 m ²	Diffusors	2.48	2.59	3.78	2.48	2.16	0.00
14.7 m ²	Carpet floor	1.47	5.88	9.11	10.29	9.26	12.94
14.7 m ²	Suspended ceiling	6.62	8.09	8.82	13.23	12.64	11.03
		15.02	19.53	23.49	27.19	25.25	25.45
33.81 m ³	Sabine-formula: $T = 0.161 V/As$	0.36	0.28	0.23	0.20	0.22	0.21
	T_{mean}	0.22 s					

Cellar – Sound laboratory and small event hall

T_{60} can be modified depending on event and experiment/lecture. Modification is possible by curtains, changeable floor covering, movable absorbing panels, movable diffusors.

Reverberation time:

CELLAR	Equivalent sound absorption surface: $A_i * \alpha_i$ (sound absorption capability)						
Area:	Type of surface	125	250	500	1000	2000	4000
70 m ²	Brick wall	2.10	2.10	2.10	2.80	3.50	4.90
52 m ²	Barrel vault	1.56	1.56	1.56	2.08	2.60	3.64
32 m ²	Removable Carpet or	2.24	9.92	15.68	25.92	21.12	17.28
32 m ²	Stone covering or	0.64	0.96	0.96	0.96	1.28	2.24
32 m ²	Removabel Wooden covering	2.88	1.92	1.60	1.60	1.60	1.28
14 m ²	back side curtain	0.42	6.30	9.10	7.84	8.26	9.94
	Carpet	6.32	19.88	28.44	38.64	35.48	35.76
	Wooden	6.96	11.88	14.36	14.32	15.96	19.76
	Initial	4.30	4.62	4.62	5.84	7.38	10.78

112	m ³	Sabine-formula: $T = 0.161 V/As$	2.85	0.91	0.63	0.47	0.51	0.50
		Tmean Carpet	0.55					
112	m ³	Sabine-formula: $T = 0.161 V/As$	2.59	1.52	1.26	1.26	1.13	0.91
		Tmean Wooden	1.26					
112	m ³	Sabine-formula: $T = 0.161 V/As$	4.19	3.90	3.90	3.09	2.44	1.67
		Tmean Initial	3.50					

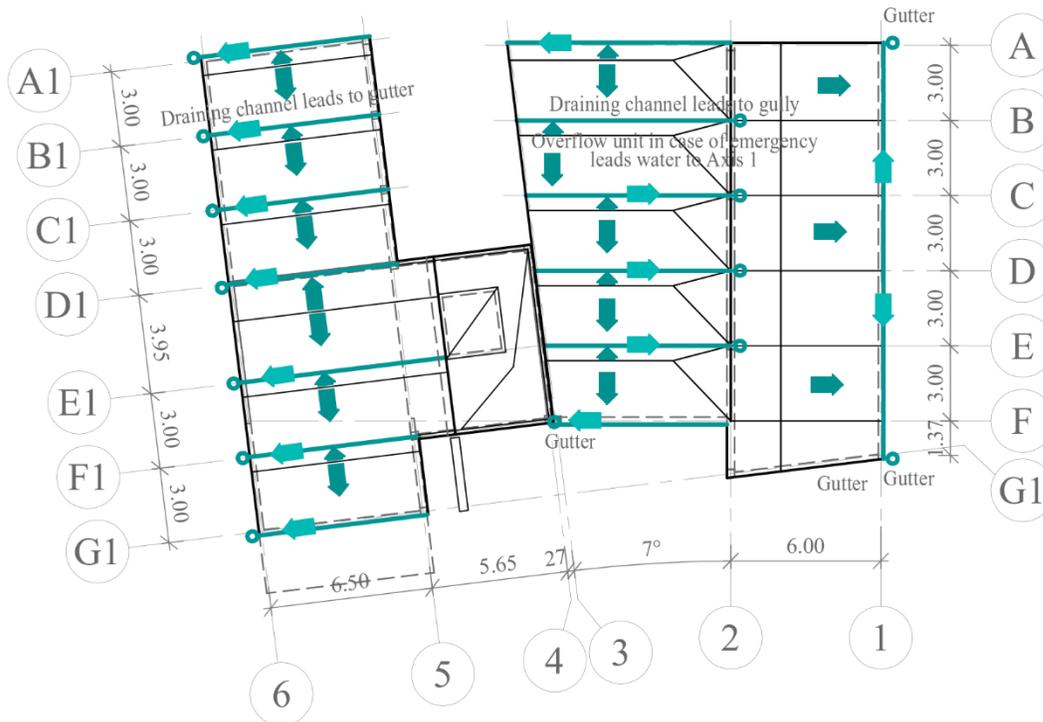
Thermal insulation

Layers are designed so that U value of the roof does not exceed $U_{req}=0.17 \text{ W/m}^2\text{K}$, U value of the walls does not exceed $U_{req}=0.24 \text{ W/m}^2\text{K}$. Because of soil, wind and rain exposure, the structures and sub-structures must be protected.

Waterproofing

Building elements which are exposed by water must be protected. The walls that are located in the ground are protected by two layers of bitumen membrane placed on the supporting walls. Flat roof is protected by two layers of bitumen membrane. Folded CLT roof structures protected by PVC membrane Thermofol U.

Water removal (M1:300)



Moisture protection

CLT panels are covered by vapour barrier to avoid water condensation

Wall layers

W1

- 150 mm - XPS foam (thermal insulation)
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 200 mm - Reinforced concrete wall

W2

- 150 mm - EPS foam (thermal insulation)
- 60 mm - LEIER crust panel
- 200 mm - RC wall
- 60 mm - LEIER crust panel
- 10 mm - Plaster

W3

- 150 mm - Supporting wall
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 100 mm - XPS foam (thermal insulation)
- 200 mm - Reinforced concrete wall
- 10 mm - Plaster

W4

- Existing retaining wall structures (anchored to the soil)
- 50 mm - Draining layer
- 150 mm - Supporting wall
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 100 mm - XPS foam (thermal insulation)
- 200 mm - Reinforced concrete wall

W5

- 20 mm - Revco footing plaster
- 180 mm - EPS foam (thermal insulation)
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding

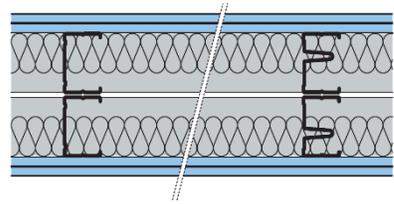
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 200 mm - Reinforced concrete wall
- 10 mm – Plaster

W6

- 20 mm - Plaster
- 200 mm - Mineral wool (thermal insulation)
- 200 mm - Reinforced concrete wall
- 10 mm - Plaster

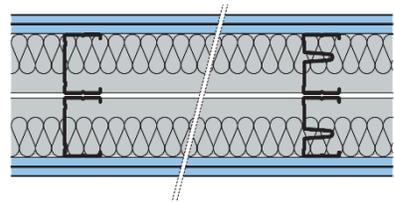
W7

- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 100 mm - Frame Knauf C-Stud with mineral wool
- 75 mm - Gap with self-adhesive insulation strip
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant



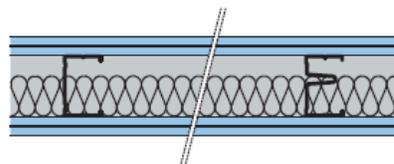
W8

- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 100 mm - Frame Knauf C-Stud with mineral wool
- 25 mm - Gap with self-adhesive insulation strip
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant



W9

- 12.5 mm - Knauf Plasterboards
- 12.5 mm - Knauf Plasterboards
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards
- 12.5 mm - Knauf Plasterboards



W10

- 12.5 mm - Knauf Plasterboards
- 12.5 mm - Knauf Plasterboards
- 50 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards
- 12.5 mm - Knauf Plasterboards

W11

- 10 mm - Plaster
- 200 mm - Reinforced concrete wall

W12

- 10 mm - Plaster
- 200 mm - Reinforced concrete wall
- 20 mm - dilatation joint (mineral wool)
- 200 mm - Reinforced concrete wall
- 10 mm - Plaster

W13

- 10 mm - Plaster
- 150 mm - Reinforced concrete wall

W14

- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 100 mm - Frame Knauf C-Stud with mineral wool
- 25 mm - Gap with self-adhesive insulation strip
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant

W15

- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 50 mm - Gap with self-adhesive insulation strip
- 12.5 mm - Knauf Plasterboards Diamant (shaft wall construction)
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant

W16

- 150 mm - Supporting wall
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 100 mm - XPS foam (thermal insulation)
- 200 mm - Reinforced concrete wall
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant

- 12.5 mm - Knauf Plasterboards Diamant

W17

- 300 mm - Retaining wall (shotcrete technology)
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 100 mm - XPS foam (thermal insulation)
- 200 mm - Reinforced concrete wall
- 10 mm - Plaster

Floor and roof covering

L1

- 22 mm - Stone tile
- 3 mm - Cement-based layer
- 60 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 140 mm - EPS foam (thermal insulation + installation layer)
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 120 mm - Reinforced concrete slab
- 80 mm - Concrete blinding

L2

- 19 mm - Wooden floor
- 6 mm - Bedding layer
- 60 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 140 mm - EPS foam (thermal insulation + installation layer)
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 120 mm - Reinforced concrete slab
- 80 mm - Concrete blinding

L3

- 40 mm - Granite stone paving
- 40 mm - d8-15 mm stone chipping and drainage layer
- 1 layer - Synthetic filter layer with specific density of 125 g/m²
- 200 mm - XPS thermal insulation
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 40-85 mm - Concrete inclination layer (substructure, dilatation by 50 m²)
- 200 mm - Reinforced concrete slab

L4

- 19 mm - Wooden floor
- 6 mm - Bedding layer
- 60 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 40 mm - EPS foam (thermal insulation + installation layer)
- 200 mm - Reinforced concrete slab
- 425 mm - Air gap
- 50 mm - Carrying channel 60/27 filled with 50 mm sound insulating mineral wool
- 12.5 mm - Knauf baseboard
- 12.5 mm - Knauf baseboard

L5

- 19 mm - Wooden floor
- 6 mm - Bedding layer
- 60 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 40 mm - EPS foam (thermal insulation + installation layer)
- 200 mm - Reinforced concrete slab
- 180 mm - Air gap
- 50 mm - Carrying channel CD 60/27 filled with sound insulation mineral wool 50 mm
- 27 mm - Furring channel CD 60/27
- 12.5 x 2 mm - Knauf plasterboard
- 27 mm - Furring channel CD 60/27 filled with 25 mm acoustic mineral wool
- 12.5 mm - Cleaneo linear (Circular perforation 8/18 R)

L6

- 22 mm - Stone tile
- 3 mm - Cement based layer
- 100 mm - Screed
- 1 layer - PE foil

- 25 mm - Mineral wool (floating floor)
- 200 mm - Reinforced concrete slab
- 425 mm - Air gap
- 50 mm - Carrying channel 60/27 filled with 50 mm sound insulating mineral wool
- 12.5 mm - Knauf baseboard
- 12.5 mm - Knauf baseboard

L7

- 22 mm - Stone tile
- 3 mm - Cement based layer
- 100 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 200 mm - Reinforced concrete slab
- 155 mm - Air gap
- 50 mm - Carrying channel 60/27 filled with 50 mm sound insulating mineral wool
- 12.5 mm - Knauf baseboard
- 12.5 mm - Knauf baseboard

L8

- 15 mm - Carpet
- 70 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 40 mm - EPS foam (thermal insulation + installation layer)
- 200 mm - Reinforced concrete slab
- 155 mm - Air gap
- 50 mm - Carrying channel 60/27 filled with 50 mm sound insulating mineral wool
- 12.5 mm - Knauf baseboard
- 12.5 mm - Knauf baseboard

L9

- 22 mm - Stone tile
- 3 mm - Cement based layer
- 100 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 200 mm - Reinforced concrete slab
- 1 cm - Plaster

L10

- 19 mm - Wooden floor
- 6 mm - Bedding layer
- 60 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 140 mm - EPS foam (thermal insulation + installation layer)

- 450 mm - Reinforced concrete slab
- 80 mm - Concrete blinding

L11

- 0.7 mm - VMZINC Natural Zinc, seam height 25 mm
- 20 x 96 mm - Wooden boards
- 60 mm - Ventilation gap
- 1 layer - PVC membrane Thermofol U
- 200 mm - Mineral wool
- 30 mm - Honeycomb acoustic infill FERMACELL
- 1 layer - Vapour barrier
- 200 mm - CLT structures

L12

- 50 mm - d16-32 mm gravel ballasting and protecting layer
- 1 layer - Synthetic filter with specific density of 125 g/m²
- 200 mm - XPS foam (thermal insulation, with staggered joints)
- 4 mm - Modified bitumen waterproofing membrane (polyester fibre reinforced), fully bonded by torch applied welding
- 4 mm - Modified bitumen waterproofing membrane (glass fibre reinforced), fully bonded
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 40-80 mm - Concrete inclination layer
- 200 mm - Reinforced concrete slab
- 10 mm - Plaster

L13

- 19 mm - Wooden floor
- 6 mm - Bedding layer
- 60 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 140 mm - EPS foam (thermal insulation + installation layer)
- 300 mm - Reinforced concrete slab
- 80 mm - Concrete blinding

L14

- 19 mm - Wooden floor
- 6 mm - Bedding layer
- 60 mm - Screed
- 1 layer - PE foil
- 115 mm - EPS foam (thermal insulation + installation layer)
- 50 mm - Resilient pads (sound insulation in drum room)
- 300 mm - Reinforced concrete slab
- 80 mm - Concrete blinding

L15

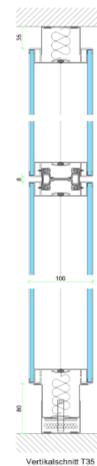
- 0.7 mm - VMZINC Natural Zinc, seam height 25 mm

- 20 x 96 mm - Wooden boards
- 60 mm - Ventilation gap
- 1 layer - PVC membrane Thermofol U
- 200 mm - Mineral wool
- 30 mm - Honeycomb acoustic infill FERMACELL
- 1 layer - Vapour barrier
- 200 mm - CLT structures
- 130 mm - Air gap
- 50 mm - Carrying channel CD 60/27 filled with sound insulation mineral wool 50 mm
- 27 mm - Furring channel CD 60/27
- 12.5 x 2 mm - Knauf plasterboard
- 27 mm - Furring channel CD 60/27 filled with 25 mm acoustic mineral wool
- 12.5 mm - Cleaneo linear (Circular perforation 8/18 R)

