

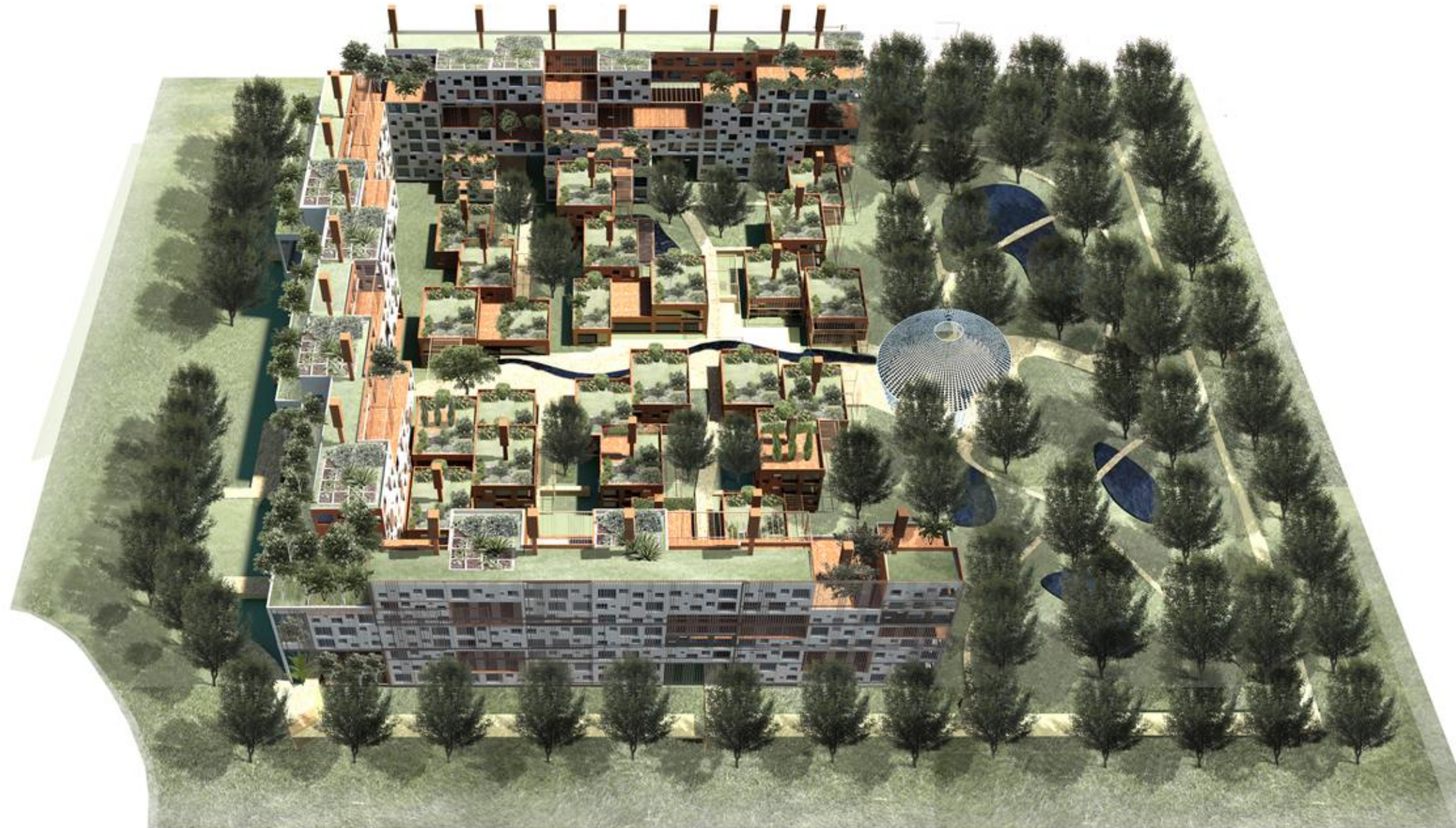
# ASTANA DREAM – HOT ´N´COLD

Isover Multi-Comfort house contest 2015, **Czech Republic 2. Prize**, **Zuzana Zelingerová, Barbora Medová, Jakub Med**  
The Faculty of Architecture CTU Prague, doc. Ing. arch. Petr Suske, CSc.



# EVERYDAY RECREATION AND RELAX

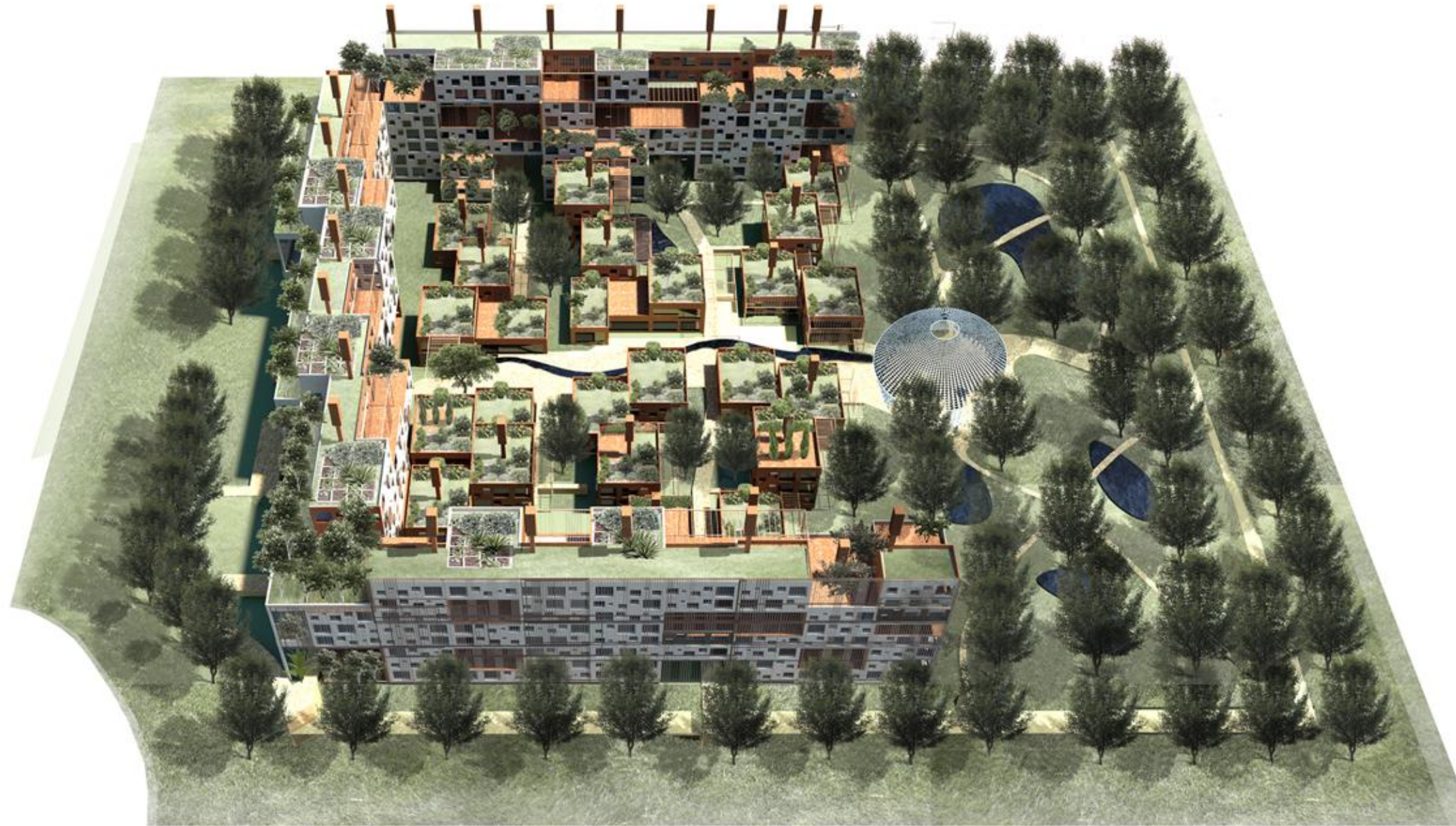
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LIVING

