School of tomorrow – Gaziantep

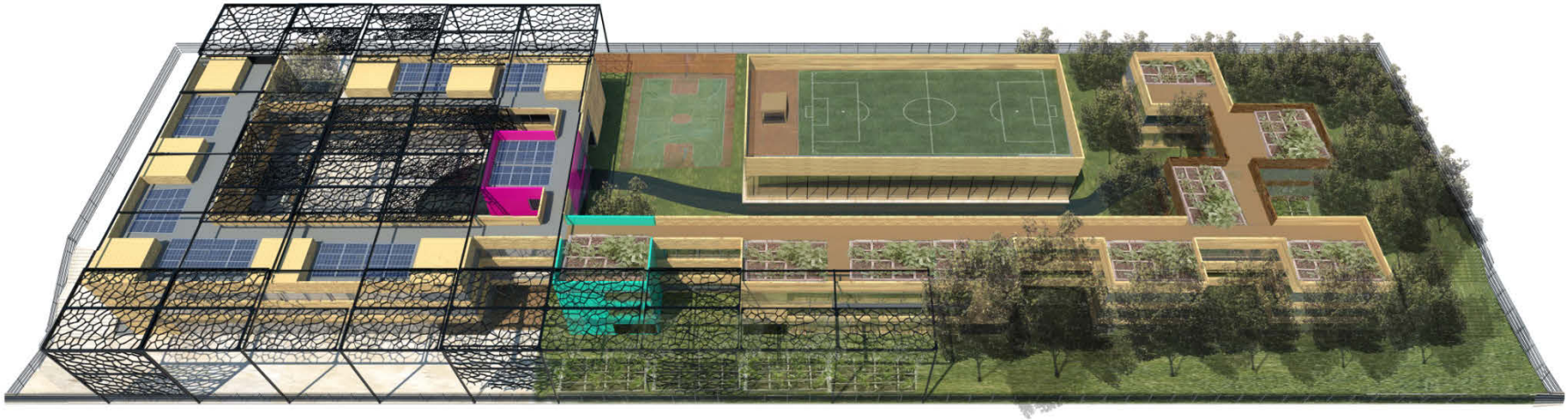
Isover Multi-Comfort house contest 2014, Czech Republic 1. Prize, Zuzana Zelingerová, Marek Novák

The Faculty of Architecture CTU Prague, doc. Ing. arch. Petr Suske, CSc.


1 pavement
2 organic garden
3 area for sport
4 water
5 organic garden on the roof
6 economic part of the roof with solar panels
7 area for sport on the roof
8 natural ventilation - MALQAF
950
950
935