Other elements and connections

Glass Partition Goldbach Kirchner glass partition T35 double glazing

- Partition wall system with double glazing
- Wall thickness 100 mm
- Fall-proof glazing compliant with TRAV optional
- Fire protection
- Smoke protection
- Sound insulation up to 51 dB
- Many special models available with electrically powered panels, opaque glass panes or internal blinds

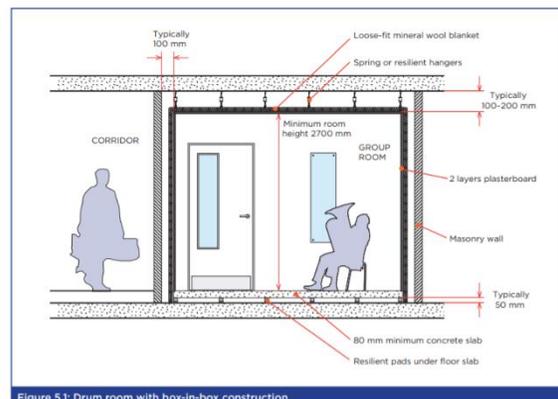


Hufcor operable partitions Hufcor 631

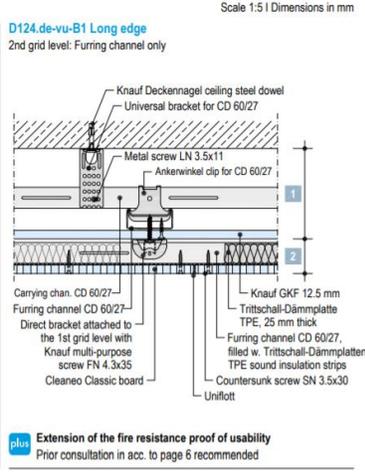
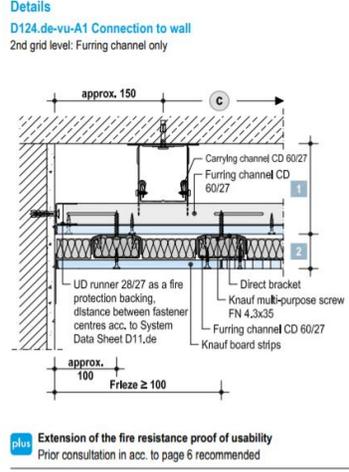
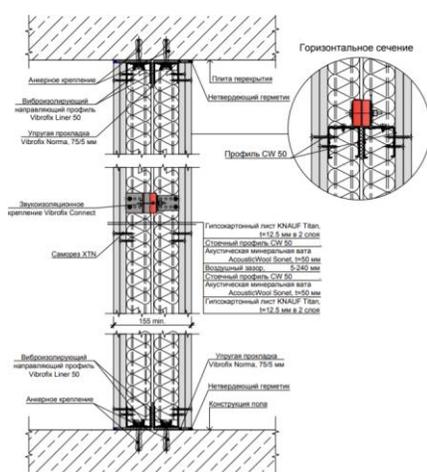
Acoustical models include multi-ply sweep strips at the top and bottom, both sides of the door. Acoustical models are available up to 56 STC and perforated panels are available to better absorb sound. The lead post also includes a magnetic seal to help close the door and seal out sound.

Drum room

Extra measures for floor, ceiling, and walls. 50 mm resilient pads under the concrete slab, resilient handers for the suspended ceiling.



Drywall and suspended ceiling



Roof covering

Figure 6.48 Holding down cleats.

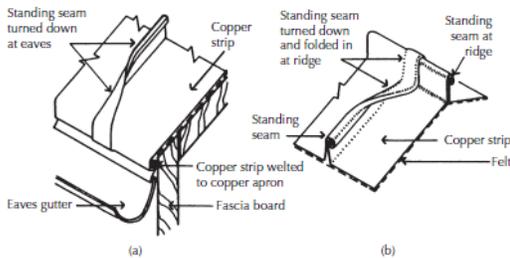
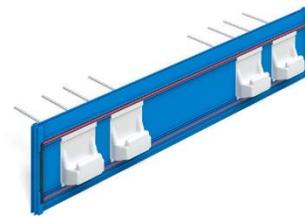


Figure 6.49 (a) Eaves. (b) Ridge.

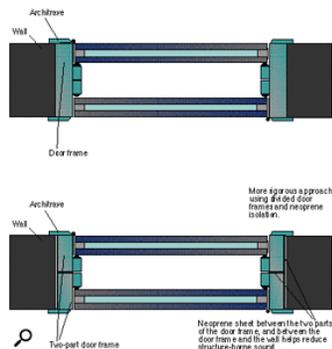


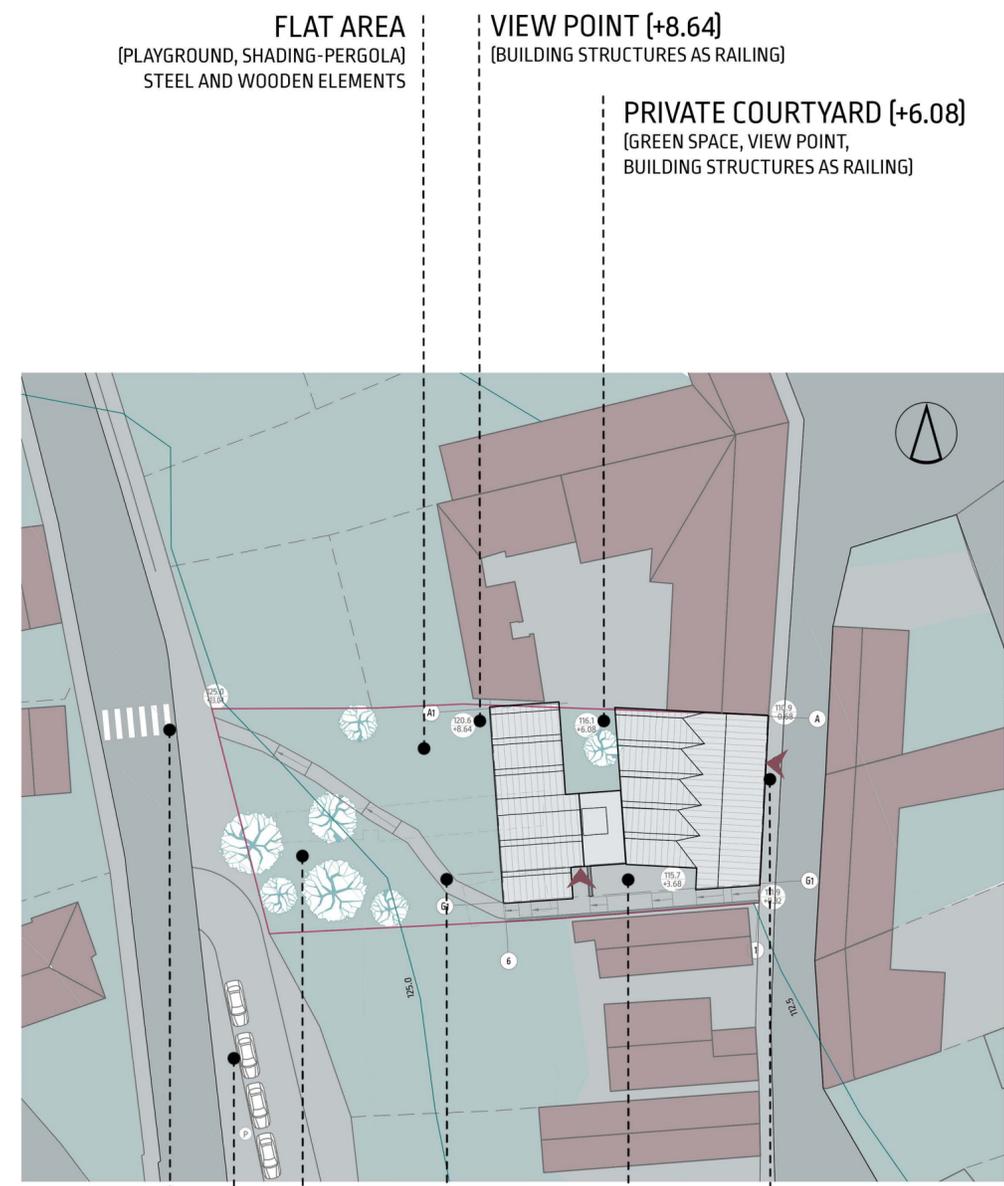
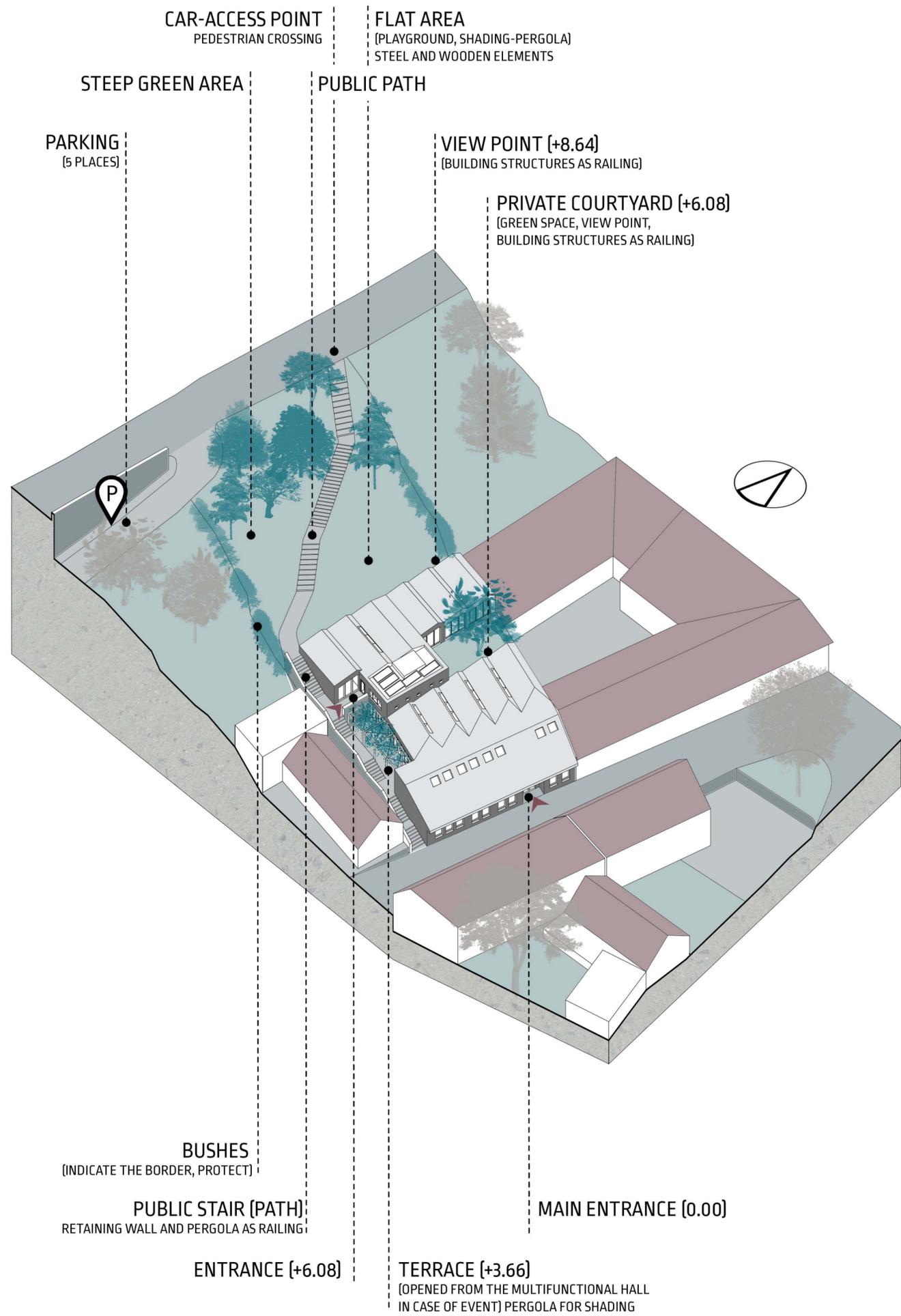
Schöck Tronsole

Schöck Tronsole® type T can be used for acoustically insulated connections between in-situ concrete or prefabricated stairs and in-situ concrete or element landings.