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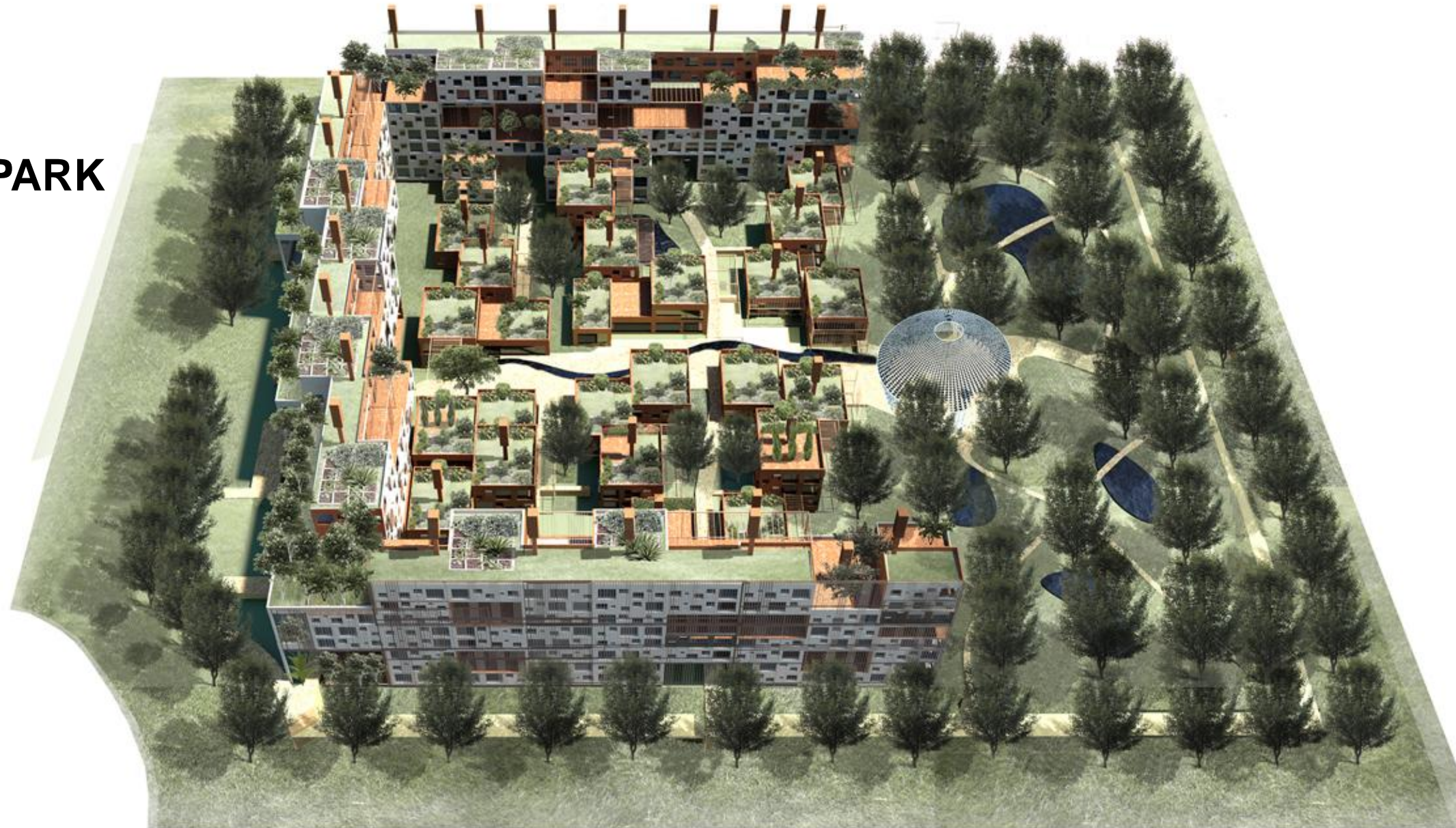


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# EUROPEAN TYPE APARTMENT

VERTICAL PARK

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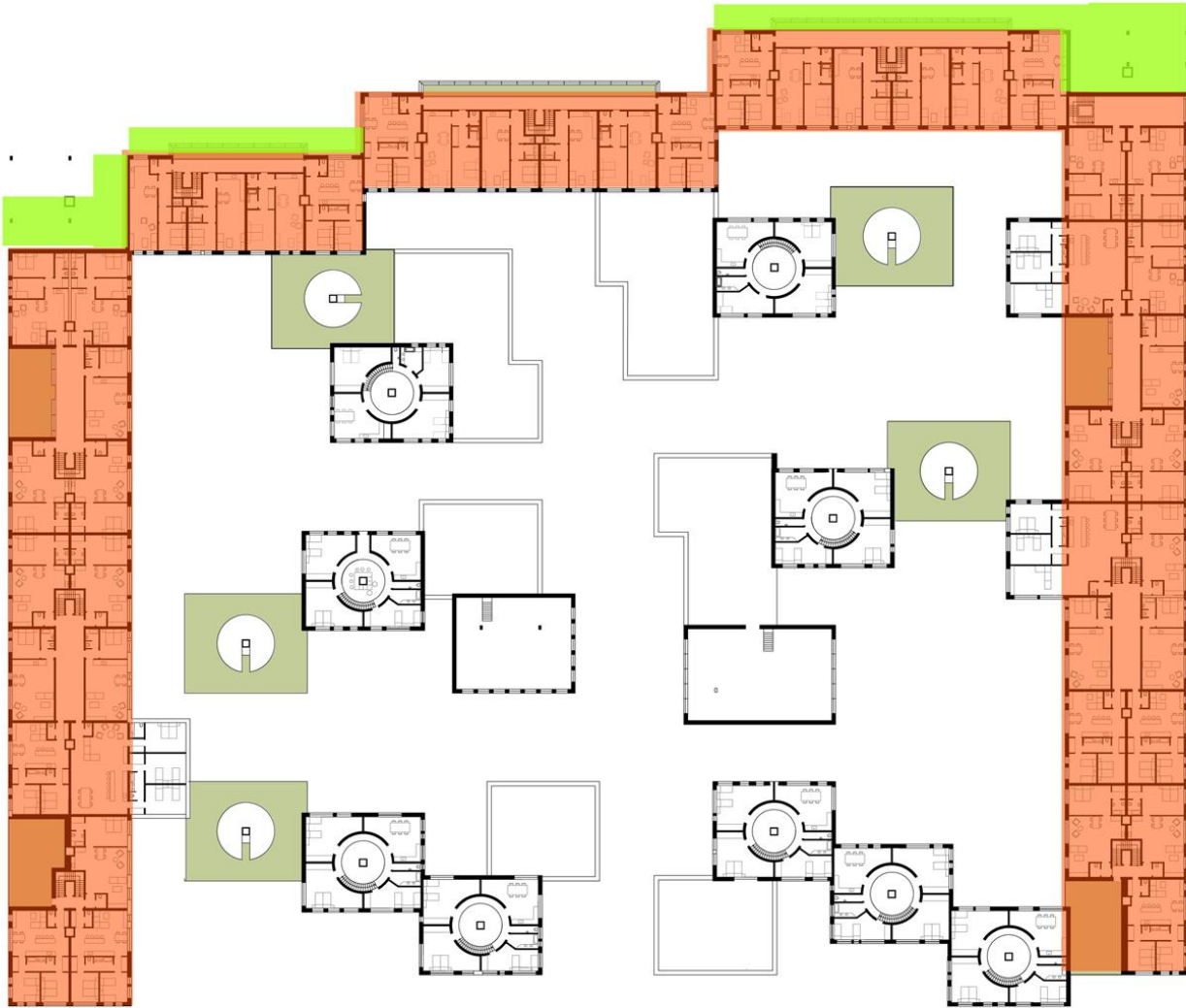
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PLANS – EUROPEAN TYPE APARTMENTS