1.level: the land

-recreation and sport

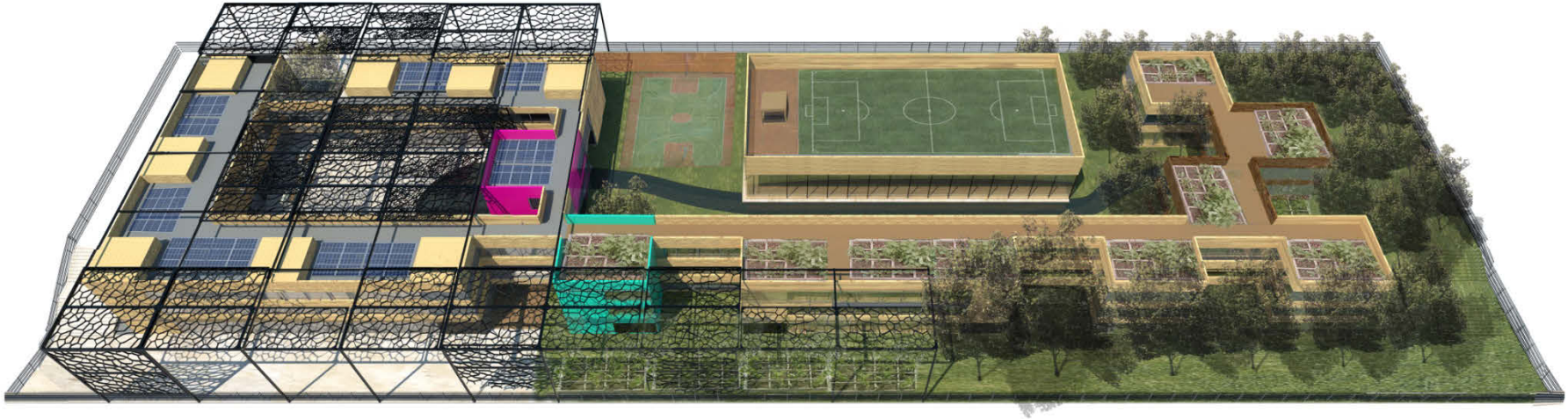


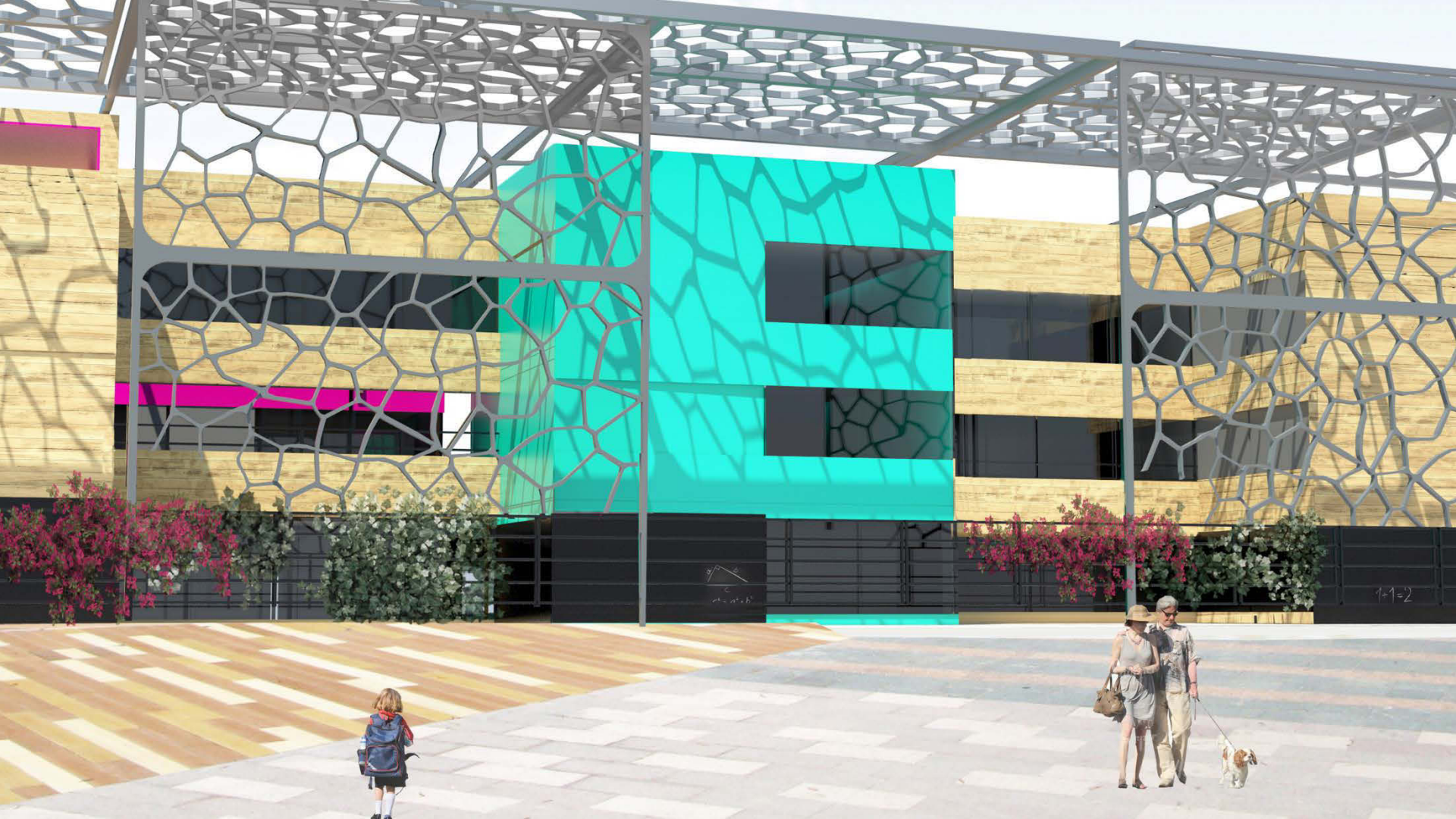
2.level: the building

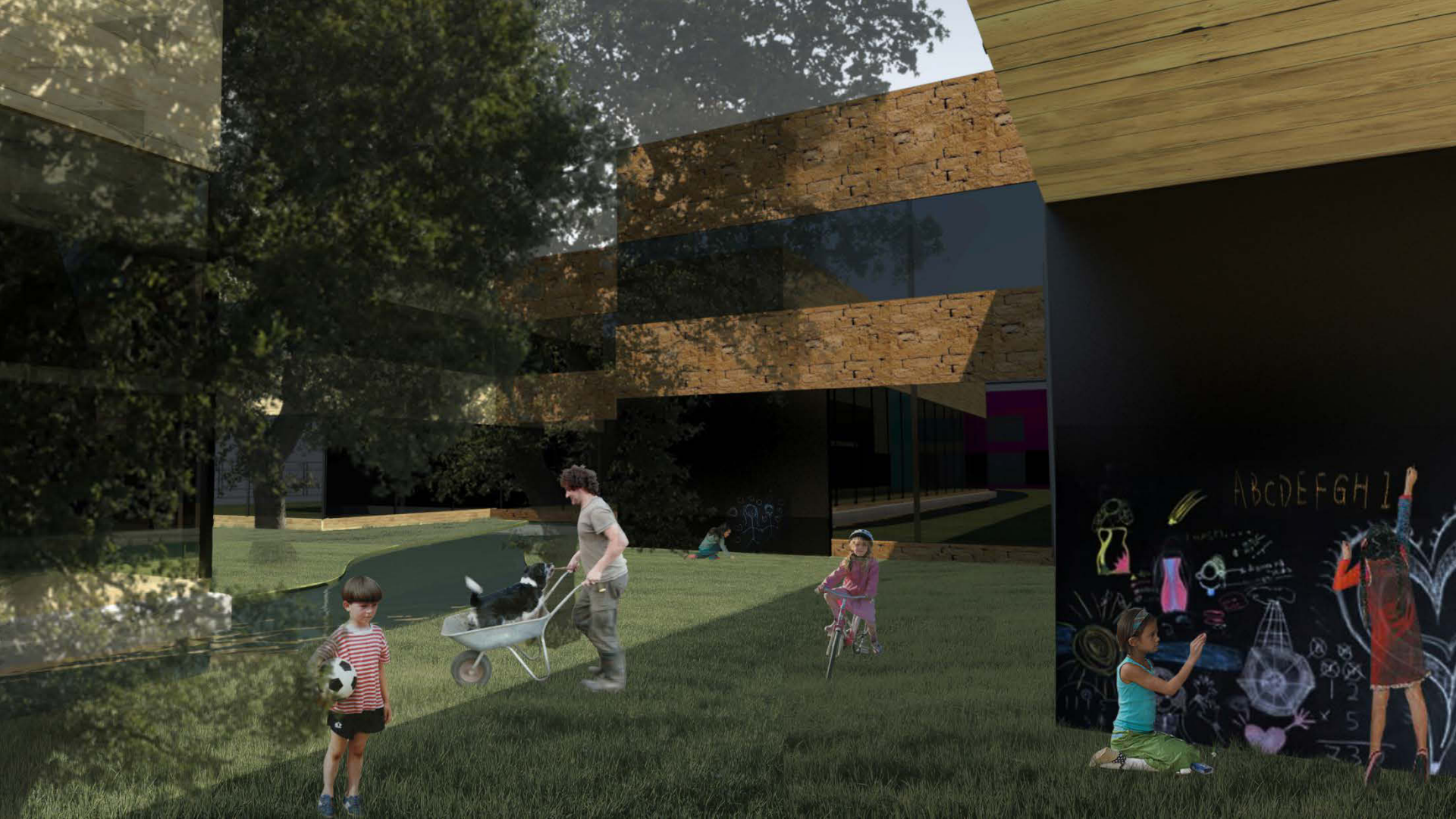
- studying
- the building as an education tool