Double door for extra sound insulation





1:500 **25**

Drawing SITEPLAN

Budapest University of Technology and Economics
Department of Urban Planning and Design
Diploma Project



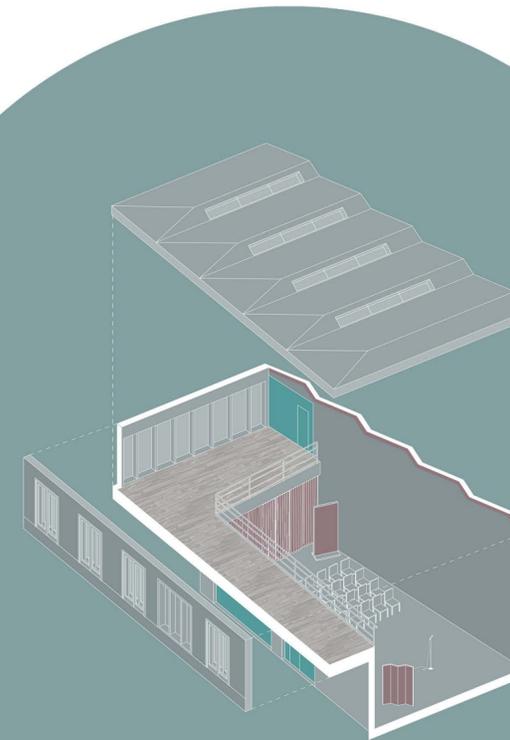
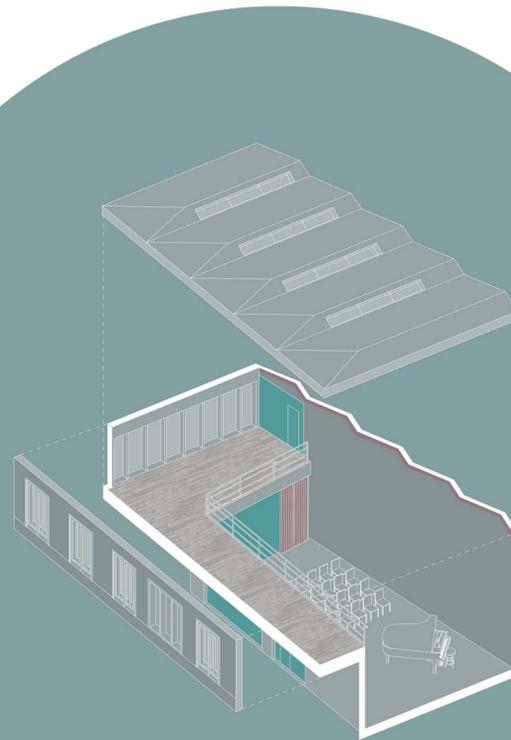
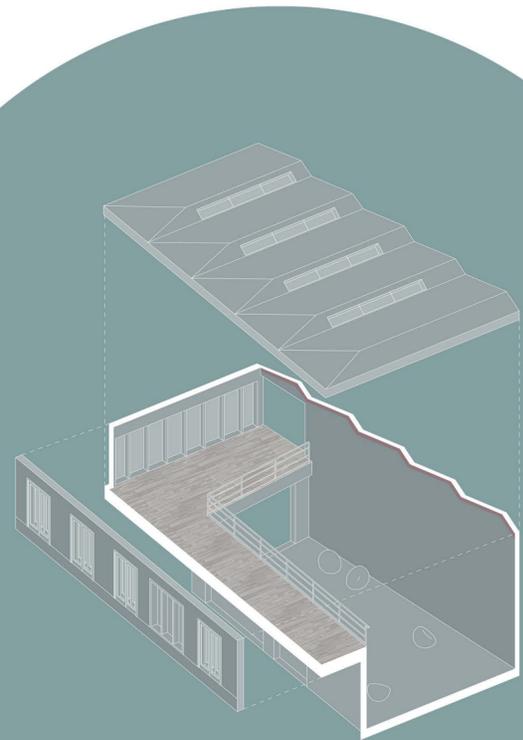
Student: Karina Kasatkina

MULTIFUNCTIONAL HALL

WELCOMING SPACE

MUSIC EVENT

SPEECH EVENT



T60 NOT SPECIFIED

T60=1.32 s

T60=0.80 s

OPEN SPACE

SOUND INSULATING WALLS
SOUND INSULATION OF ROOF STRUCTURES
OPERABLE PARTITIONS (FULL SEPARATION)

SOUND INSULATING WALLS
SOUND INSULATION OF ROOF STRUCTURES
OPERABLE PARTITIONS (FULL SEPARATION)

FLEXIBLE FURNITURE ARRANGEMENT
VISUAL CONNECTION TO THE ENTRANCE
VISUAL CONNECTION TO THE TERRACE

NON PARALLEL WALLS
FOLDED STRUCTURES
TILE AND PARQUET COVERING
CURTAINS

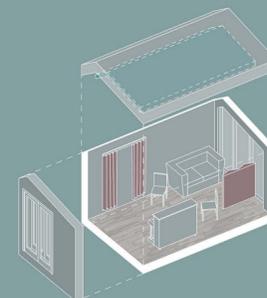
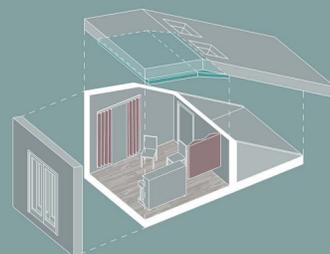
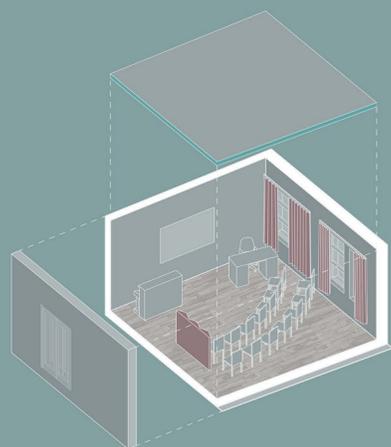
NON PARALLEL WALLS
FOLDED STRUCTURES
TILE AND PARQUET COVERING
CURTAINS
MOVABLE ABSORBERS

CLASSROOM

LEARNING THE THEORY

INDIVIDUAL PRACTICE

SMALL GROUP PRACTICE



T60=0.70 s

SOUND INSULATING WALLS
SOUND INSILATING SUSPENDED CEILING
DOUBLE DOORS

NON PARALLEL WALLS
SOUND ABSORBING SUSPENDED CEILING
PARQUET COVERING
DIFFUSERS
CURTAINS

T60=0.40 s

SOUND INSULATING WALLS
SOUND INSILATING SUSPENDED CEILING
DOUBLE DOORS

FOLDED ROOF STRUCTURES
SOUND ABSORBING SUSPENDED CEILING
PARQUET COVERING
DIFFUSERS
CURTAINS

TWO SMALL EXTRA UNITS
FOR PRACTICE WITHOUT SUPERVISION

T60=0.40 s

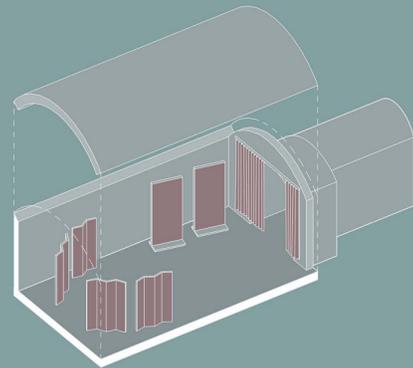
SOUND INSULATING WALLS
SOUND INSILATING SUSPENDED CEILING

FOLDED ROOF STRUCTURES
SOUND ABSORBING SUSPENDED CEILING
PARQUET COVERING
DIFFUSERS
CURTAINS

ONE DRUM ROOM WITH EXTRA MEASURES
(RESILIENT PADS)

EXISTING CELLARS

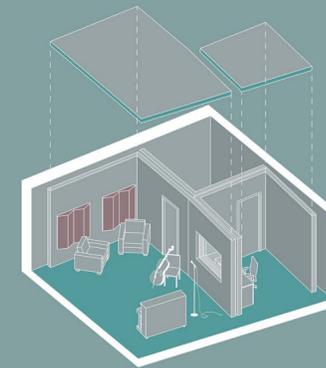
SOUND LABORATORY
SPECIAL SMALL EVENTS



$T_{60}=0.3...2.5\text{ s}$

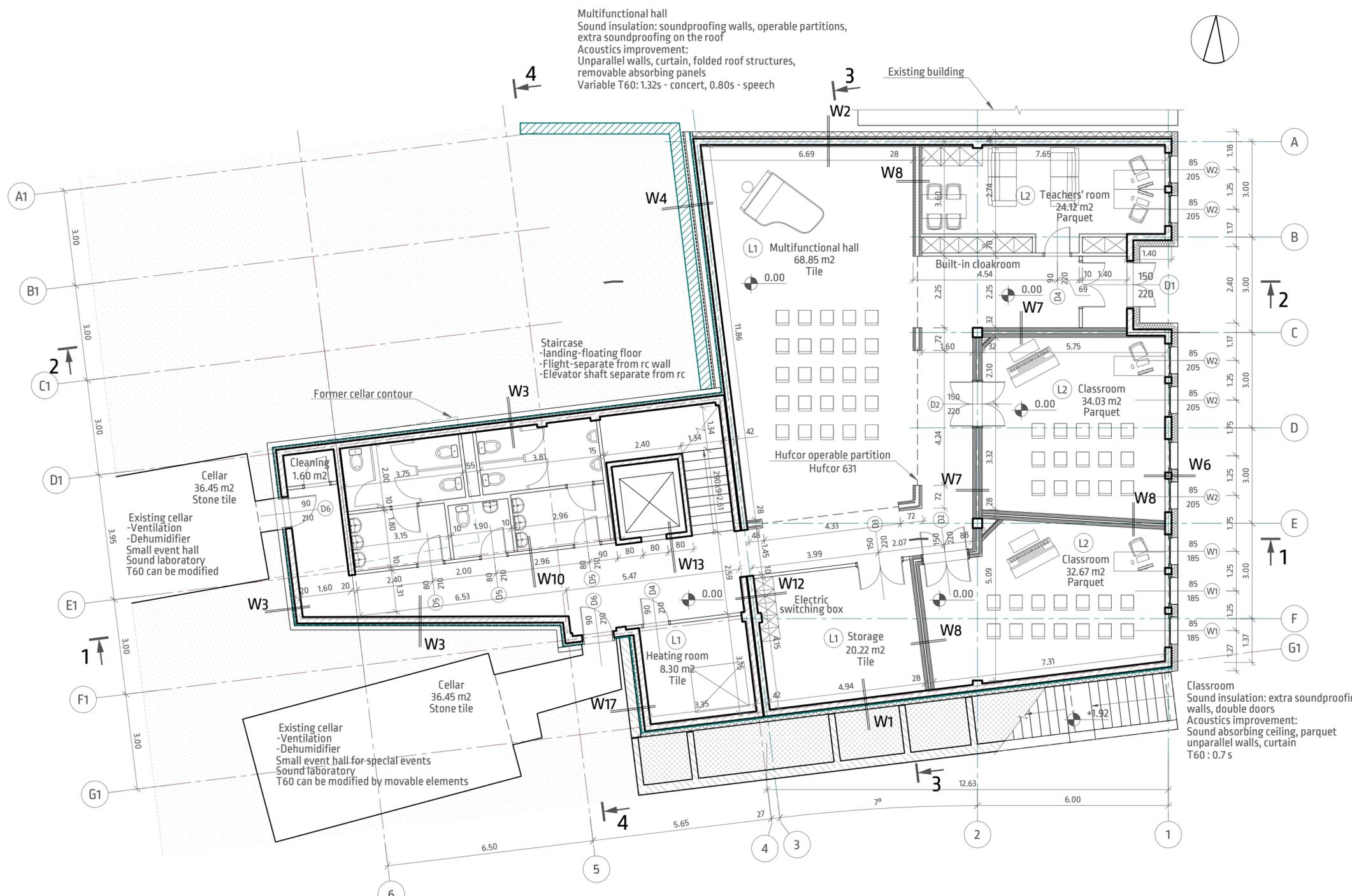
MOVABLE ABSORBING PANELS
MOVABLE DIFFUSORS
CHANGEABLE FLOOR COVERING
(STONE TILE, CARPET, WOODEN BOARDS)
CURTAINS

RECORDING STUDIO



$T_{60}=0.20...0.30\text{ s}$

SOUND INSULATING WALLS
SOUND INSILATING SUSPENDEED CEILING
SOUND ABSORBING SUSPENDEED CEILING
CARPET COVERING
DIFFUSERS



Multifunctional hall
 Sound insulation: soundproofing walls, operable partitions, extra soundproofing on the roof
 Acoustics improvement: Unparallel walls, curtain, folded roof structures, removable absorbing panels
 Variable T60: 1.32s - concert, 0.80s - speech

Staircase
 - landing-floating floor
 - Flight-separate from rc wall
 - Elevator shaft separate from rc

Classroom
 Sound insulation: extra soundproofing walls, double doors
 Acoustics improvement: Sound absorbing ceiling, parquet unparallel walls, curtain
 T60 : 0.7 s

- W10
 12.5 mm - Knauf Plasterboards
 12.5 mm - Knauf Plasterboards
 50 mm - Frame Knauf C-Stud with mineral wool
 12.5 mm - Knauf Plasterboards
 12.5 mm - Knauf Plasterboards
- W12
 10 mm - Plaster
 200 mm - Reinforced concrete wall
 20 mm - dilatation joint (mineral wool)
 200 mm - Reinforced concrete wall
 10 mm - Plaster
- W13
 10 mm - Plaster
 150 mm - Reinforced concrete wall
- W17
 300 mm - Retaining wall (shotcrete technology)
 1 layer - Cold bitumen patching compound (about 300 g/m2)
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 100 mm - XPS foam (thermal insulation)
 200 mm - Reinforced concrete wall
 10 mm - Plaster
- L1
 22 mm - Stone tile
 3 mm - Cement-based layer
 60 mm - Screed
 1 layer - PE foil
 25 mm - Mineral wool (floating floor)
 140 mm - EPS foam (thermal insulation + installation layer)
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 1 layer - Cold bitumen patching compound (about 300 g/m2)
 120 mm - Reinforced concrete slab
 80 mm - Concrete blinding
- L2
 19 mm - Wooden floor
 6 mm - Bedding layer
 60 mm - Screed
 1 layer - PE foil
 25 mm - Mineral wool (floating floor)
 140 mm - EPS foam (thermal insulation + installation layer)
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- W6
 20 mm - Plaster
 200 mm - Mineral wool (thermal insulation)
 200 mm - Reinforced concrete wall
 10 mm - Plaster
- W7
 12.5 mm - Knauf Plasterboards Diamant
 12.5 mm - Knauf Plasterboards Diamant
 100 mm - Frame Knauf C-Stud with mineral wool
 75 mm - Gap with self-adhesive insulation strip
 100 mm - Frame Knauf C-Stud with mineral wool
 12.5 mm - Knauf Plasterboards Diamant
- W8
 12.5 mm - Knauf Plasterboards Diamant
 12.5 mm - Knauf Plasterboards Diamant
 100 mm - Frame Knauf C-Stud with mineral wool
 25 mm - Gap with self-adhesive insulation strip
 100 mm - Frame Knauf C-Stud with mineral wool
 12.5 mm - Knauf Plasterboards Diamant
 12.5 mm - Knauf Plasterboards Diamant