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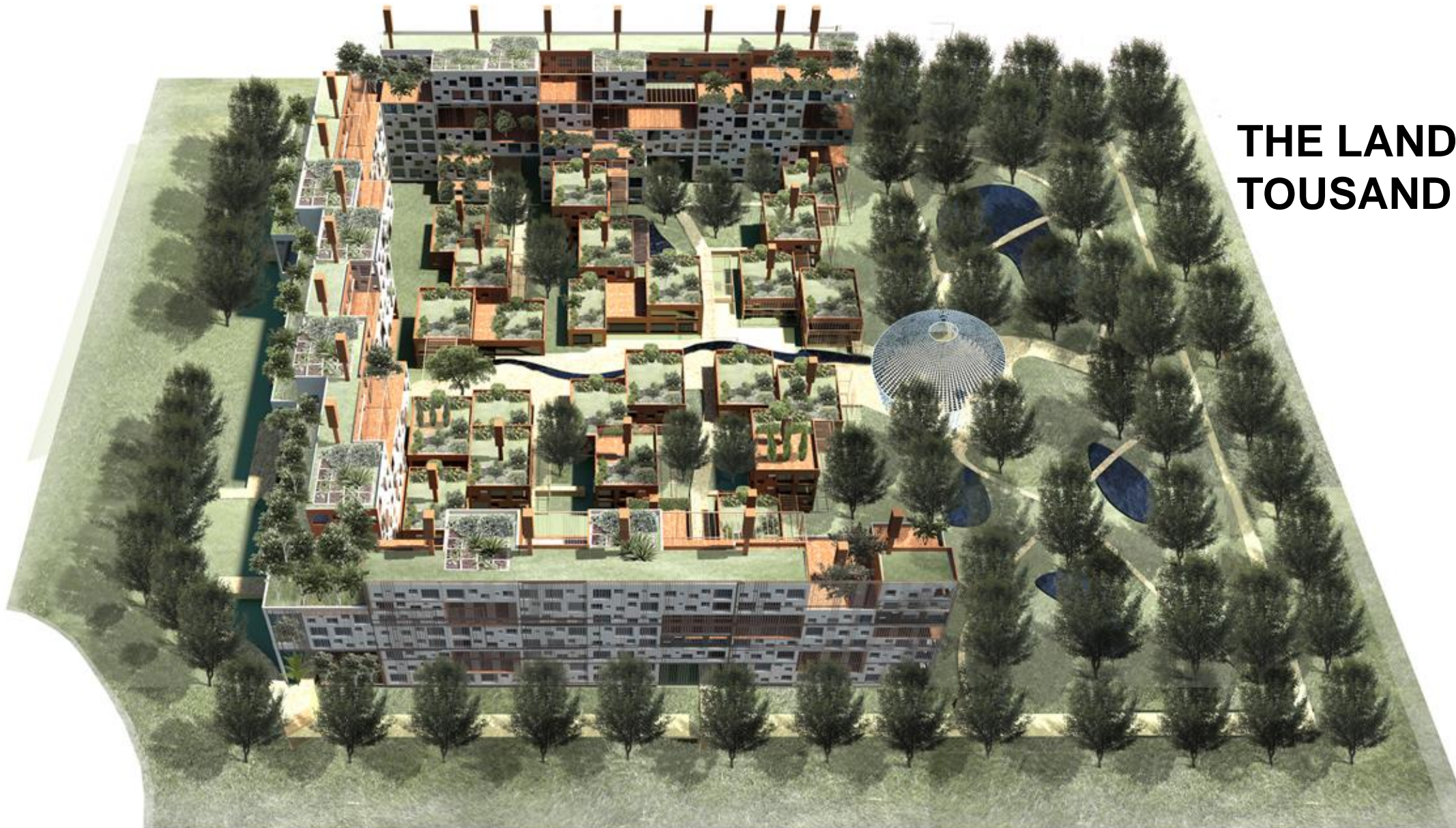