1.level: the land

-recreation and sport




1+1=2


ABCDEFGH I


$c^2 = a^2 + b^2$
2+2=4

3.level: the roof

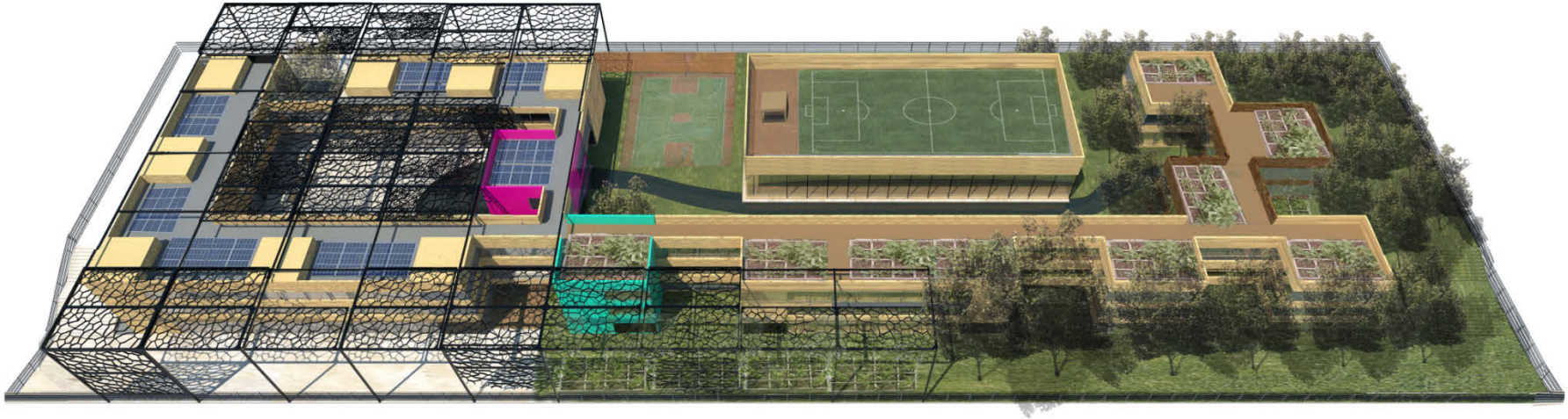
- agricultural and technological

2.level: the building

- studying
- the building as an education tool

1.level: the land

-recreation and sport



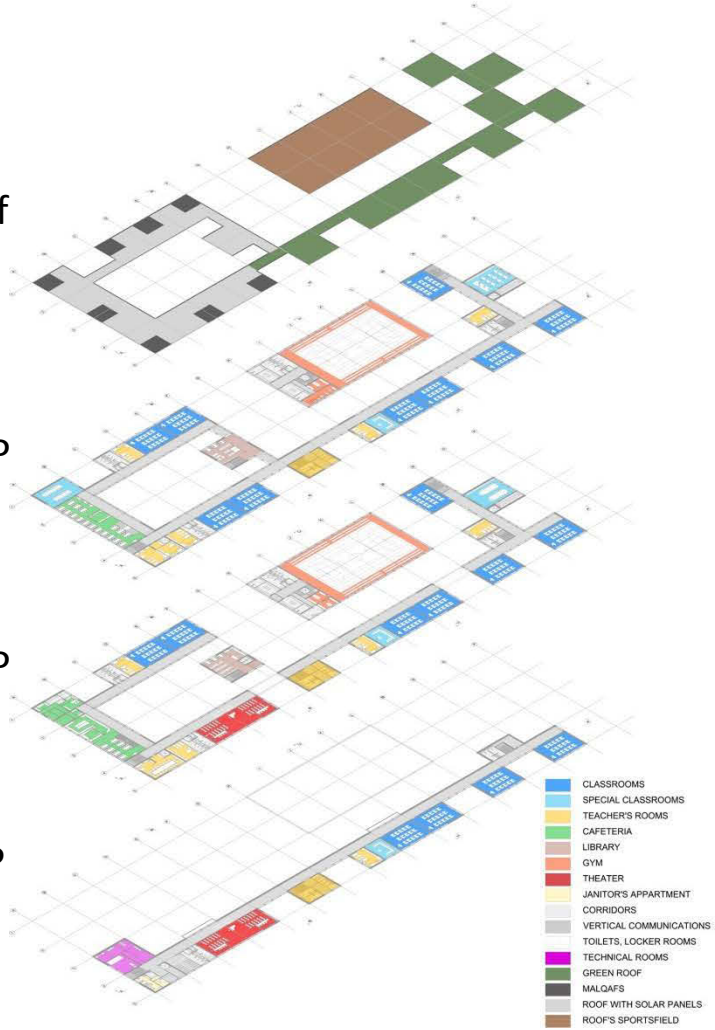
Plans

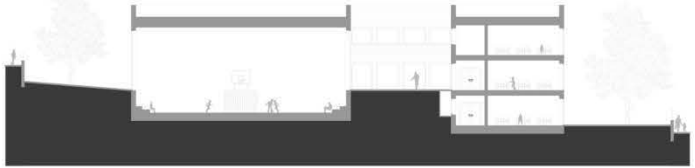
Roof

2.NP

1.NP

1.PP

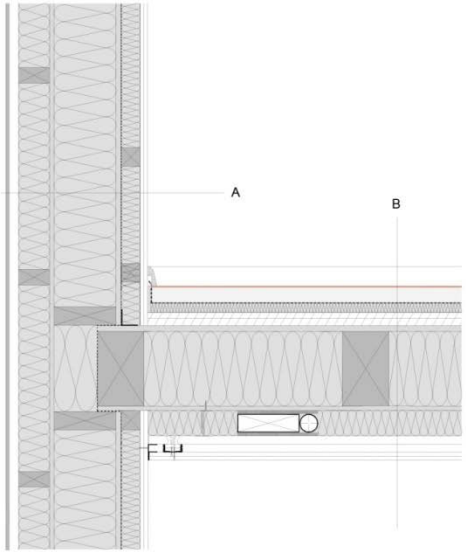




Construction, materials

- Ecological materials
- Wooden load-bearing construction
- Wooden cladding (except two cubes with fundermax panels and two with adobe bricks)
- Interior material Rigips plasterboard

Wood beam with RVF External wall, intermediate ceiling



Build-up A in cm

2,5	Rigips Rigidur H double layer, each layer 12.5mm
6,0	ISOVER Integra UKF 1-032 (wood 6/6 e=40cm, 13% wp) ISOVER VARIO KM Duplex UV
1,5	OSB board or chipboard
20,0	ISOVER Integra ZKF 1-032 (wood 6/16 e=62.5cm, 14%wp)
1,5	OSB board or chipboard
10,0	Kontur FSP 1-032 Easy Fix 120 (wood 6/12 e=60cm, 12%wp)
3,0	Rear ventilation
1,0	Exterior cladding (e.g. wood, metal, plastic, stone)

Build-up B in cm

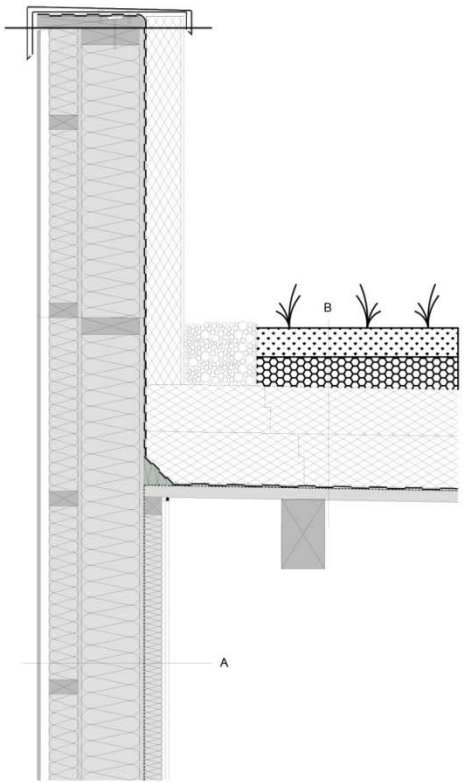
0,5	Floor covering
5,0	Screed
3,0	ISOVER Akustic EP 3 040
4,0	ISOVER Exporit EPS 100/035 as compensation for height of tube
1,9	OSB board or chipboard
24,0	ISOVER Integra ZKF 1-032 (solid wood beams 10/16, e=80cm, 11% wp)
1,5	OSB board or chipboard
8,0	Installation level with ISOVER Akustik TP 1 (glass wool, WLG 040)
2,7	Rigips Ceiling profile CD 60/27 as basic profile
2,7	Rigips Ceiling profile CD 60/27 as supporting profile
2,5	Rigips Rigidur H double layer, each layer 12.5 mm

Construction

- Gravel spreading / green roof for organic garden
- Gym‘s roof designed to have glued beams
- Ceiling based on beam system on shorter span
- Floor clayer spatula (easy and cheap maintenance), carpets in teacher rooms, tiles in toilets

  - Outer walls U = 0,11 W/m²K
  - Roof U = 0,12 W/m²K
  - Slab U = 0,10 W/m²K
  - Windows U = 0,70 W/m²K
  - No thermal bridges
  - Very good airtightness

Inverted roof with pebbles (UD) Eaves



Build-up A in cm

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1,5	OSB board or chipboard
10,0	Kontur FSP 1-032 Easy Fix 120 (wood 6/12 e=60cm, 12%wp)
3,0	Rear ventilation
1,0	Exterior cladding (e.g. wood, metal, plastic, stone)

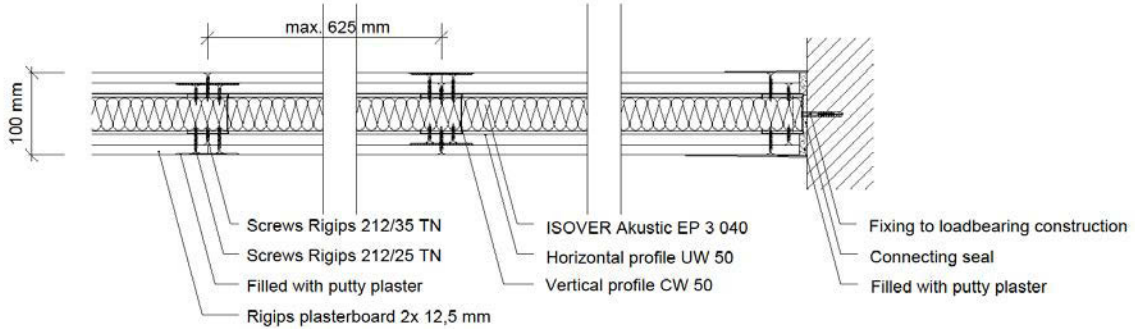
Build-up B in cm

8,0	Pebbles
	ISOVER AquaDefense
14,0	Styrodur CS
16,0	Styrodur CS
0,8	Double layer roof and sealing sheeting, bonded or scorched
4,0	Tongue and groove panelling at inclination