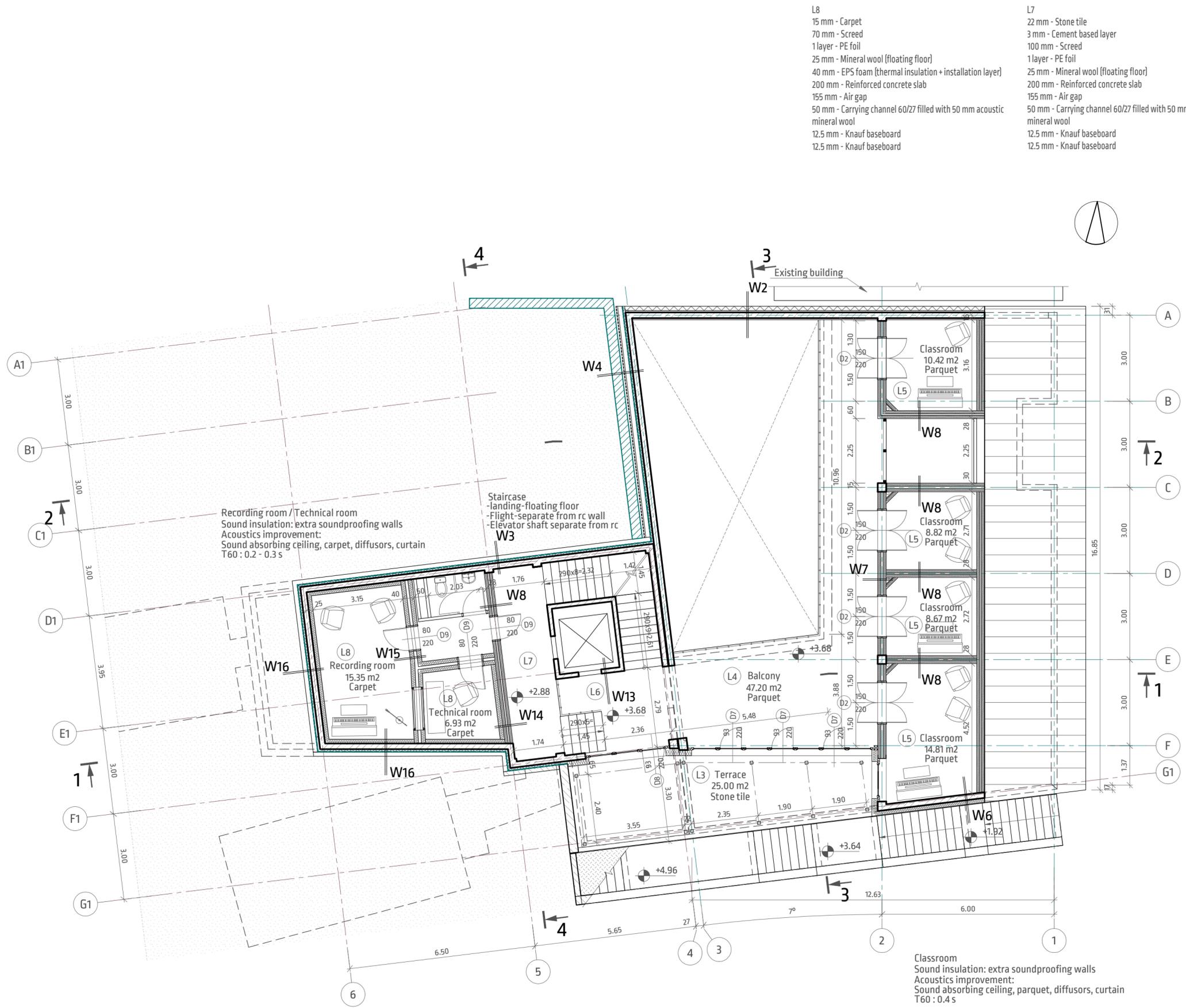
1:100 **29**

Drawing GROUND FLOOR

Budapest University of Technology and Economics
 Department of Urban Planning and Design
 Diploma Project



Student: Karina Kasatkina



- L8
- 15 mm - Carpet
- 70 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 40 mm - EPS foam (thermal insulation + installation layer)
- 200 mm - Reinforced concrete slab
- 155 mm - Air gap
- 50 mm - Carrying channel 60/27 filled with 50 mm acoustic mineral wool
- 12.5 mm - Knauf baseboard
- 12.5 mm - Knauf baseboard

- L7
- 22 mm - Stone tile
- 3 mm - Cement based layer
- 100 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 200 mm - Reinforced concrete slab
- 155 mm - Air gap
- 50 mm - Carrying channel 60/27 filled with 50 mm acoustic mineral wool
- 12.5 mm - Knauf baseboard
- 12.5 mm - Knauf baseboard

- W15
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 50 mm - Gap with self-adhesive insulation strip
- 12.5 mm - Knauf Plasterboards Diamant (shaft wall construction)
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant

- W2
- 150 mm - EPS foam (thermal insulation)
- 60 mm - LEIER crust panel
- 200 mm - RC wall
- 60 mm - LEIER crust panel
- 10 mm - Plaster

- W16
- 150 mm - Supporting wall
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 100 mm - XPS foam (thermal insulation)
- 200 mm - Reinforced concrete wall
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant

- W3
- 150 mm - Supporting wall
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 100 mm - XPS foam (thermal insulation)
- 200 mm - Reinforced concrete wall
- 10 mm - Plaster

- L3
- 40 mm - Granite stone paving
- 40 mm - d8-15 mm stone chipping and drainage layer
- 1 layer - Synthetic filter layer with specific density of 125 g/m²
- 200 mm - XPS thermal insulation
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 40-85 mm - Concrete inclination layer (substructure, dilatation by 50 m²)
- 200 mm - Reinforced concrete slab

- W4
- Existing retaining wall structures (anchored to the soil)
- 50 mm - Draining layer
- 150 mm - Supporting wall
- 1 layer - Cold bitumen patching compound (about 300 g/m²)
- 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
- 100 mm - XPS foam (thermal insulation)
- 200 mm - Reinforced concrete wall

- L4
- 19 mm - Wooden floor
- 6 mm - Bedding layer
- 60 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 40 mm - EPS foam (thermal insulation + installation layer)
- 200 mm - Reinforced concrete slab
- 425 mm - Air gap
- 50 mm - Carrying channel 60/27 filled with 50 mm mineral wool
- 12.5 mm - Knauf baseboard
- 12.5 mm - Knauf baseboard

- W6
- 20 mm - Plaster
- 200 mm - Mineral wool (thermal insulation)
- 200 mm - Reinforced concrete wall
- 10 mm - Plaster

- L5
- 19 mm - Wooden floor
- 6 mm - Bedding layer
- 60 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 40 mm - EPS foam (thermal insulation + installation layer)
- 200 mm - Reinforced concrete slab
- 180 mm - Air gap
- 50 mm - Carrying channel CD 60/27 filled with sound insulating mineral wool 50 mm
- 27 mm - Furring channel CD 60/27
- 12.5 x 2 mm - Knauf plasterboard
- 27 mm - Furring channel CD 60/27 filled with 25 mm acoustic mineral wool
- 12.5 mm - Cleaneo linear (Circular perforation 8/18 R)

- W7
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 100 mm - Frame Knauf C-Stud with mineral wool
- 75 mm - Gap with self-adhesive insulation strip
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant

- L6
- 22 mm - Stone tile
- 3 mm - Cement based layer
- 100 mm - Screed
- 1 layer - PE foil
- 25 mm - Mineral wool (floating floor)
- 200 mm - Reinforced concrete slab
- 425 mm - Air gap
- 50 mm - Carrying channel 60/27 filled with 50 mm mineral wool
- 12.5 mm - Knauf baseboard
- 12.5 mm - Knauf baseboard

- W8
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 100 mm - Frame Knauf C-Stud with mineral wool
- 25 mm - Gap with self-adhesive insulation strip
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant
- 100 mm - Frame Knauf C-Stud with mineral wool
- 12.5 mm - Knauf Plasterboards Diamant
- 12.5 mm - Knauf Plasterboards Diamant

1:100 30

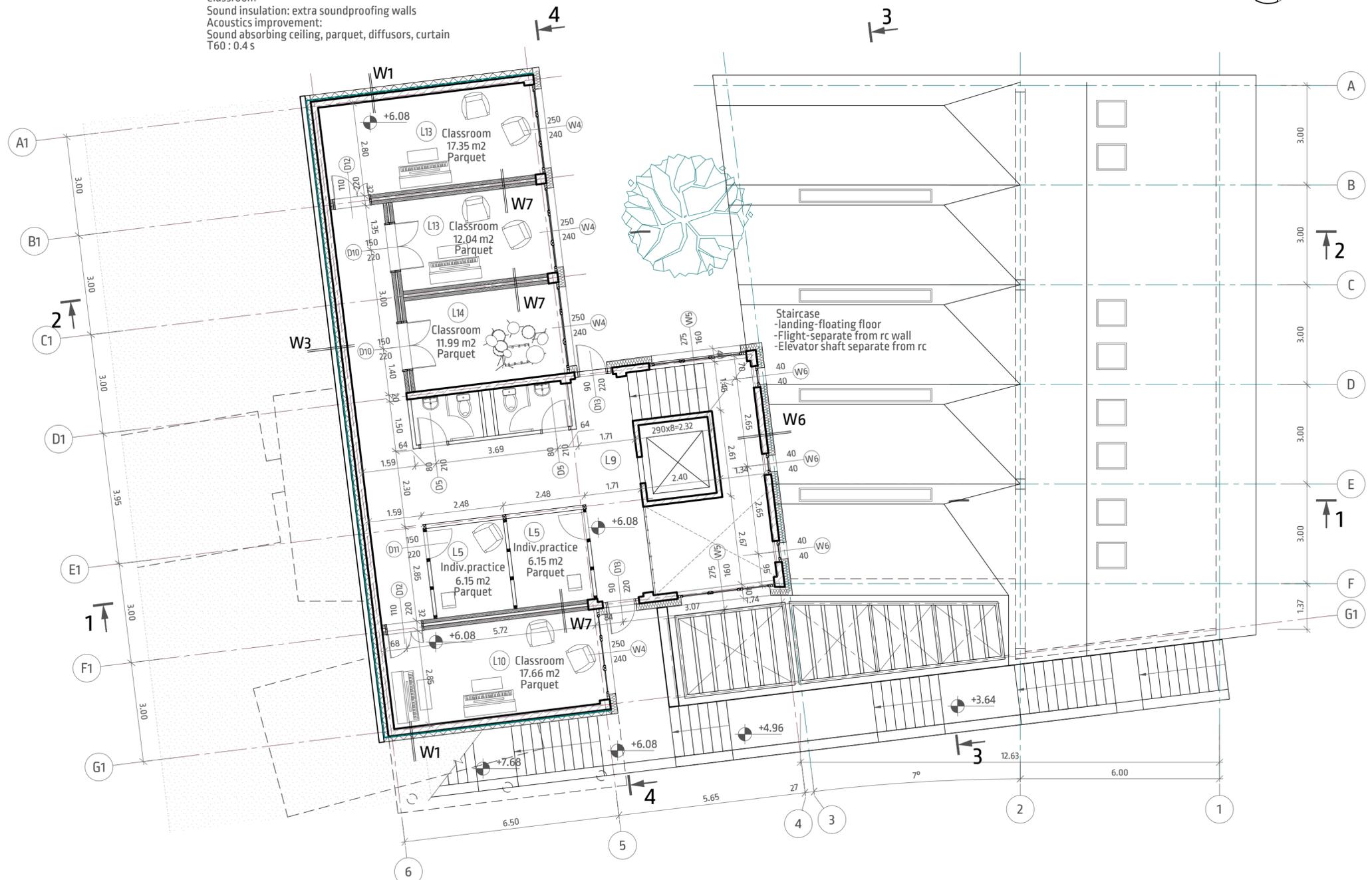
Drawing FIRST FLOOR

Budapest University of Technology and Economics
Department of Urban Planning and Design
Diploma Project



Student: Karina Kasatkina

Classroom
 Sound insulation: extra soundproofing walls
 Acoustics improvement:
 Sound absorbing ceiling, parquet, diffusers, curtain
 T60: 0.4 s



- L5
 19 mm - Wooden floor
 6 mm - Bedding layer
 60 mm - Screed
 1 layer - PE foil
 25 mm - Mineral wool (floating floor)
 40 mm - EPS foam (thermal insulation + installation layer)
 200 mm - Reinforced concrete slab
 180 mm - Air gap
 50 mm - Carrying channel CD 60/27 filled with sound insulating mineral wool 50 mm
 27 mm - Furring channel CD 60/27
 12.5 x 2 mm - Knauf plasterboard
 27 mm - Furring channel CD 60/27 filled with 25 mm acoustic mineral wool
 12.5 mm - Cleaneo linear (Circular perforation 8/18 R)
- L9
 22 mm - Stone tile
 3 mm - Cement based layer
 100 mm - Screed
 1 layer - PE foil
 25 mm - Mineral wool (floating floor)
 200 mm - Reinforced concrete slab
 1 cm - Plaster
- L10
 19 mm - Wooden floor
 6 mm - Bedding layer
 60 mm - Screed
 1 layer - PE foil
 25 mm - Mineral wool (floating floor)
 140 mm - EPS foam (thermal insulation + installation layer)
 450 mm - Reinforced concrete slab
 80 mm - Concrete blinding
- L13
 19 mm - Wooden floor
 6 mm - Bedding layer
 60 mm - Screed
 1 layer - PE foil
 25 mm - Mineral wool (floating floor)
 140 mm - EPS foam (thermal insulation + installation layer)
 300 mm - Reinforced concrete slab
 80 mm - Concrete blinding
- L14
 19 mm - Wooden floor
 6 mm - Bedding layer
 60 mm - Screed
 1 layer - PE foil
 115 mm - EPS foam (thermal insulation + installation layer)
 50 mm - Resilient pads (sound insulation in drum room)
 300 mm - Reinforced concrete slab
 80 mm - Concrete blinding

- W1
 150 mm - XPS foam (thermal insulation)
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 1 layer - Cold bitumen patching compound (about 300 g/m²)
 200 mm - Reinforced concrete wall
- W3
 150 mm - Supporting wall
 1 layer - Cold bitumen patching compound (about 300 g/m²)
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 100 mm - XPS foam (thermal insulation)
 200 mm - Reinforced concrete wall
 10 mm - Plaster
- W7
 12.5 mm - Knauf Plasterboards Diamant
 12.5 mm - Knauf Plasterboards Diamant
 100 mm - Frame Knauf C-Stud with mineral wool
 75 mm - Gap with self-adhesive insulation strip
 100 mm - Frame Knauf C-Stud with mineral wool
 12.5 mm - Knauf Plasterboards Diamant
 12.5 mm - Knauf Plasterboards Diamant
- W8
 12.5 mm - Knauf Plasterboards Diamant
 12.5 mm - Knauf Plasterboards Diamant
 100 mm - Frame Knauf C-Stud with mineral wool
 25 mm - Gap with self-adhesive insulation strip
 100 mm - Frame Knauf C-Stud with mineral wool
 12.5 mm - Knauf Plasterboards Diamant
 12.5 mm - Knauf Plasterboards Diamant
- W9
 12.5 mm - Knauf Plasterboards
 12.5 mm - Knauf Plasterboards
 100 mm - Frame Knauf C-Stud with mineral wool
 12.5 mm - Knauf Plasterboards
 12.5 mm - Knauf Plasterboards
- W10
 12.5 mm - Knauf Plasterboards
 12.5 mm - Knauf Plasterboards
 50 mm - Frame Knauf C-Stud with mineral wool
 12.5 mm - Knauf Plasterboards
 12.5 mm - Knauf Plasterboards