# KAZAKHSTAN TYPE APARTMENTS

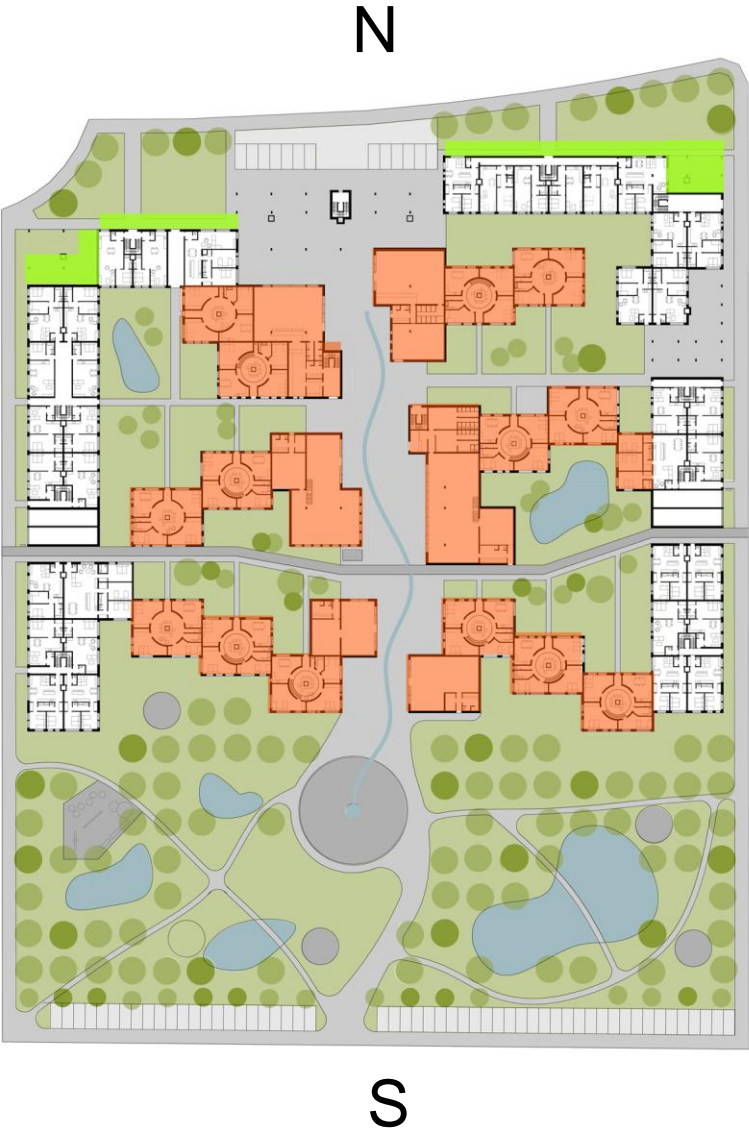
THE LAND OF  
TOUSAND LAKES

N

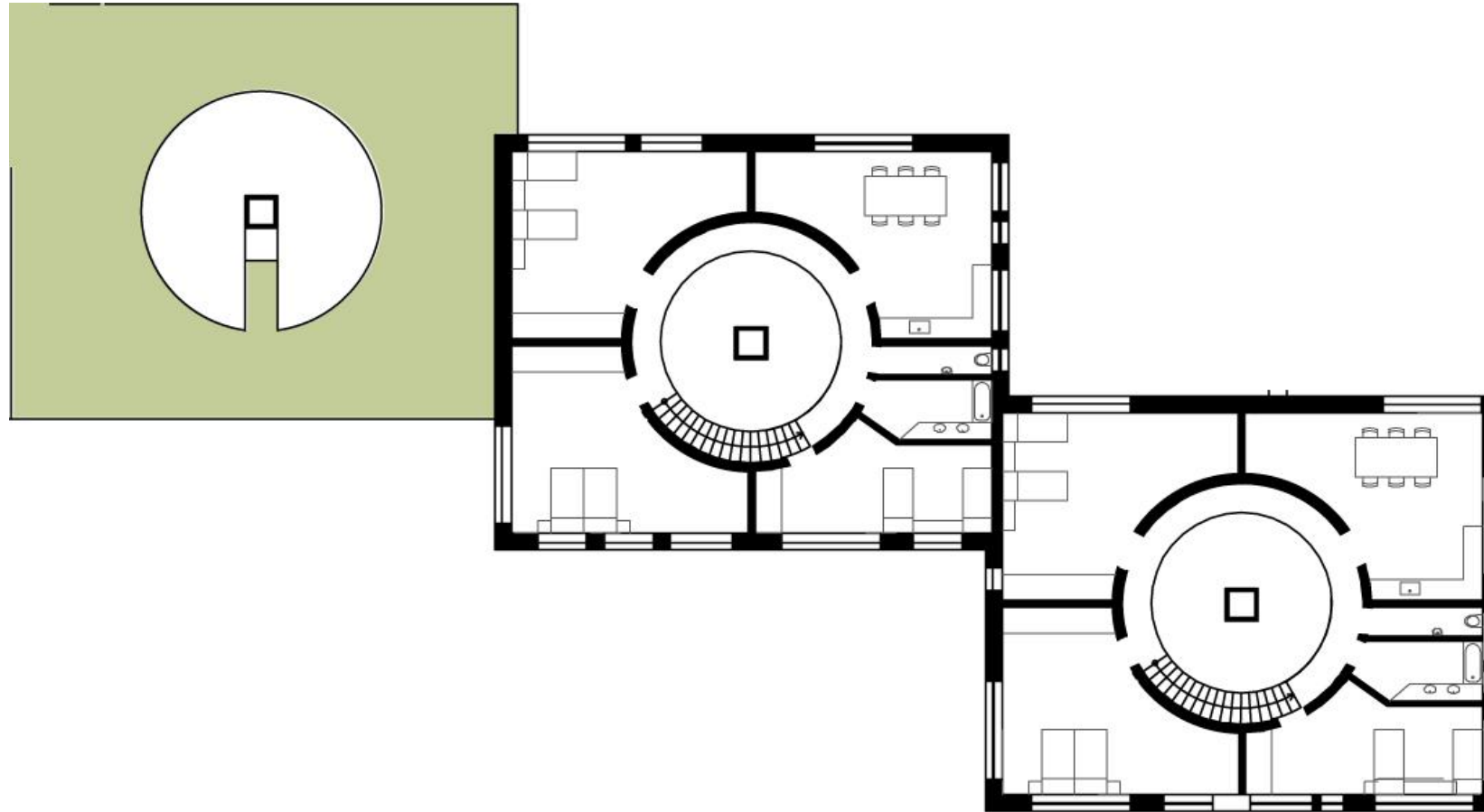
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PLANS – KAZAKHSTAN TYPE APARTMENTS