Acoustics

- Classes separated by load-bearing waalls, exceeding 58
- db (63db) sound redection
- Partitions at toilets 51 db
- Transparent structures 45 db (one of the most effective, high value/cost ratio)
- Landscaping + fence prevent the spread of noise from street
- Acoustic barrier enhanced by offseting and afforestation

Rigips partition wall - double sheating M 1:10



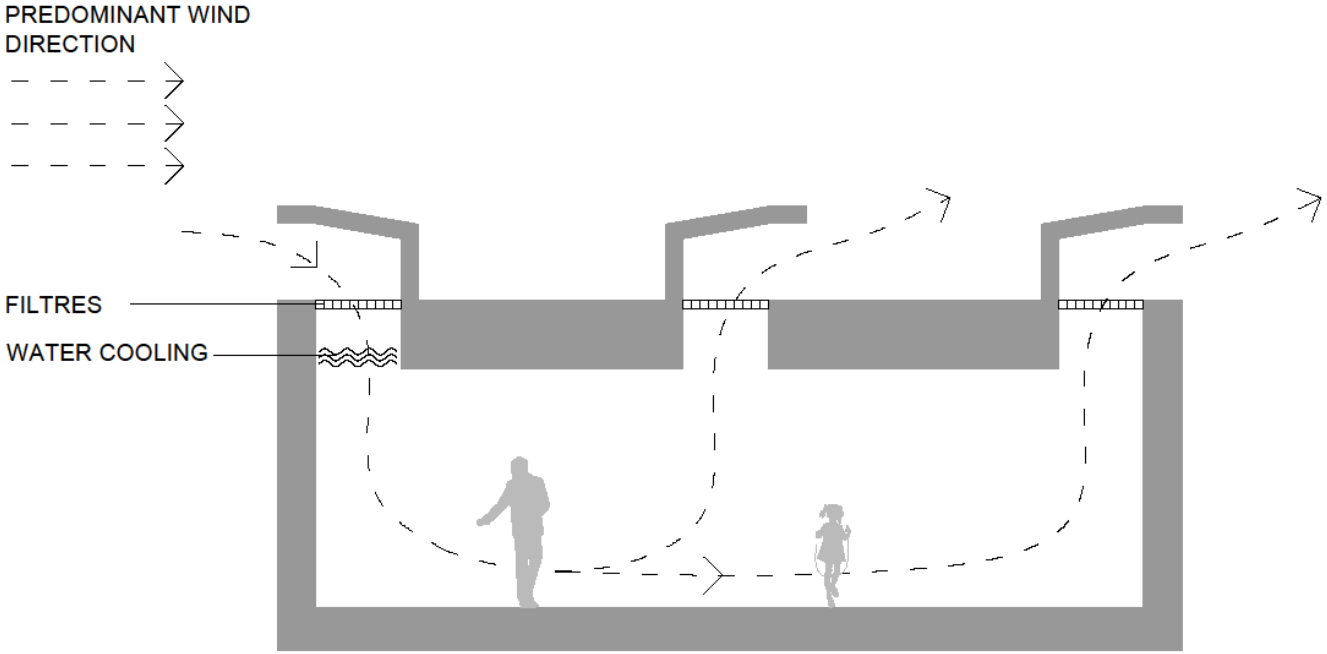
Fire protection and safety

- All structures meet fire resistance REI 60
- Evacuation time less than 5 minutes
- Many exits, possibility to escape at least 2 directions
- Escape routes at least 1100mm (2 fire bars)
- Escape routes less than 50 meters to free space
- Fire signalization (alarms and indication)
- Instalation of sprinklers possible

Ventilation, CO_2

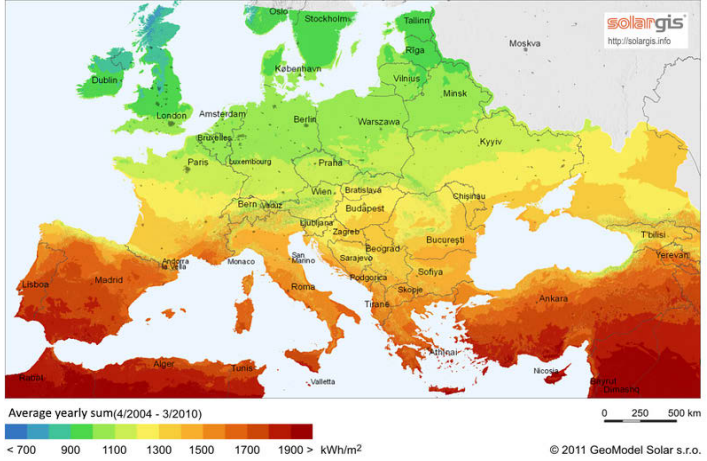
- Manually through big openable transparent areas

- Malqaf system
  exchange of air
  cooling
  ecological
  maintenance free

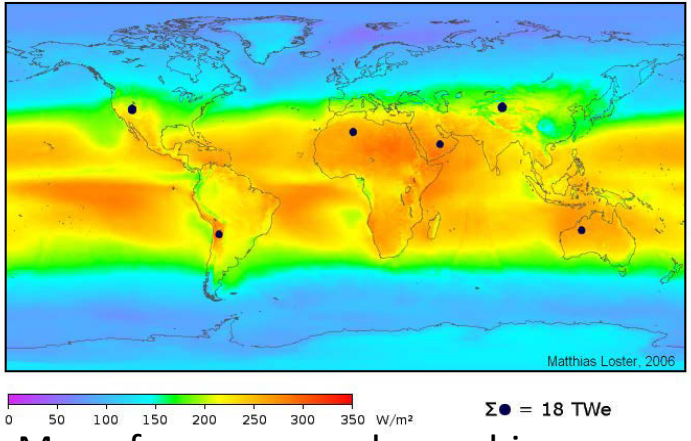


Energy, heating

- Solar colectors
- Solar panels (a lot of sun)
- Inside radiators and convectors



Map of average yearly sum of solar gain (kWh/m2)

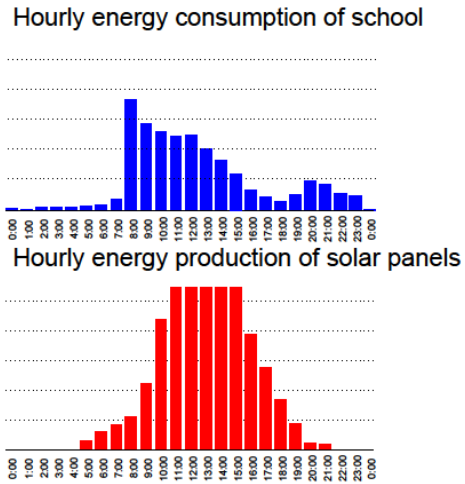


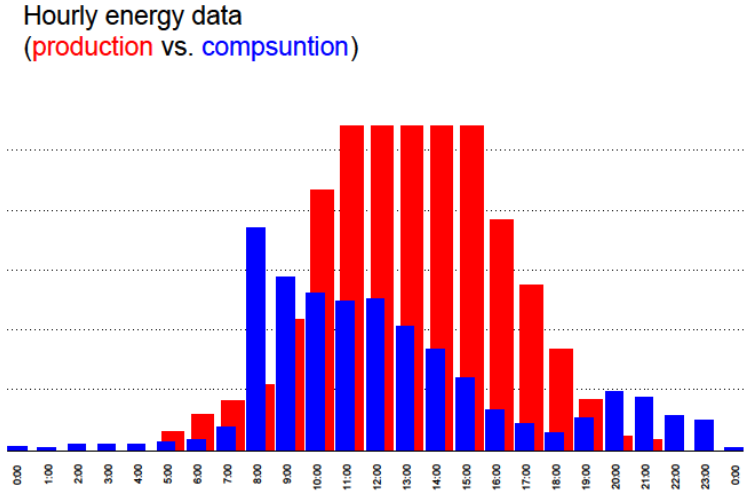
Map of average yearly sunshine

Solar energy

- Energy gain higher than consumption (self-sufficient + energy producing building)