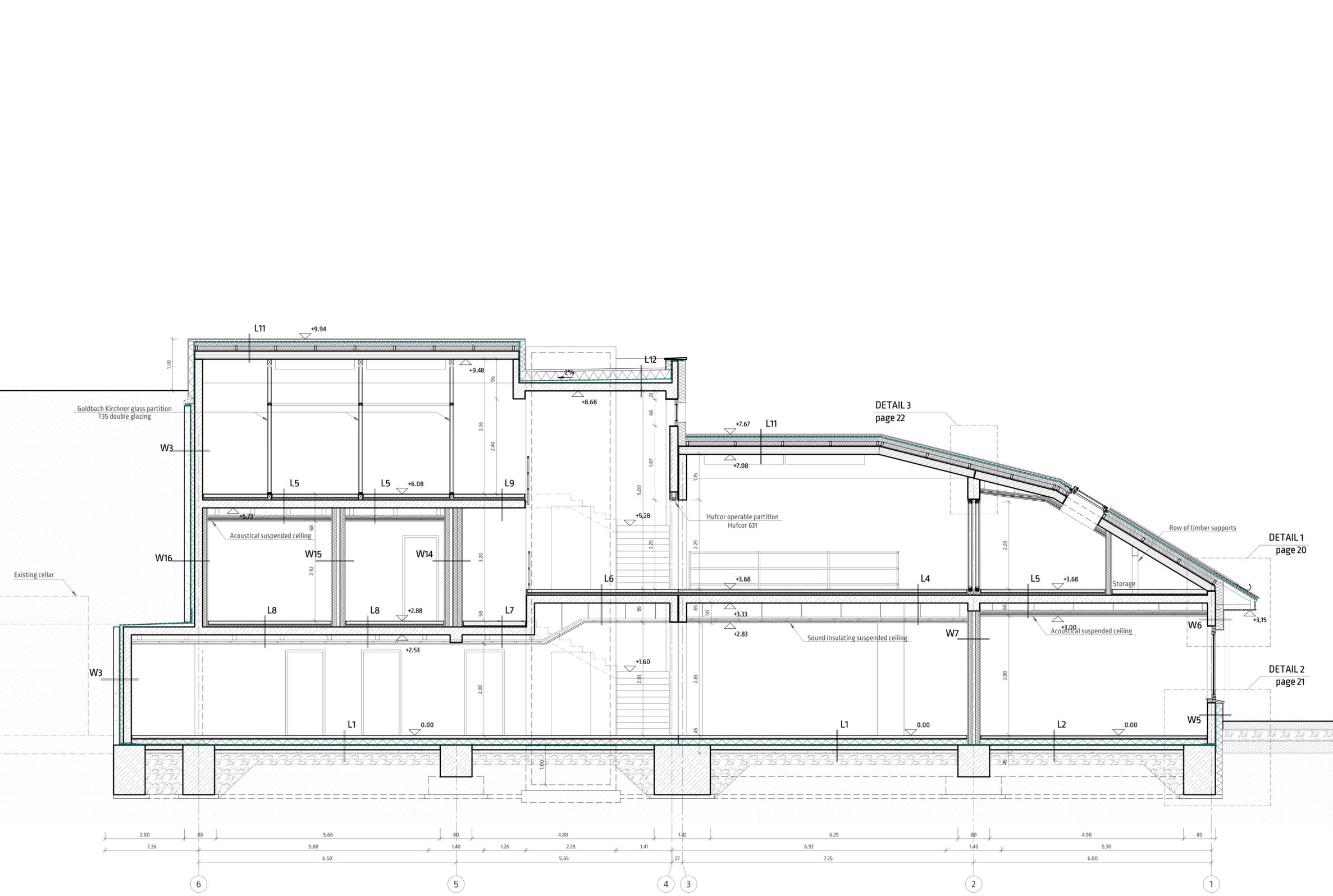
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Drawing SECOND FLOOR

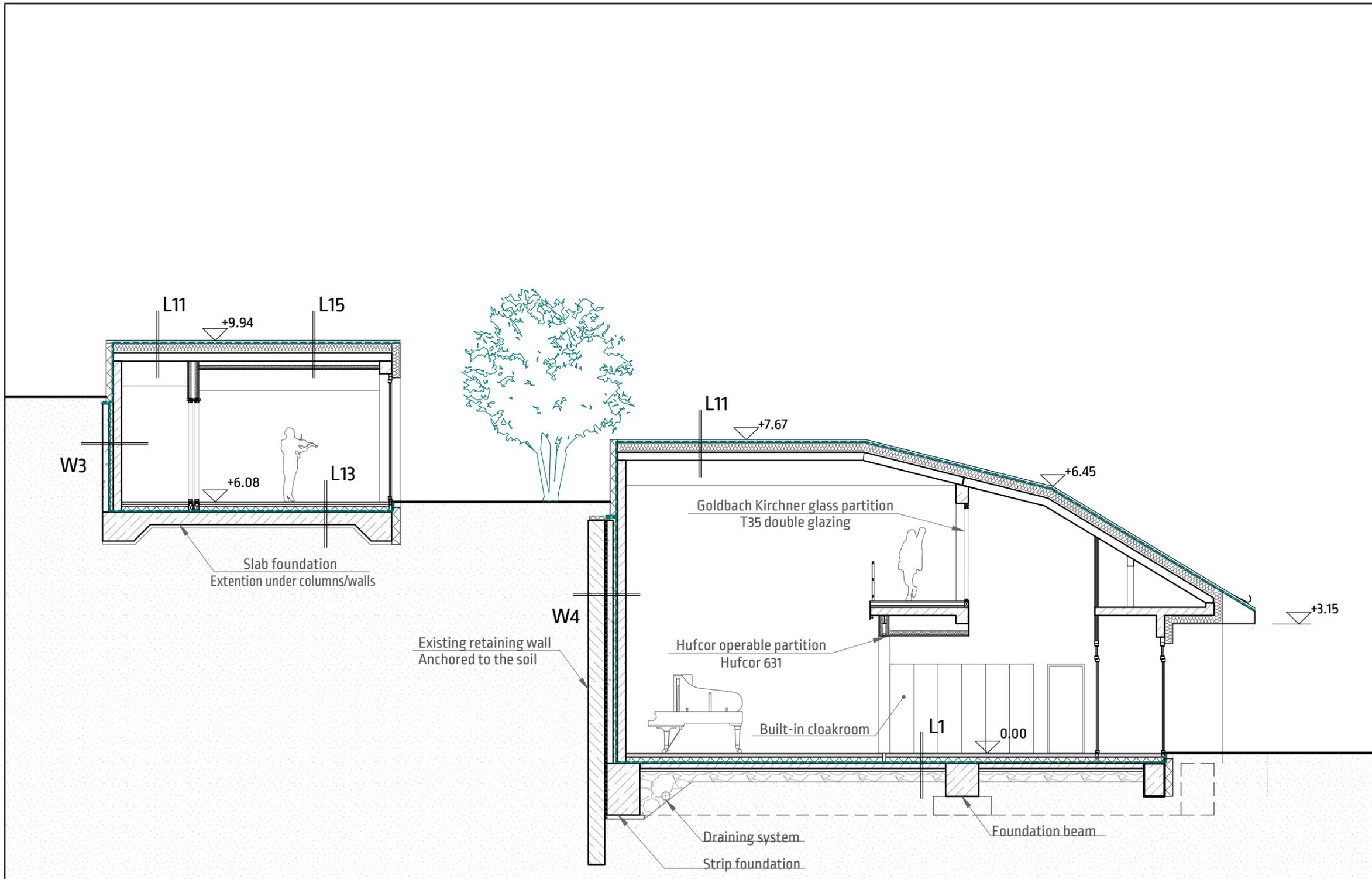
Budapest University of Technology and Economics
 Department of Urban Planning and Design
 Diploma Project



Student: Karina Kasatkina



- L1
22 mm - Stone tile
3 mm - Cement-based layer
60 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
140 mm - EPS foam (thermal insulation + installation layer)
4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
1 layer - Cold bitumen patching compound (about 300 g/m²)
120 mm - Reinforced concrete slab
80 mm - Concrete blinding
- L2
19 mm - Wooden floor
6 mm - Bedding layer
60 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
140 mm - EPS foam (thermal insulation + installation layer)
4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
1 layer - Cold bitumen patching compound (about 300 g/m²)
120 mm - Reinforced concrete slab
80 mm - Concrete blinding
- L3
19 mm - Wooden floor
60 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
40 mm - EPS foam (thermal insulation + installation layer)
200 mm - Reinforced concrete slab
425 mm - Air gap
50 mm - Carrying channel 60/27 filled with 50 mm sound insulating mineral wool
12.5 mm - Knauf baseboard
- L4
19 mm - Wooden floor
6 mm - Bedding layer
60 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
40 mm - EPS foam (thermal insulation + installation layer)
200 mm - Reinforced concrete slab
425 mm - Air gap
50 mm - Carrying channel 60/27 filled with 50 mm sound insulating mineral wool
12.5 mm - Knauf baseboard
- L5
19 mm - Wooden floor
60 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
40 mm - EPS foam (thermal insulation + installation layer)
200 mm - Reinforced concrete slab
180 mm - Air gap
50 mm - Carrying channel CD 60/27 filled with sound insulating mineral wool 50 mm
27 mm - Furring channel CD 60/27
12.5 x 2 mm - Knauf plasterboard
27 mm - Furring channel CD 60/27 filled with 25 mm acoustic mineral wool
12.5 mm - Cleaneo linear (Circular perforation Ø18 R)
- L6
22 mm - Stone tile
3 mm - Cement based layer
100 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
200 mm - Reinforced concrete slab
425 mm - Air gap
50 mm - Carrying channel 60/27 filled with 50 mm sound insulating mineral wool
12.5 mm - Knauf baseboard
12.5 mm - Knauf baseboard
- L7
22 mm - Stone tile
3 mm - Cement based layer
100 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
200 mm - Reinforced concrete slab
155 mm - Air gap
50 mm - Carrying channel 60/27 filled with 50 mm sound insulating mineral wool
12.5 mm - Knauf baseboard
12.5 mm - Knauf baseboard
- L8
15 mm - Carpet
70 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
40 mm - EPS foam (thermal insulation + installation layer)
200 mm - Reinforced concrete slab
155 mm - Air gap
50 mm - Carrying channel 60/27 filled with 50 mm mineral wool
12.5 mm - Knauf baseboard
12.5 mm - Knauf baseboard
- L9
22 mm - Stone tile
3 mm - Cement based layer
100 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
200 mm - Reinforced concrete slab
200 mm - Reinforced concrete slab
1 cm - Plaster
- L11
0.7 mm - VMZINC Natural Zinc, seam height 25 mm
20 x 96 mm - Wooden boards
60 mm - Ventilation gap
1 layer - PVC membrane Thermofol U
200 mm - Mineral wool
30 mm - Honeycomb acoustic infill FERMACELL
1 layer - Vapour barrier
200 mm - CLT structures
- L12
50 mm - d16-32 mm gravel ballasting and protecting layer
1 layer - Synthetic filter with specific density of 125 g/m²
200 mm - XPS foam (thermal insulation, with staggered joints)
4 mm - Modified bitumen waterproofing membrane (polyester fibre reinforced), fully bonded by torch applied welding
4 mm - Modified bitumen waterproofing membrane (glass fibre reinforced), fully bonded
1 layer - Cold bitumen patching compound (about 300 g/m²)
40-80 mm - Concrete inclination layer
200 mm - Reinforced concrete slab
10 mm - Plaster
- W3
150 mm - Supporting wall
1 layer - Cold bitumen patching compound (about 300 g/m²)
4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
100 mm - XPS foam (thermal insulation)
200 mm - Reinforced concrete wall
10 mm - Plaster
- W5
20 mm - Revco footing plaster
180 mm - EPS foam (thermal insulation)
4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
1 layer - Cold bitumen patching compound (about 300 g/m²)
200 mm - Reinforced concrete wall
10 mm - Plaster
- W6
20 mm - Plaster
200 mm - Mineral wool (thermal insulation)
200 mm - Reinforced concrete wall
10 mm - Plaster
- W7
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
100 mm - Frame Knauf C-Stud with mineral wool
75 mm - Gap with self-adhesive insulation strip
100 mm - Frame Knauf C-Stud with mineral wool
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
- W8
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
100 mm - Frame Knauf C-Stud with mineral wool
25 mm - Gap with self-adhesive insulation strip
100 mm - Frame Knauf C-Stud with mineral wool
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
- W9
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
100 mm - Frame Knauf C-Stud with mineral wool
25 mm - Gap with self-adhesive insulation strip
100 mm - Frame Knauf C-Stud with mineral wool
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
- W10
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
100 mm - Frame Knauf C-Stud with mineral wool
25 mm - Gap with self-adhesive insulation strip
100 mm - Frame Knauf C-Stud with mineral wool
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
- W11
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
100 mm - Frame Knauf C-Stud with mineral wool
25 mm - Gap with self-adhesive insulation strip
100 mm - Frame Knauf C-Stud with mineral wool
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
- W12
150 mm - Supporting wall
1 layer - Cold bitumen patching compound (about 300 g/m²)
4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
100 mm - XPS foam (thermal insulation)
200 mm - Reinforced concrete wall
10 mm - Plaster
- W13
150 mm - Supporting wall
1 layer - Cold bitumen patching compound (about 300 g/m²)
4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
100 mm - XPS foam (thermal insulation)
200 mm - Reinforced concrete wall
10 mm - Plaster
- W14
100 mm - Frame Knauf C-Stud with mineral wool
25 mm - Gap with self-adhesive insulation strip
100 mm - Frame Knauf C-Stud with mineral wool
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
- W15
100 mm - Frame Knauf C-Stud with mineral wool
25 mm - Gap with self-adhesive insulation strip
100 mm - Frame Knauf C-Stud with mineral wool
12.5 mm - Knauf Plasterboards Diamant
12.5 mm - Knauf Plasterboards Diamant
- W16
150 mm - Supporting wall
1 layer - Cold bitumen patching compound (about 300 g/m²)
4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
100 mm - XPS foam (thermal insulation)
200 mm - Reinforced concrete wall
10 mm - Plaster