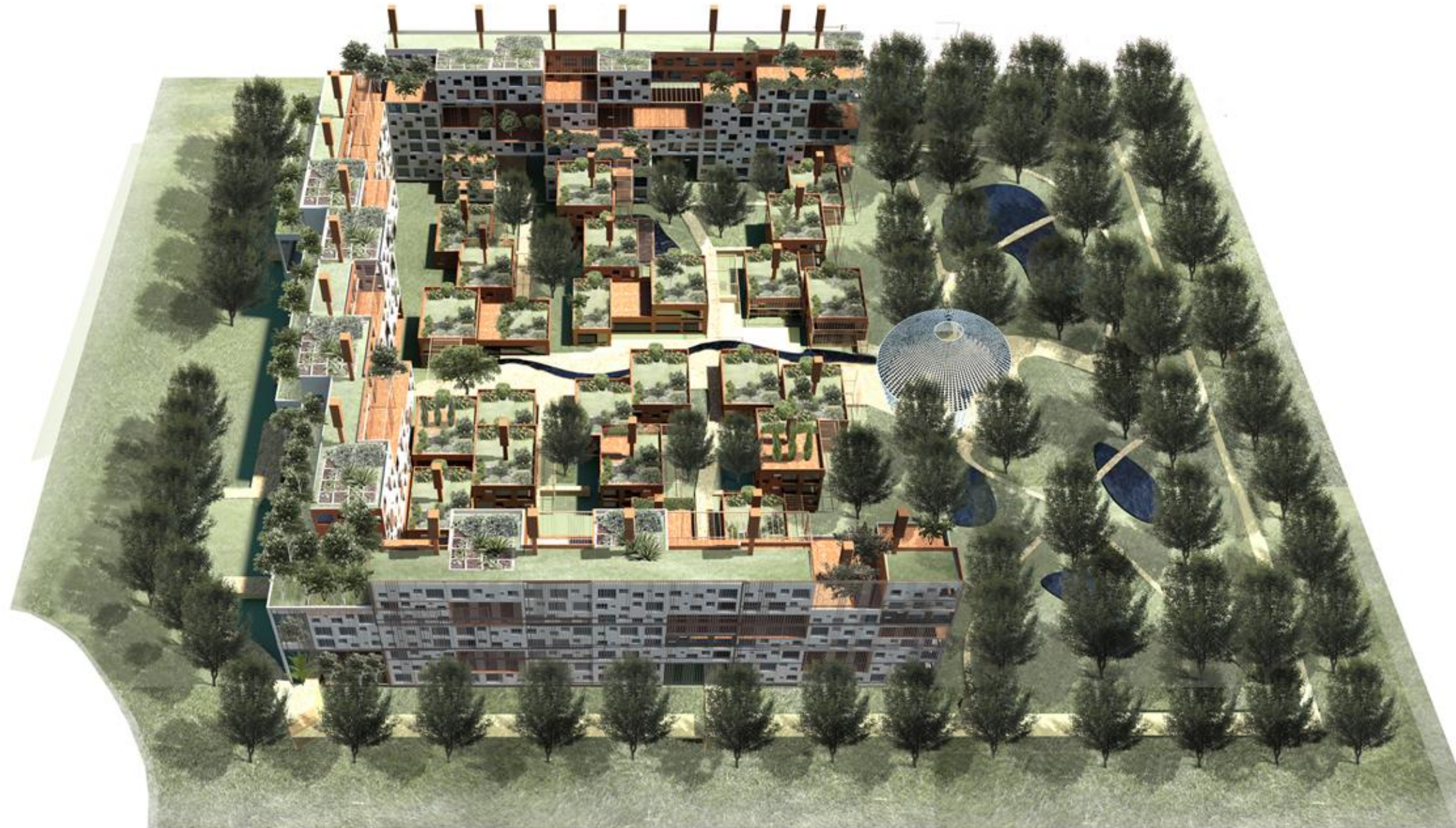
## PLANS – KAZAKHSTAN TYPE APARTMENTS





# SHOPPING STREET „MEDINA“

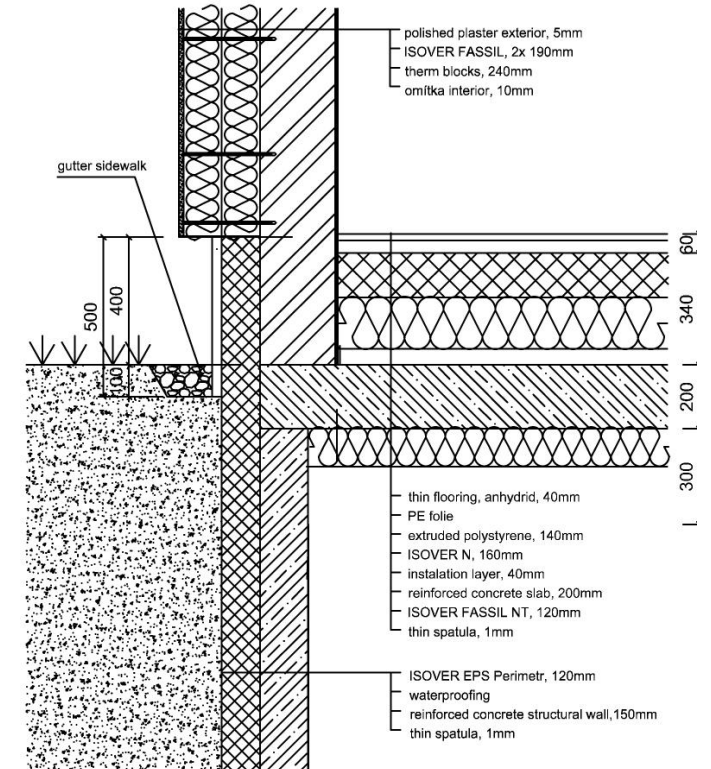
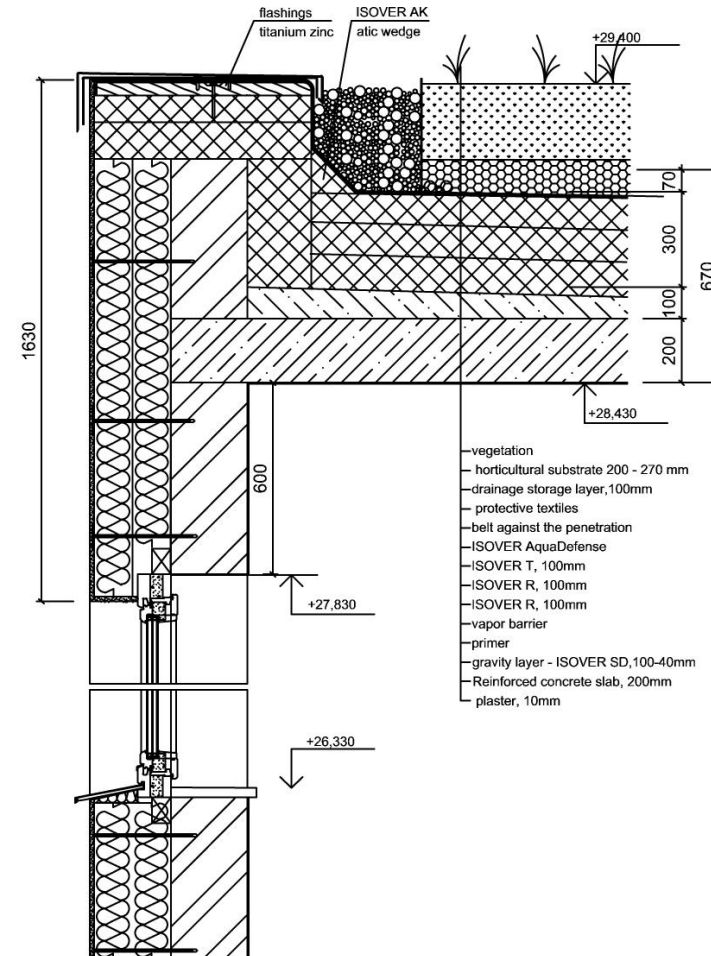
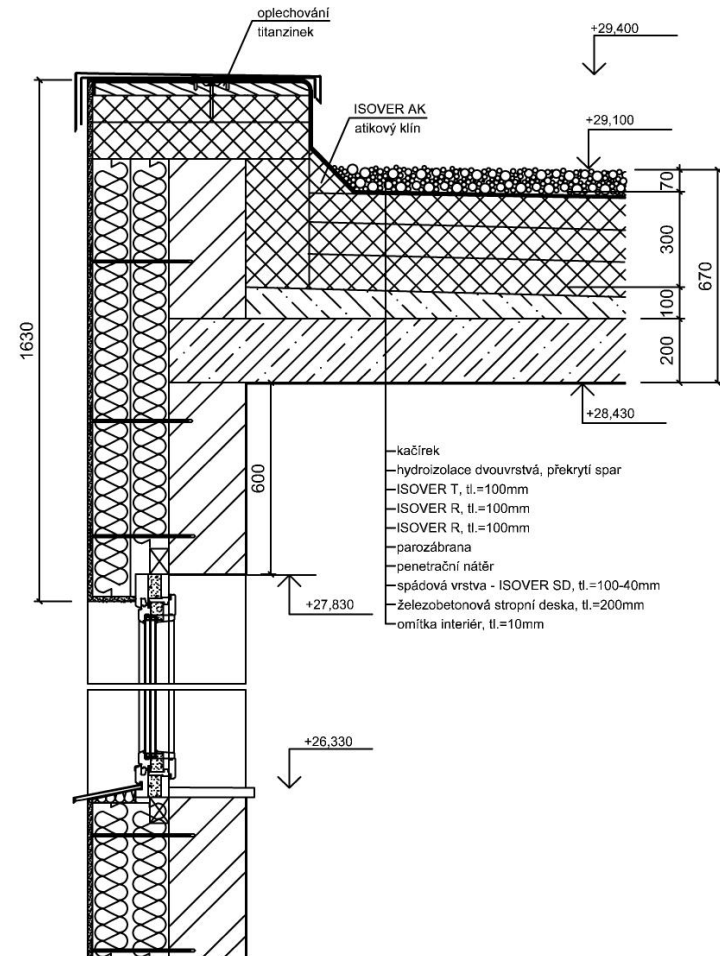
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# CONSTRUCTION

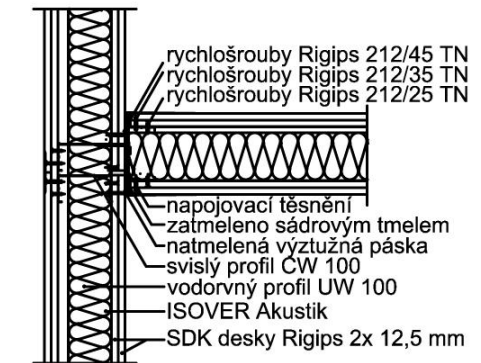
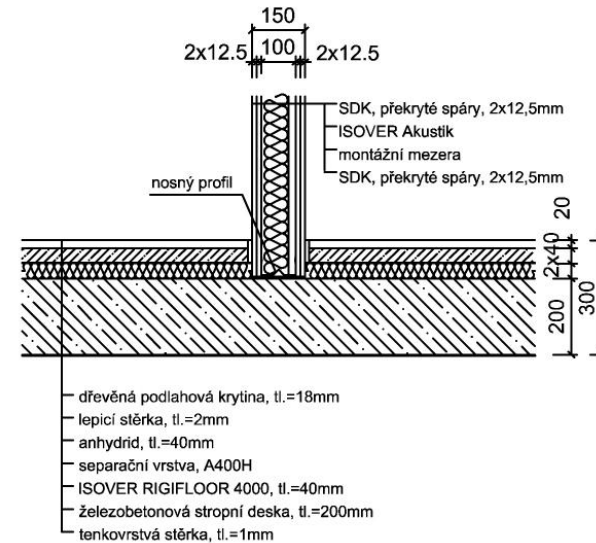
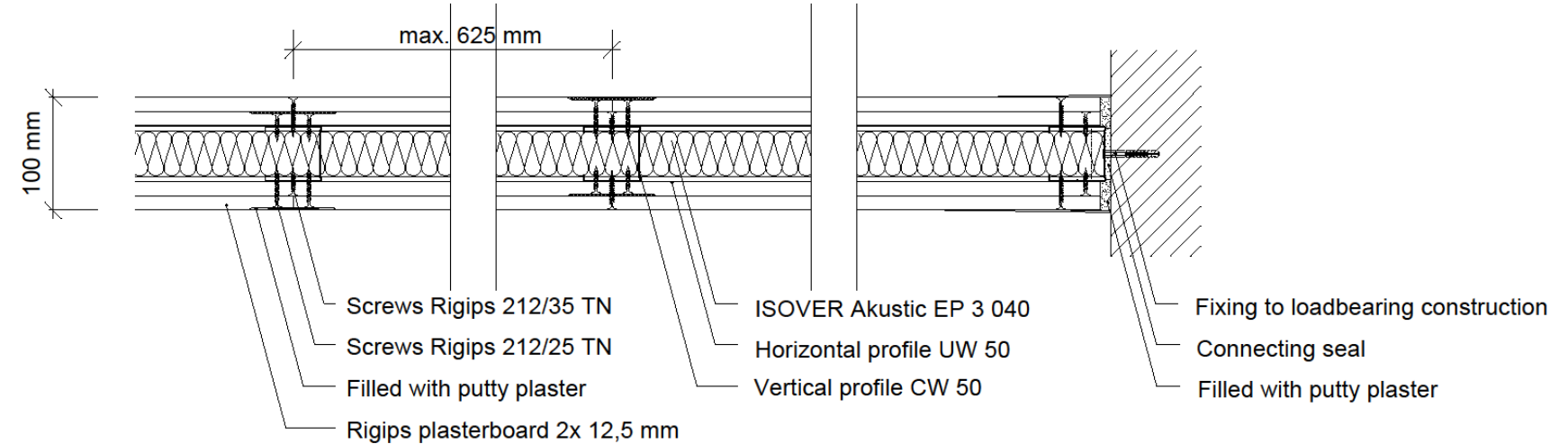