- Energy gain either to reservoirs, electrical grids or energy for nearby buidlings



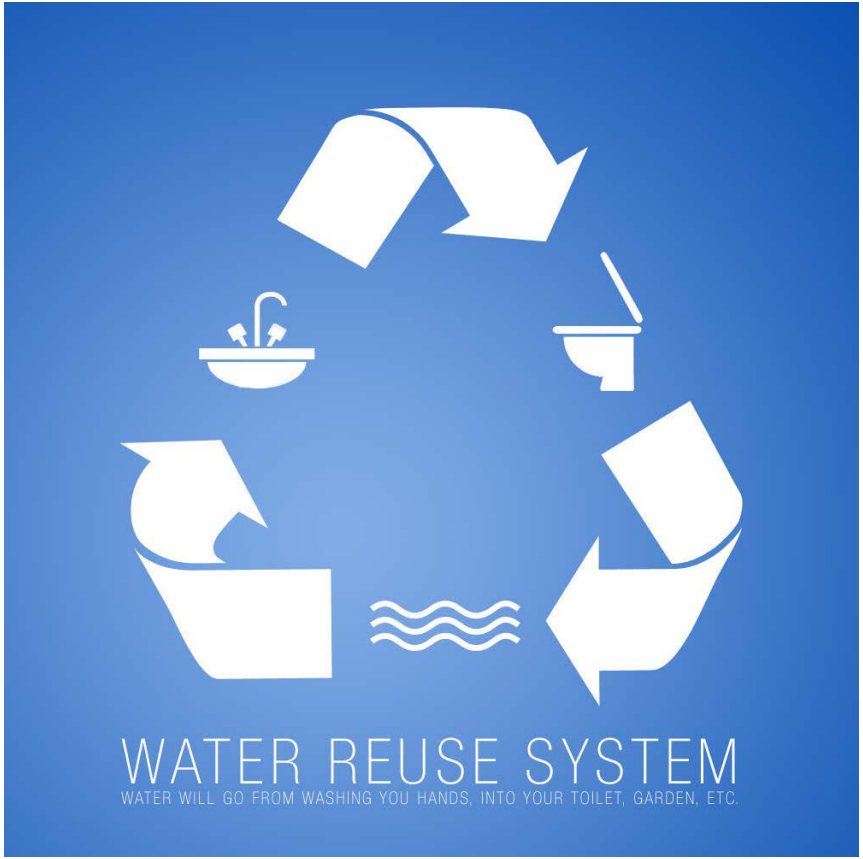


Water

- Water tank collecting water from the roof for irigation and flushing
  water demand lower by tens of percents

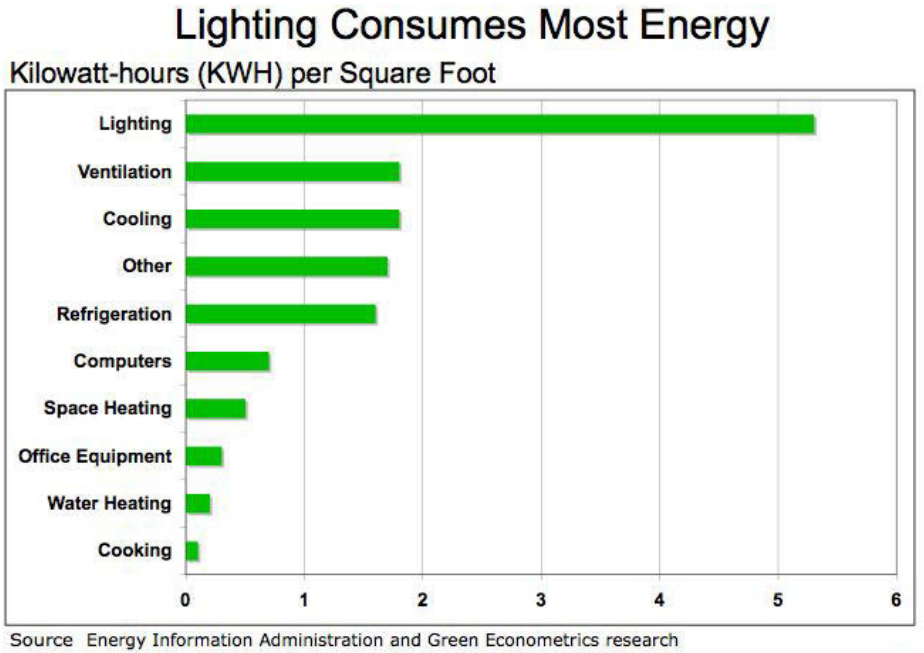
- Flow-through heaters in toilets and kitchens

- Main kitchen with water tank



Lighting

- Classes have at least 17% window/floor area ratio
- Depth of 6.7 meters
- Materials and colors with minimum light absorption
- Mostly east, south orientation (only 8% spaces towards north)
- Artificial lighting – LED-diods, sensors for lower costs
- If unwanted sun exposure or solar heat gain, shades pull-out
- Natural lighting access during working hours reaches 100%



According to the EIA. in commercial buildings, lighting fixtures consume the most electric energy, three times the energy consumption of air conditioning.

Calculation:

Dmin = 1,5 (3,0 recommended) , result D = 4,174

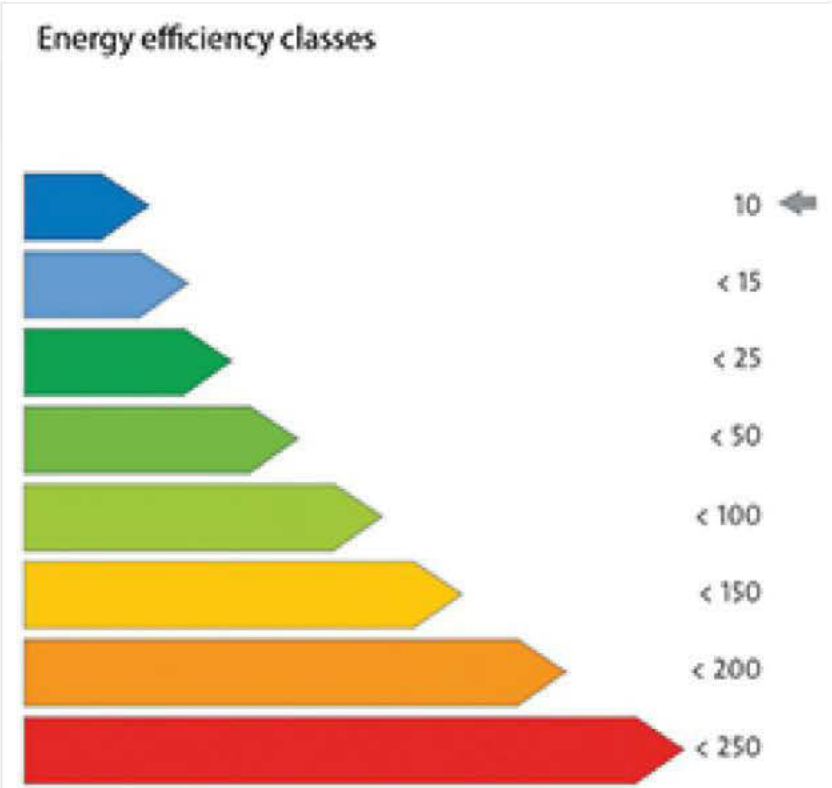
Average value of Dm = 5,0 met

If building in the south built, D = 3,883

Performance simulation

Calculations

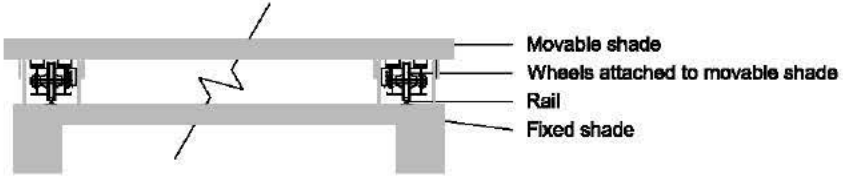
Transmission Heat Losses:	74909.31	kWh/a
Ventilation Heat Losses:	36298.54	kWh/a
Total Heat Losses:	111207.85	kWh/a
Internal Heat Gains:	48791.42	kWh/a
Available Solar Heat Gains:	46834.59	kWh/a
Total Heat Gains:	85053.12	kWh/a
Annual Heat Demand:	26154.73	kWh/a
Specific Annual Heat Demand:	4.43	kWh/(m²a)

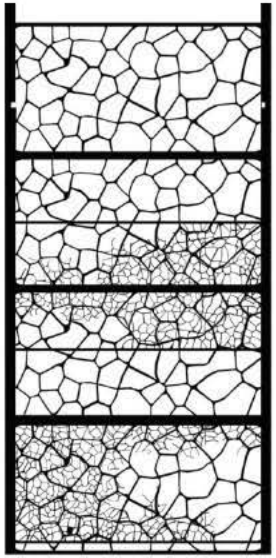


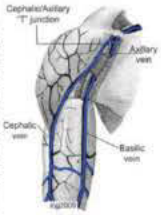
4.43 kWh/(m^2a) without solar panels, green roof, water re-use