W3
 150 mm - Supporting wall
 1 layer - Cold bitumen patching compound (about 300 g/m²)
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 100 mm - XPS foam (thermal insulation)
 200 mm - Reinforced concrete wall
 10 mm - Plaster

W4
 Existing retaining wall structures (anchored to the soil)
 50 mm - Draining layer
 150 mm - Supporting wall
 1 layer - Cold bitumen patching compound (about 300 g/m²)
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 100 mm - XPS foam (thermal insulation)
 200 mm - Reinforced concrete wall

L1
 22 mm - Stone tile
 3 mm - Cement-based layer
 60 mm - Screed
 1 layer - PE foil
 25 mm - Mineral wool (floating floor)
 140 mm - EPS foam (thermal insulation + installation layer)
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 1 layer - Cold bitumen patching compound (about 300 g/m²)
 120 mm - Reinforced concrete slab
 80 mm - Concrete blinding

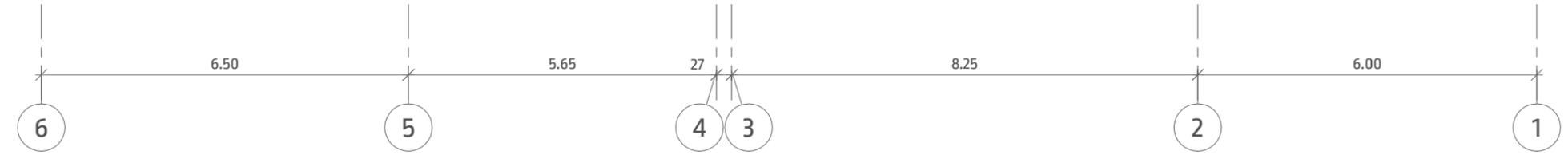
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Drawing SECTION 02

Budapest University of Technology and Economics
 Department of Urban Planning and Design
 Diploma Project



Student: Karina Kasatkina



SECTION 20
page 18

Pergola - Steel square tube 100x100x4

Existing building

+3.64

L3

+3.68

L4

L11

Multifunctional hall
Sound insulation: soundproofing walls, operable partitions, extra soundproofing on the roof
Acoustics improvement:
Unparallel walls, curtain, folded roof structures, removable absorbing panels
Variable T60: 1.32s - concert, 0.80s - speech

Hufcor operable partition
Hufcor 631

W1

L1

0.00

W2

Existing building

Jet grouting

Retaining wall
Cross wall every 4m

Strip foundation

Foundation beam

Foundation beam

Strip foundation

G1

F

E

D

C

B

A

3.00

3.00

3.00

3.00

3.00

W1
150 mm - XPS foam (thermal insulation)
4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
1 layer - Cold bitumen patching compound (about 300 g/m²)
200 mm - Reinforced concrete wall

W2
150 mm - EPS foam (thermal insulation)
60 mm - LEIER crust panel
200 mm - RC wall
60 mm - LEIER crust panel
10 mm - Plaster

L1
22 mm - Stone tile
3 mm - Cement-based layer
60 mm - Screed
1 layer - PE foil
25 mm - Mineral wool (floating floor)
140 mm - EPS foam (thermal insulation + installation layer)
4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
1 layer - Cold bitumen patching compound (about 300 g/m²)
120 mm - Reinforced concrete slab
80 mm - Concrete blinding

L11
0.7 mm - VMZINC Natural Zinc, seam height 25 mm
20 x 96 mm - Wooden boards
60 mm - Ventilation gap
1 layer - PVC membrane Thermofol U
200 mm - Mineral wool
30 mm - Honeycomb acoustic infill FERMACELL
1 layer - Vapour barrier
200 mm - CLT structures

1:100

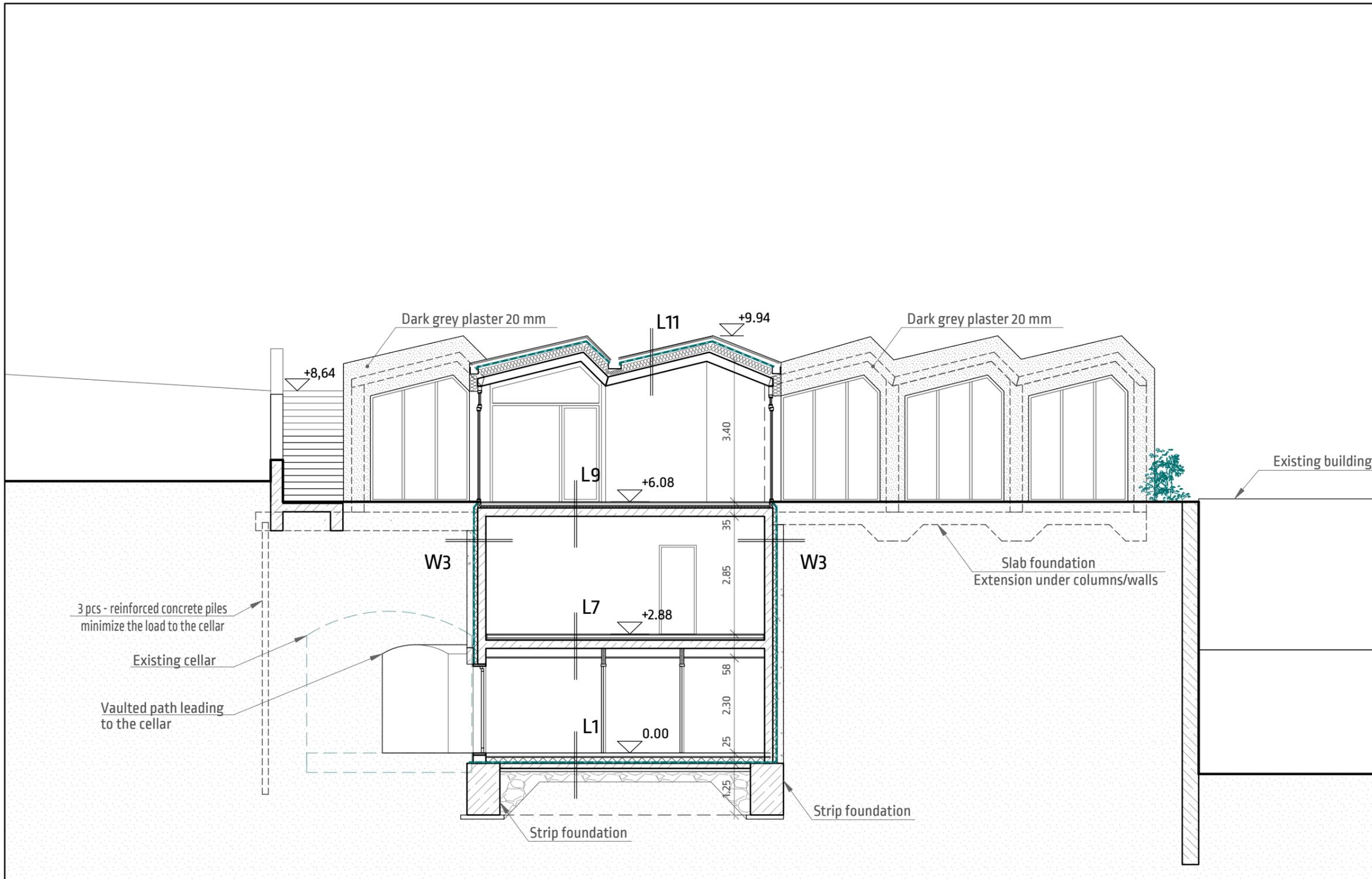
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Drawing SECTION 03

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Diploma Project

ELEVATE
SCHOOL
OF MUSIC

Student: Karina Kasatkina



W3
 150 mm - Supporting wall
 1 layer - Cold bitumen patching compound (about 300 g/m²)
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 100 mm - XPS foam (thermal insulation)
 200 mm - Reinforced concrete wall
 10 mm - Plaster

L1
 22 mm - Stone tile
 3 mm - Cement-based layer
 60 mm - Screed
 1 layer - PE foil
 25 mm - Mineral wool (floating floor)
 140 mm - EPS foam (thermal insulation + installation layer)
 4 mm - Polyester fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 4 mm - Glass fibre reinforced SBS modified bitumen membrane waterproofing, fully welded by hot air welding
 1 layer - Cold bitumen patching compound (about 300 g/m²)
 120 mm - Reinforced concrete slab
 80 mm - Concrete blinding

L11
 0.7 mm - VMZINC Natural Zinc, seam height 25 mm
 20 x 96 mm - Wooden boards
 60 mm - Ventilation gap
 1 layer - PVC membrane Thermofool U
 200 mm - Mineral wool
 30 mm - Honeycomb acoustic infill FERMACELL
 1 layer - Vapour barrier
 200 mm - CLT structures

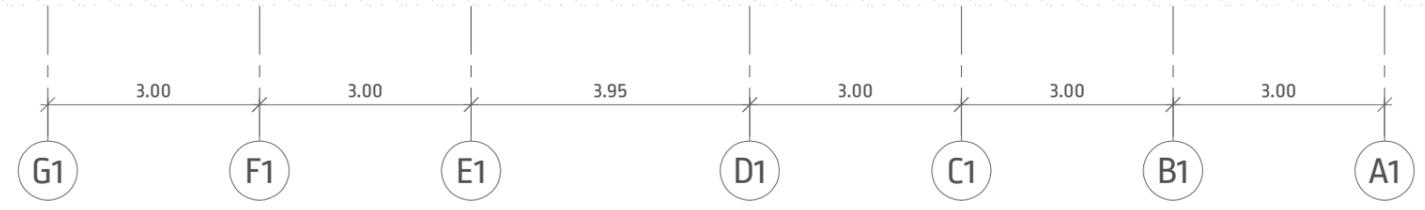
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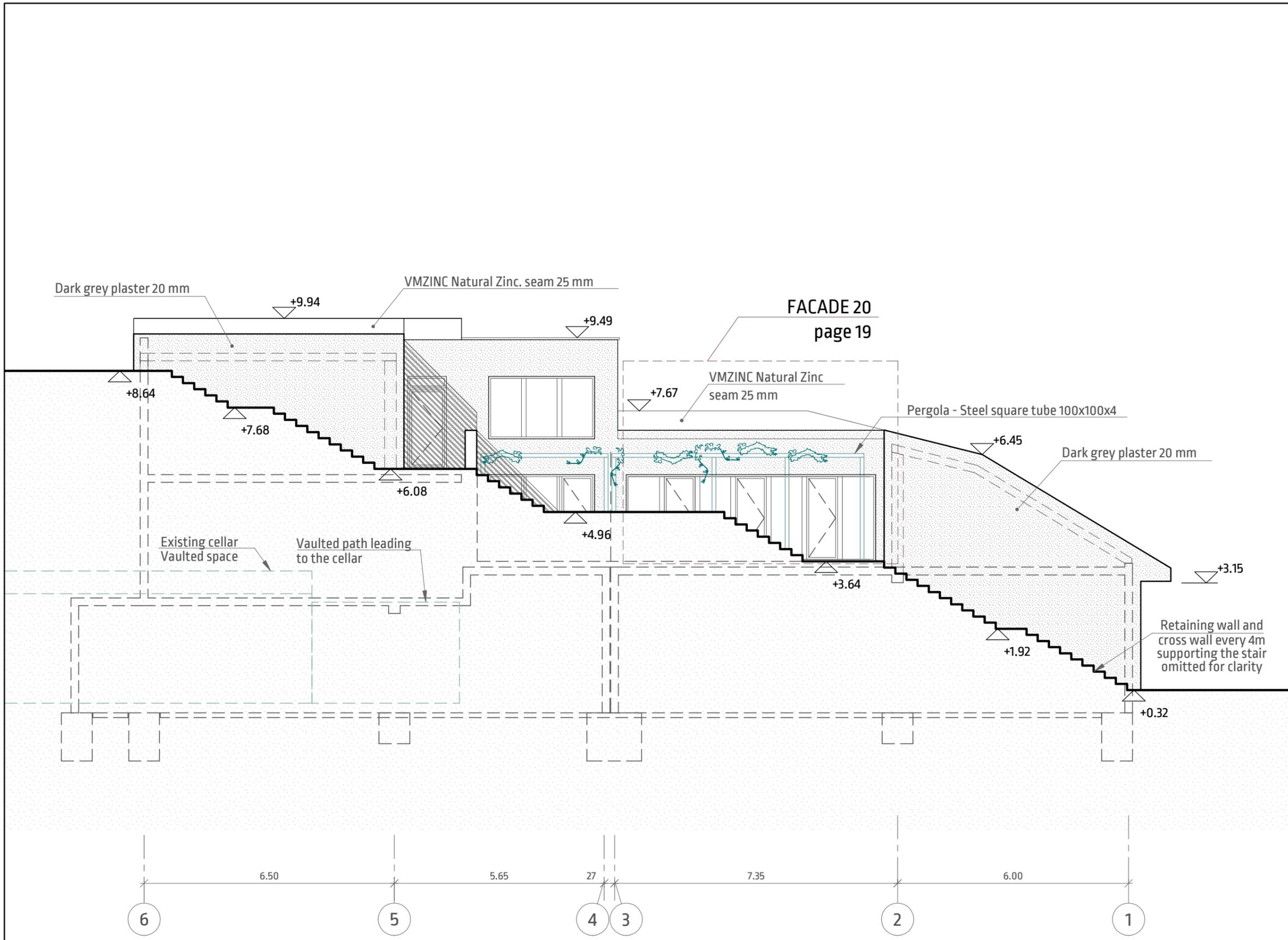
Drawing SECTION 04

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 Department of Urban Planning and Design
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Student: Karina Kasatkina