- Outer walls  $U = 0,11 \text{ W/m}^2\text{K}$
- Roof  $U = 0,12 \text{ W/m}^2\text{K}$
- Slab  $U = 0,10 \text{ W/m}^2\text{K}$
- Windows  $U = 0,70 \text{ W/m}^2\text{K}$
- No thermal bridges
- Very good airtightness

# ACOUSTIC

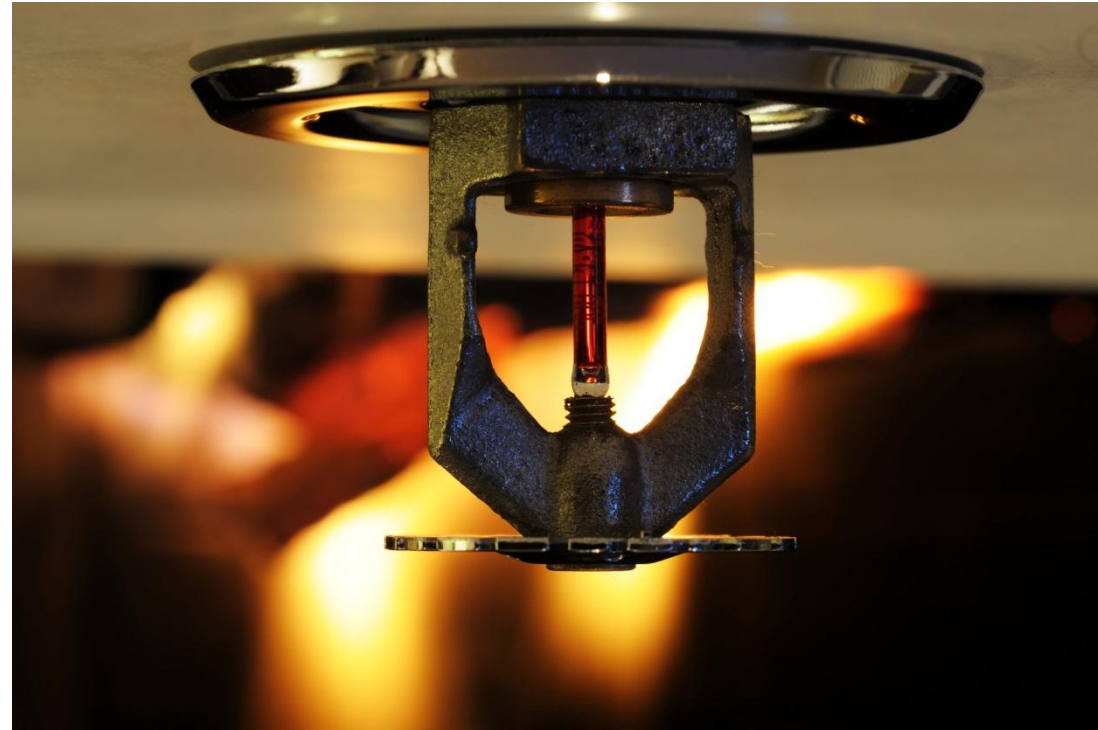
- Classes separated by load-bearing walls, exceeding 58 db (63db) sound reduction
- Partitions at toilets 51 db
- Transparent structures 45 db (one of the most effective, high value/cost ratio)
- Landscaping + fence prevent the spread of noise from street
- Acoustic barrier enhanced by offsetting and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

### Rigips partition wall - double sheathing 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



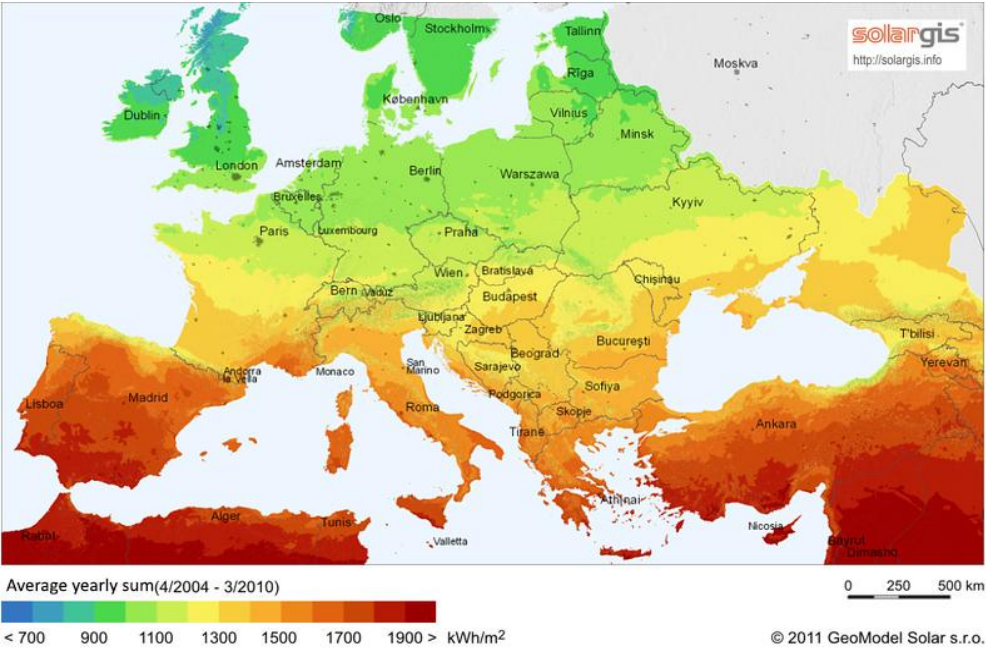
# WATER

- Water tank collecting water from the roof for irrigation and flushing  
water demand lower by tens of percents
- Flow-through heaters in toilets and kitchens
- Main kitchens (in restaurants) with water tank