0.00 kWh/(m^2a) with solar panels, green roof, water re-use

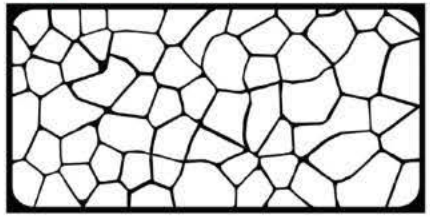
Shading system



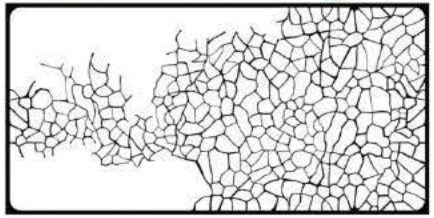




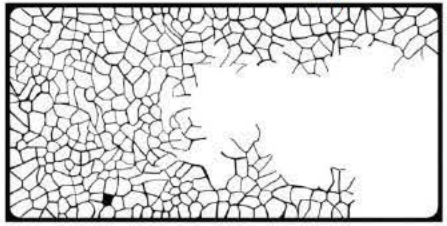
Fixed shade



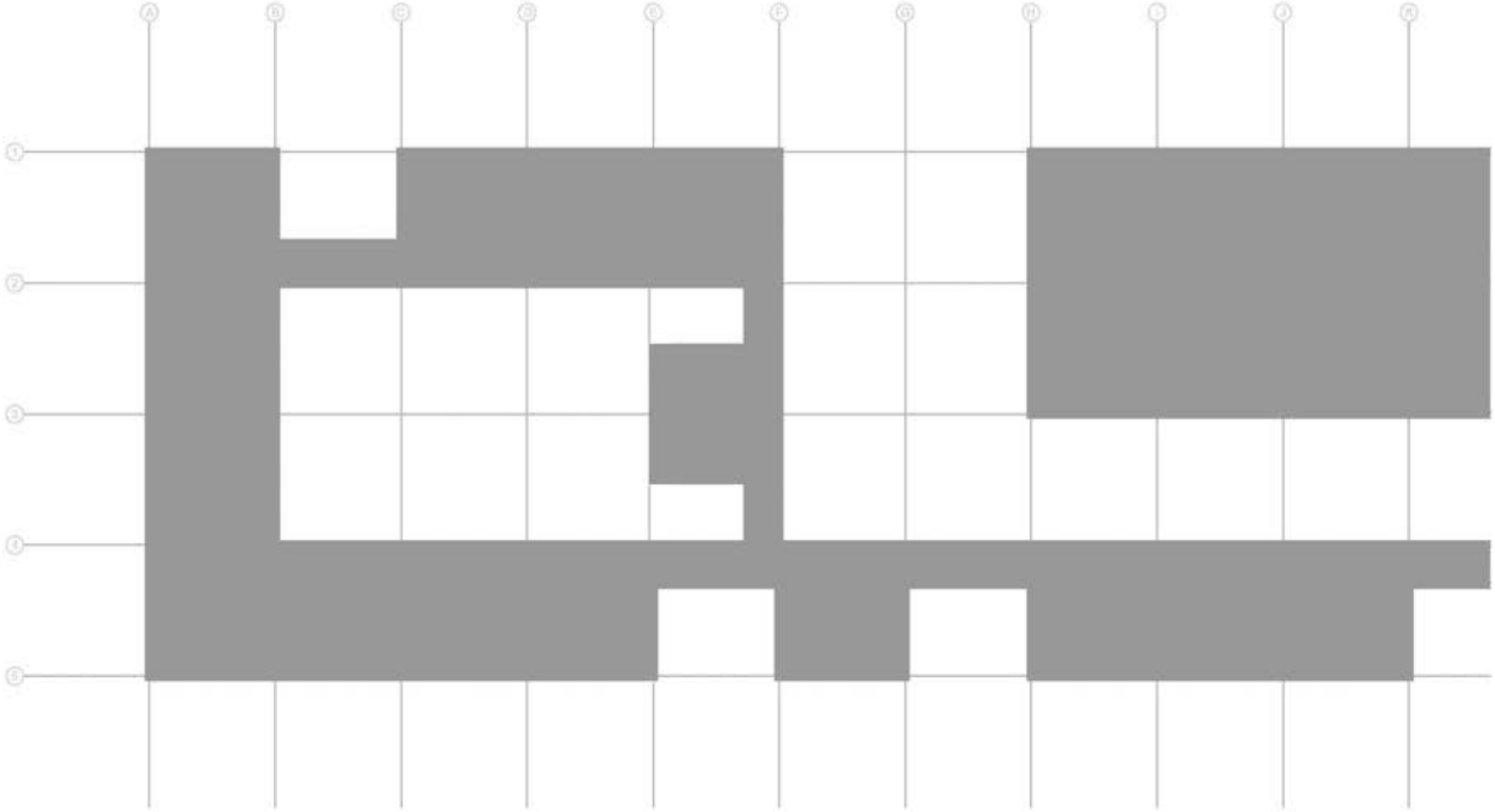
Movable shade type 1



Movable shade type 2

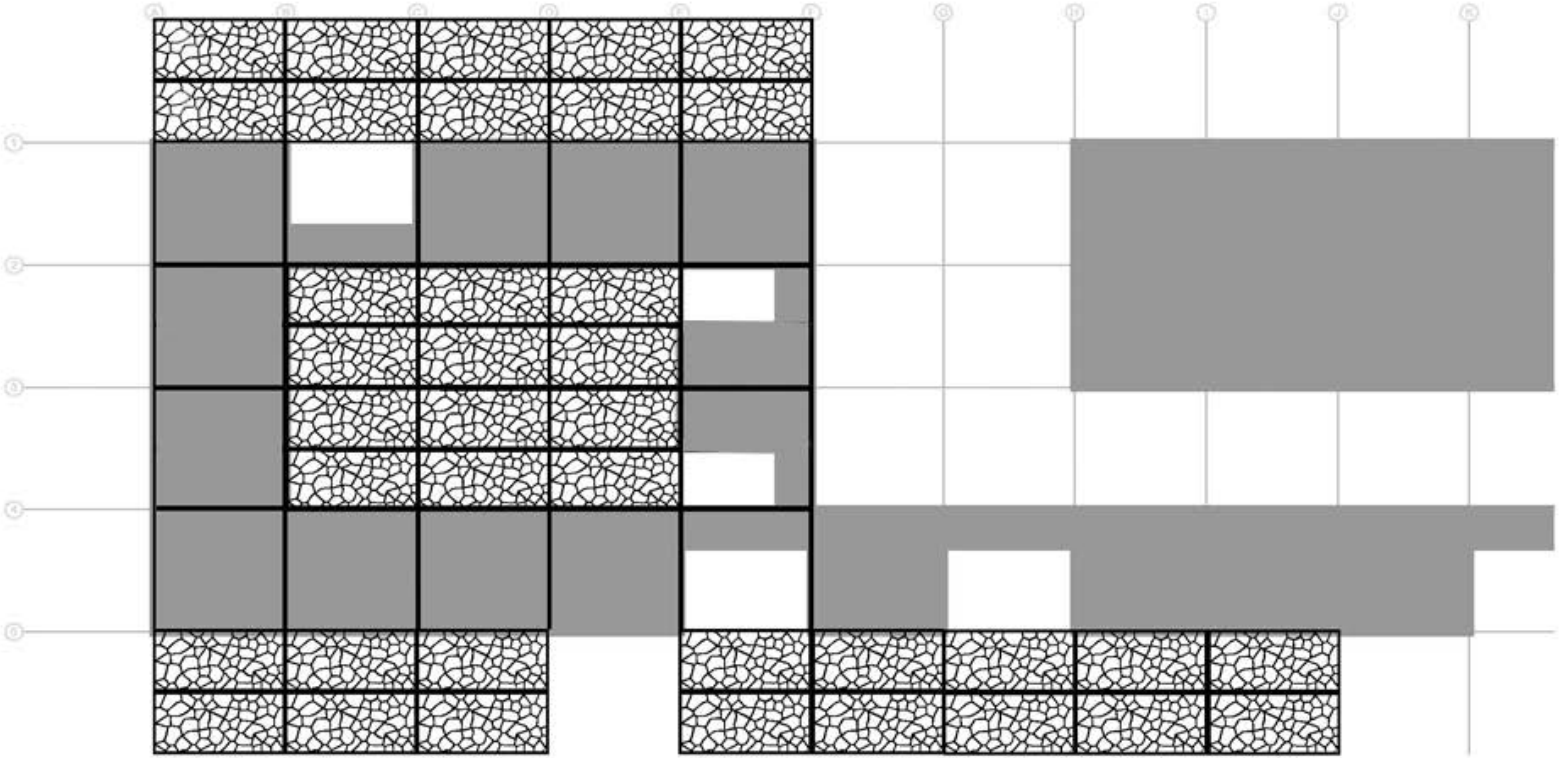


Shading system



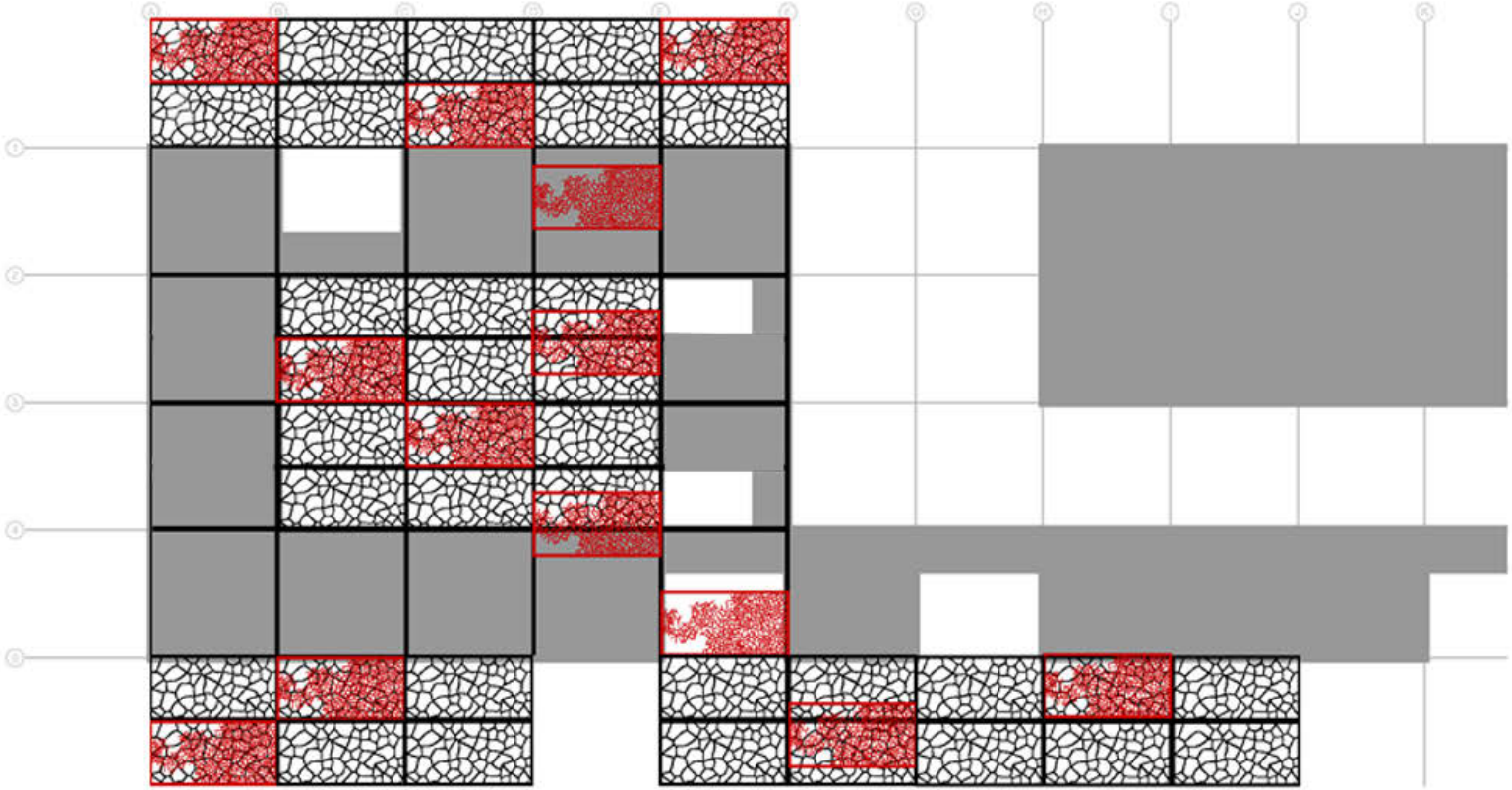
Shading system

- Fixed shade