1:100

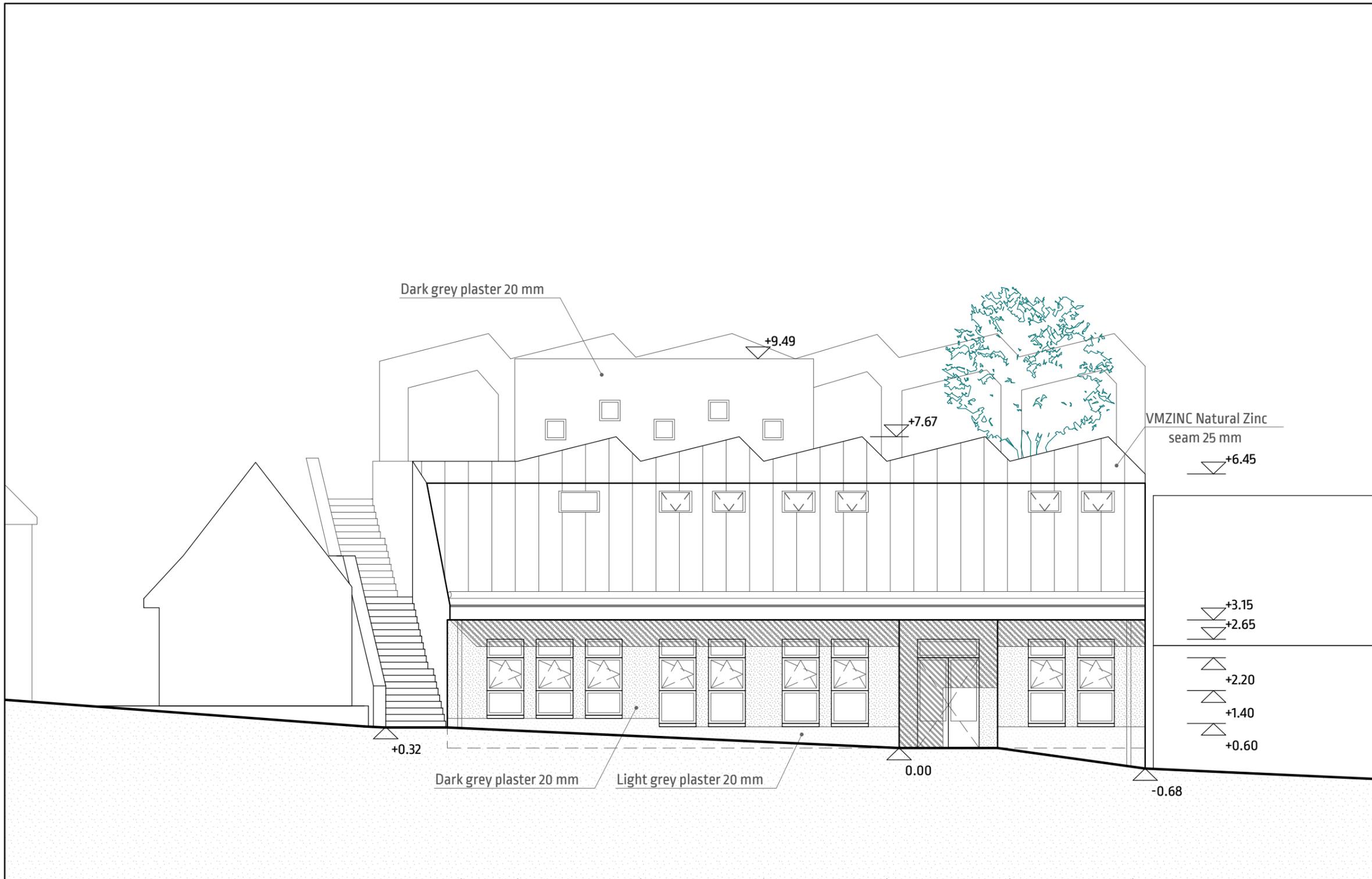
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Drawing FACADE 6-1

Budapest University of Technology and Economics
Department of Urban Planning and Design
Diploma Project



Student: Karina Kasatkina



VMZINC Natural Zinc
seam 25 mm
▽ +6.45

▽ +3.15
▽ +2.65
▽ +2.20
▽ +1.40
▽ +0.60

Dark grey plaster 20 mm

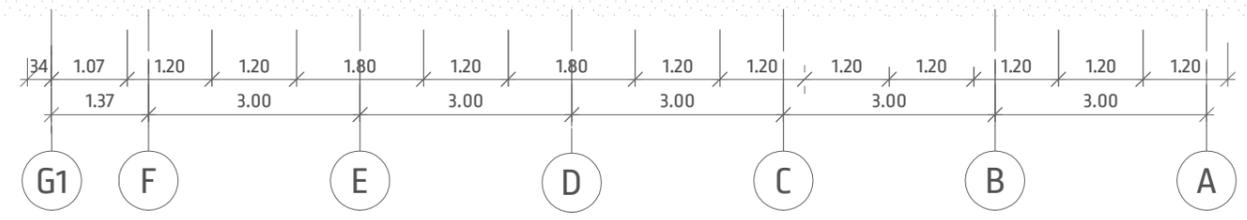
+0.32

Dark grey plaster 20 mm

Light grey plaster 20 mm

0.00

-0.68



1:100

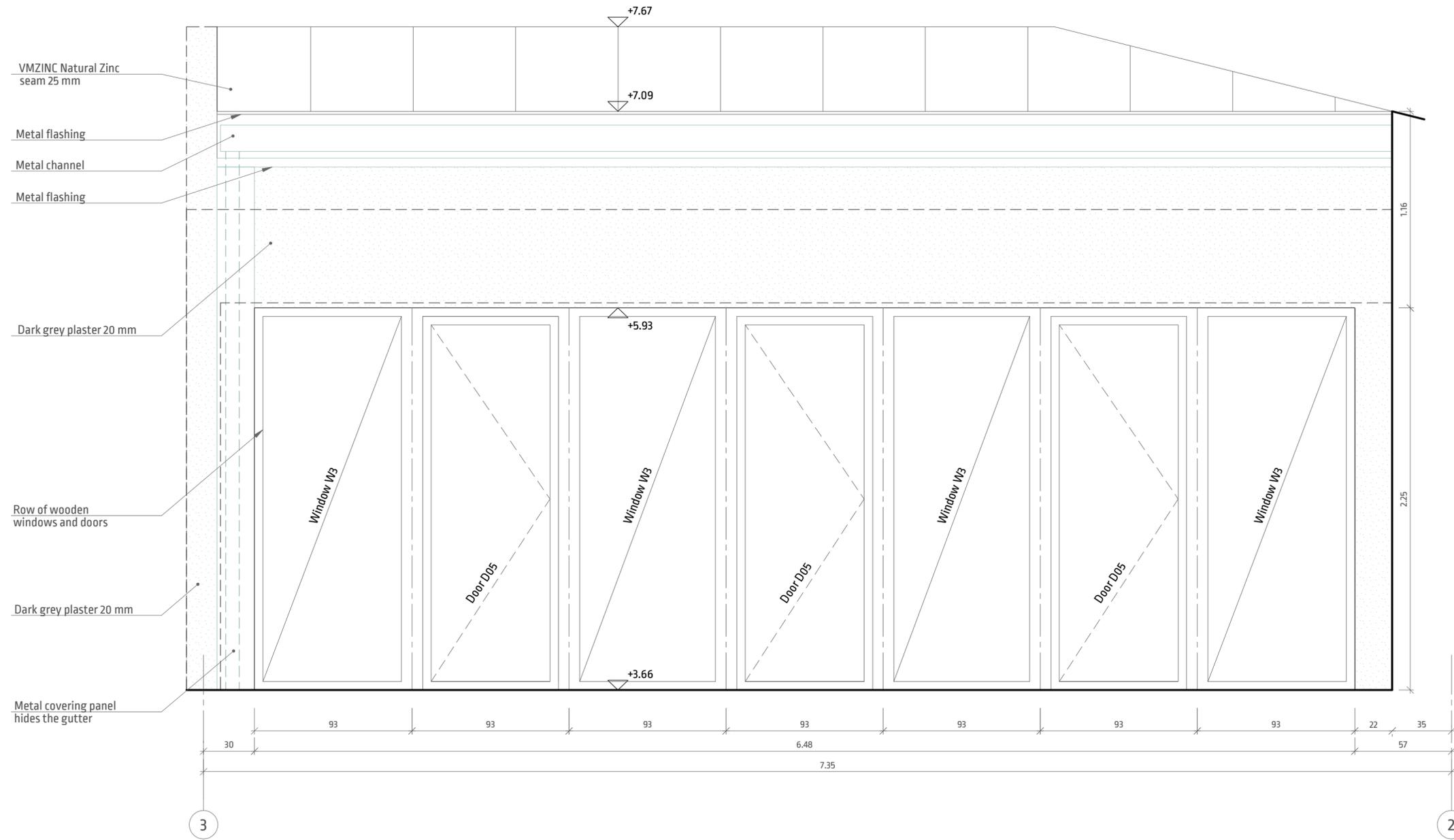
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Drawing FACADE G1-A

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Diploma Project

ELEVATE
SCHOOL
OF MUSIC

Student: Karina Kasatkina



1:20

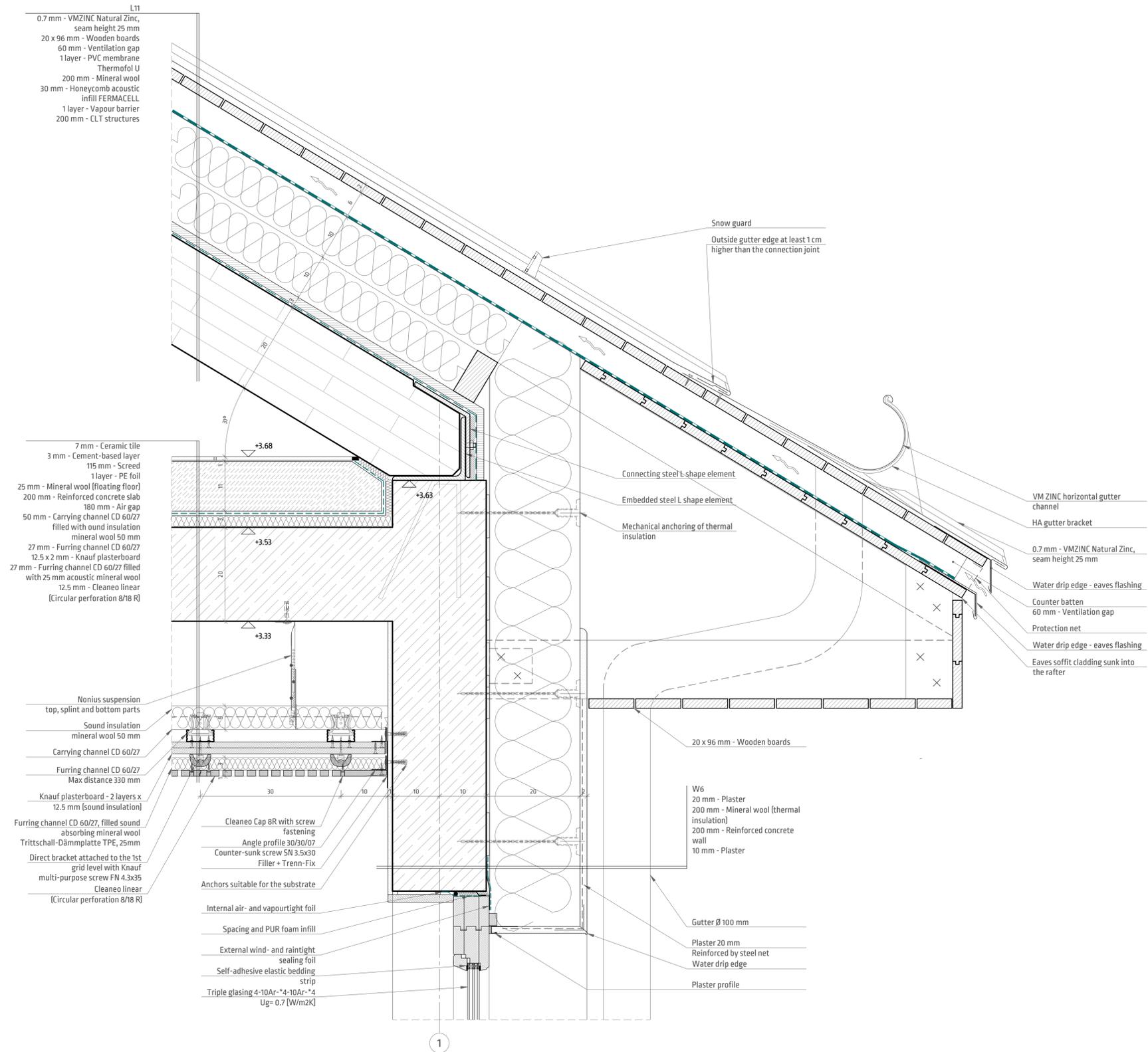
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Drawing FACADE20

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Student: Karina Kasatkina



1:5

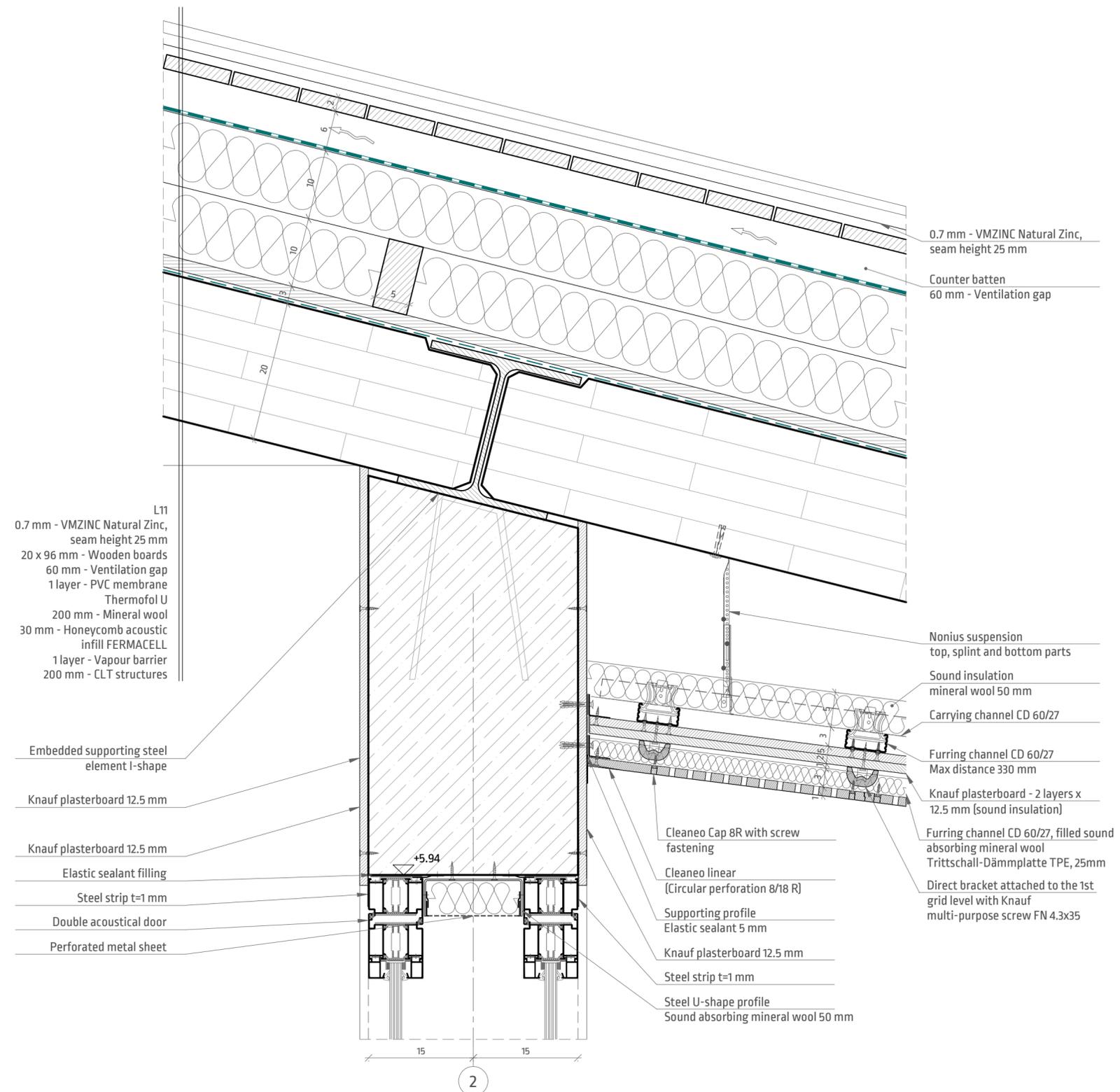
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Drawing DETAIL D1