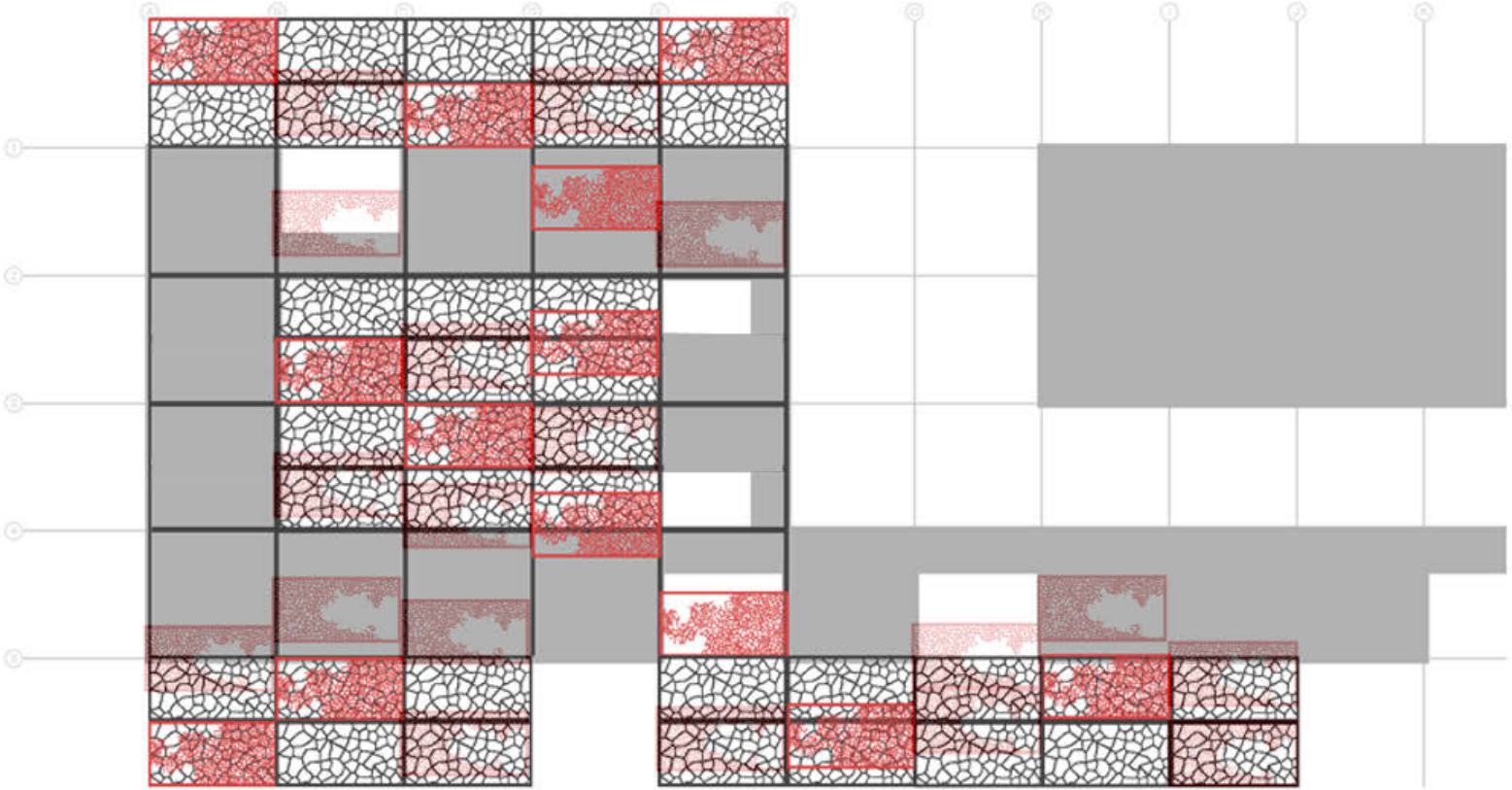
Shading system

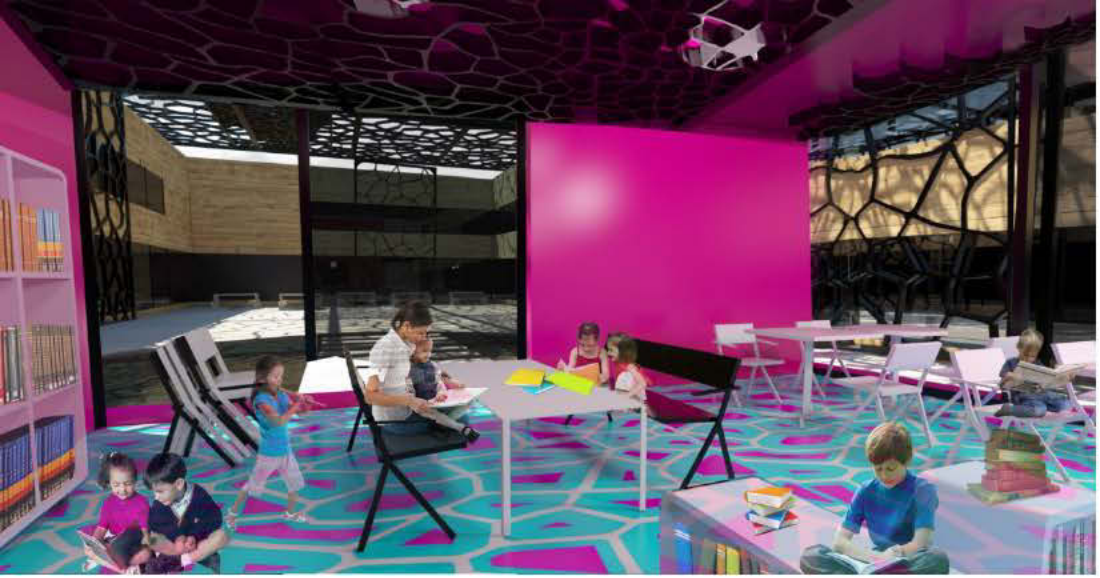
- Fixed shade - Movable shade

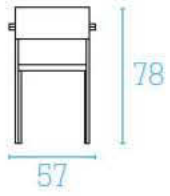


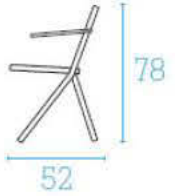
Shading system

- Fixed shade - Movable shade






78
57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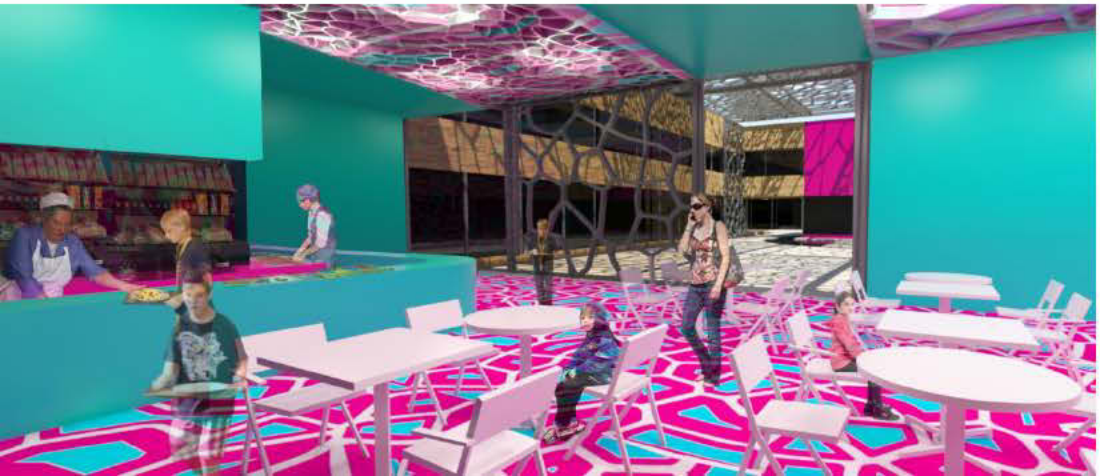
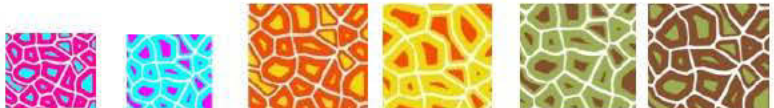



EDUCATION



Thank you for your attention