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ELEVATE
 SCHOOL
 OF MUSIC

Student: Karina Kasatkina



1:5

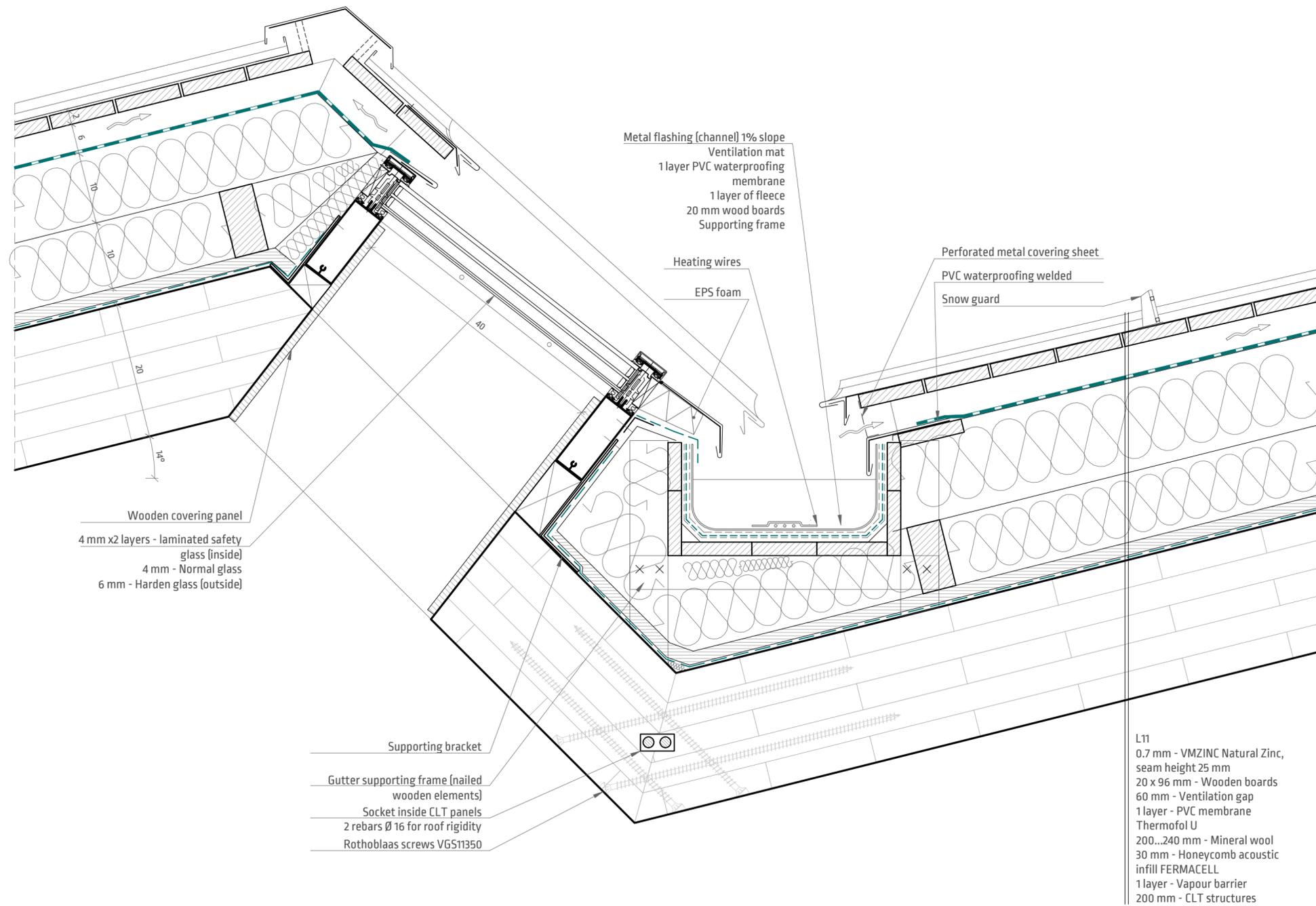
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Drawing DETAIL D3

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ELEVATE
 SCHOOL
 OF MUSIC

Student: Karina Kasatkina



1:5

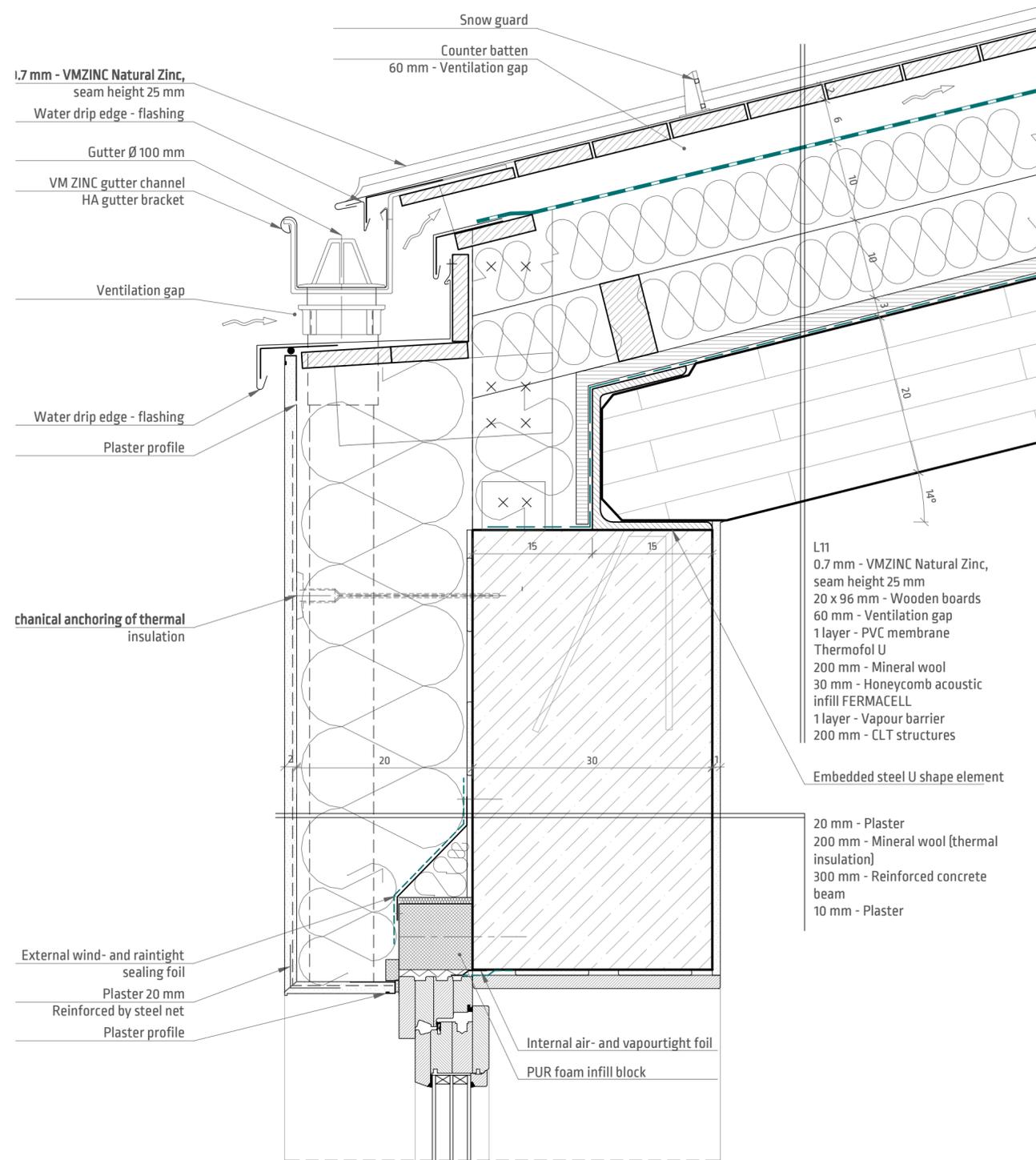
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Drawing DETAILD4

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 Department of Urban Planning and Design
 Diploma Project



Student: Karina Kasatkina



1:5

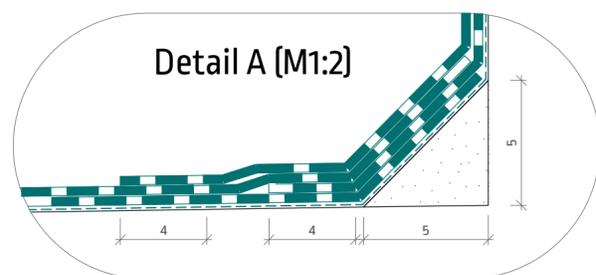
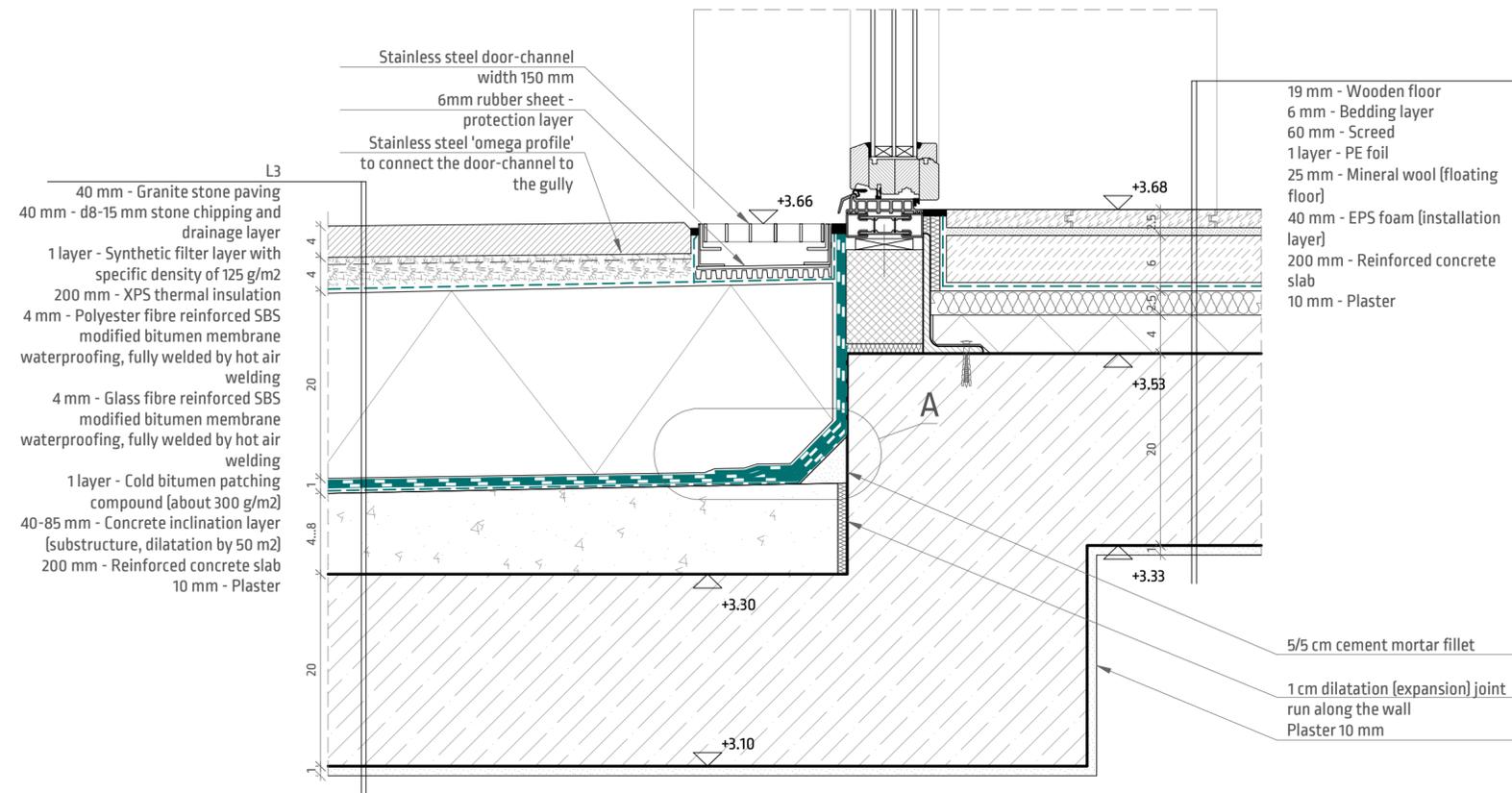
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Drawing DETAIL D5

Budapest University of Technology and Economics
 Department of Urban Planning and Design
 Diploma Project

ELEVATE
 SCHOOL
 OF MUSIC

Student: Karina Kasatkina



1:5

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Drawing DETAILD6

Budapest University of Technology and Economics
Department of Urban Planning and Design
Diploma Project

ELEVATE
SCHOOL
OF MUSIC

Student: Karina Kasatkina