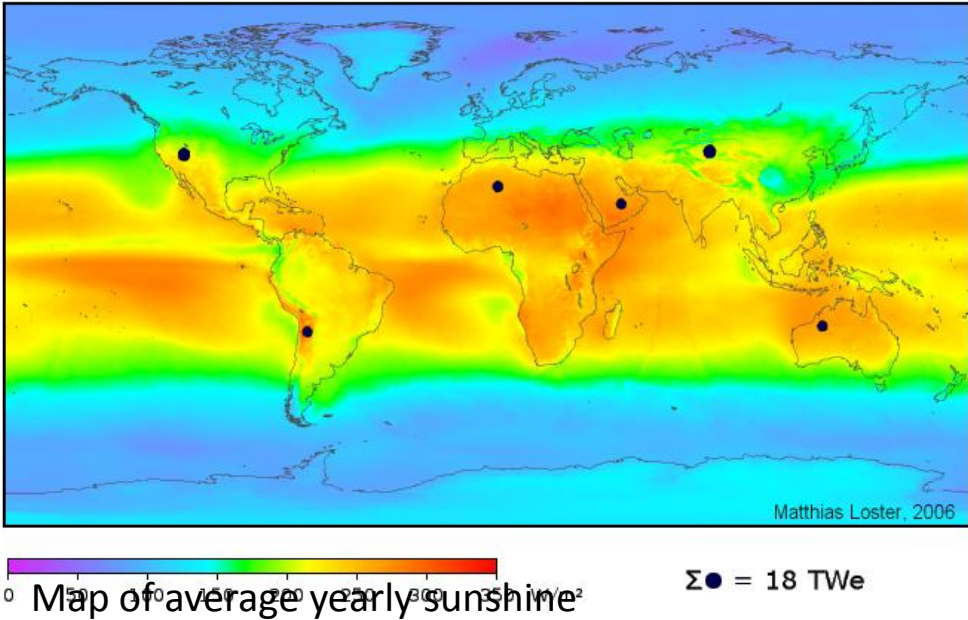


# ENERGY, HEATING

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



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

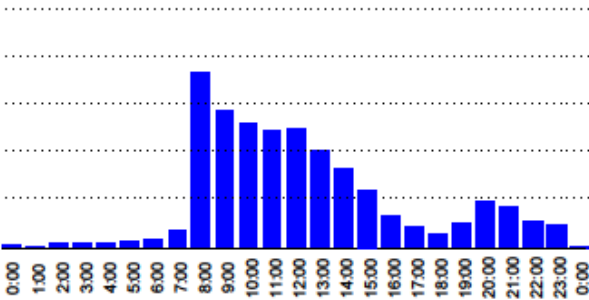


Map of average yearly sunshine

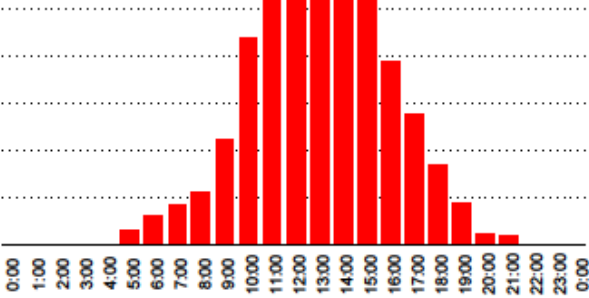
# SOLAR ENERGY

- Energy gain higher than consumption (self-sufficient + energy producing building)
- Energy gain either to reservoirs, electrical grids or energy for nearby buidlings

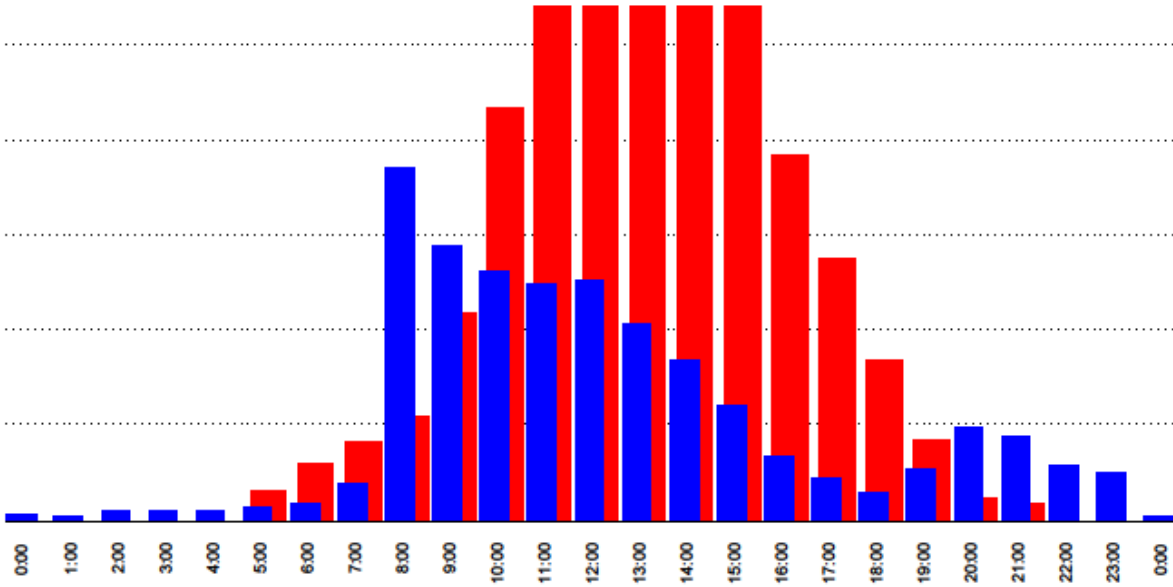
Hourly energy consumption of school



Hourly energy production of solar panels



Hourly energy data  
(production vs. consumption)



# LIGHTING

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

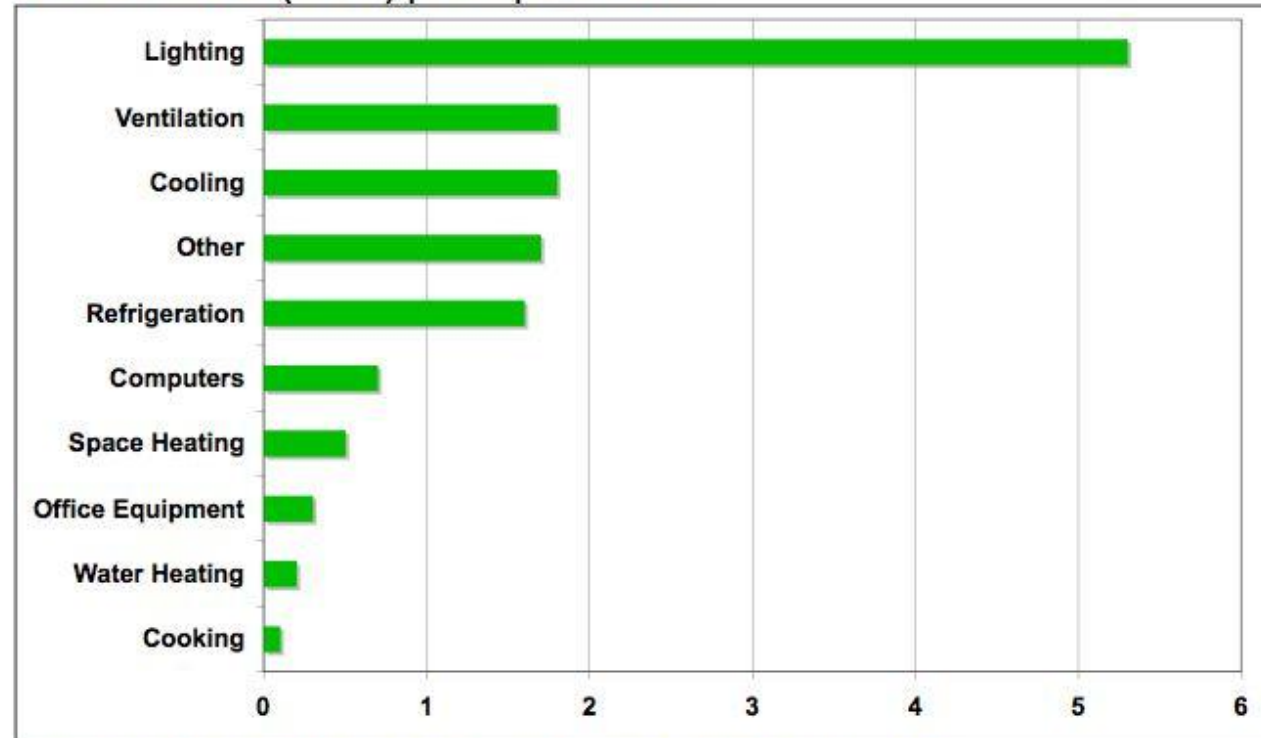
Calculation:

$D_{min} = 1,5$  (3,0 recommended) , result **D = 4,174**

Average value of  $D_m = 5,0$  met

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

**Lighting Consumes Most Energy**  
Kilowatt-hours (KWH) per Square Foot



Source: Energy Information Administration and Green Econometrics research

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

# PERFORMANCE SIMULATION

## Tepelné ztráty

1. Tepelné ztráty prostupem na m2 a rok	1.57	kWh/(m <sup>2</sup> a)
2. Tepelné ztráty větráním na m2 a rok:	0.00	kWh/(m <sup>2</sup> a)
3. Celkové tepelné ztráty na m2 a rok:	1.57	kWh/(m <sup>2</sup> a)

## Tepelné zisky:

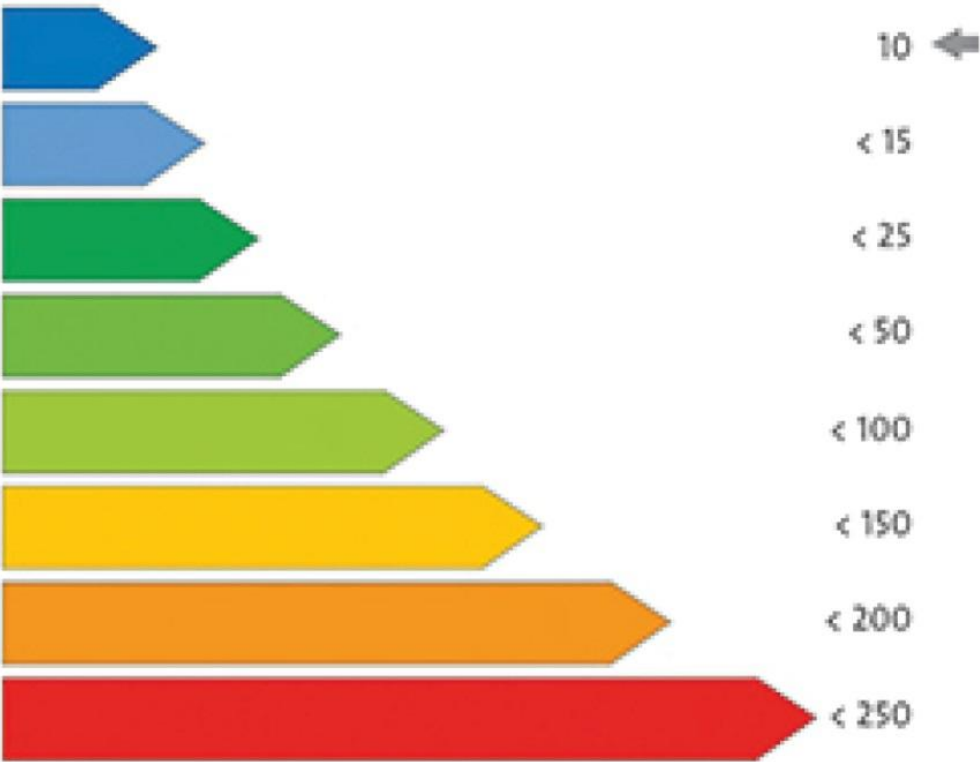
4. Vnitřní tepelné zisky na m2 a rok:	11.34	kWh/(m <sup>2</sup> a)
5. Využitelné solární zisky na m2 a rok	0.00	kWh/(m <sup>2</sup> a)
6. Celkové tepelné zisky na m2 a rok:	1.57	kWh/(m <sup>2</sup> a)

Roční potřeba tepla (kWh/m<sup>2</sup>): -3.37 kWh/m<sup>2</sup>

Měrná potřeba tepla (kWh/(m<sup>2</sup>a)) : 0.00 kWh/(m<sup>2</sup>a)

Měrná potřeba tepla < 15 kWh/(m<sup>2</sup>a) splněno: ANO

## Energy efficiency classes

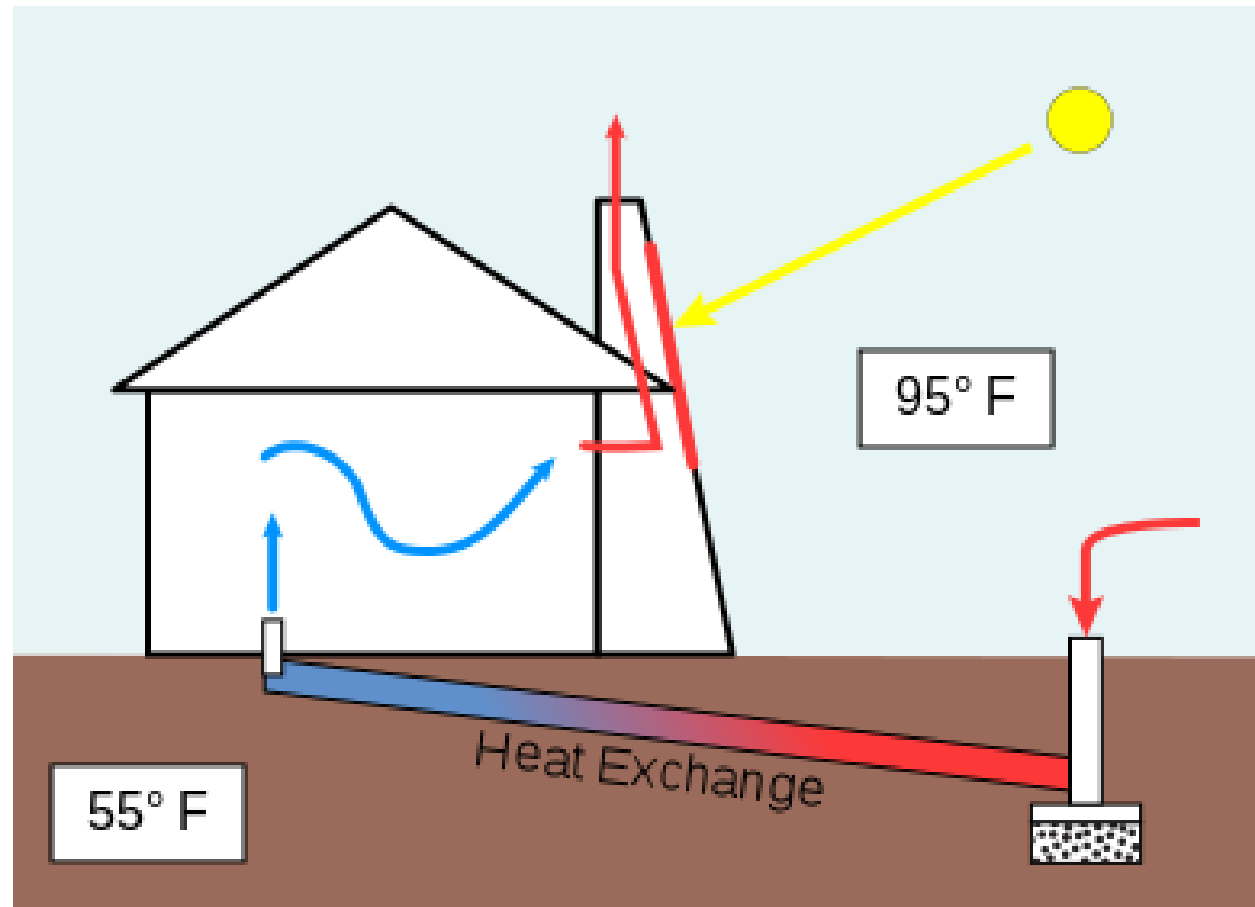


3,37 kWh/(m<sup>2</sup>a) without solar panels, green roof, water re-use

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

# VENTILATION

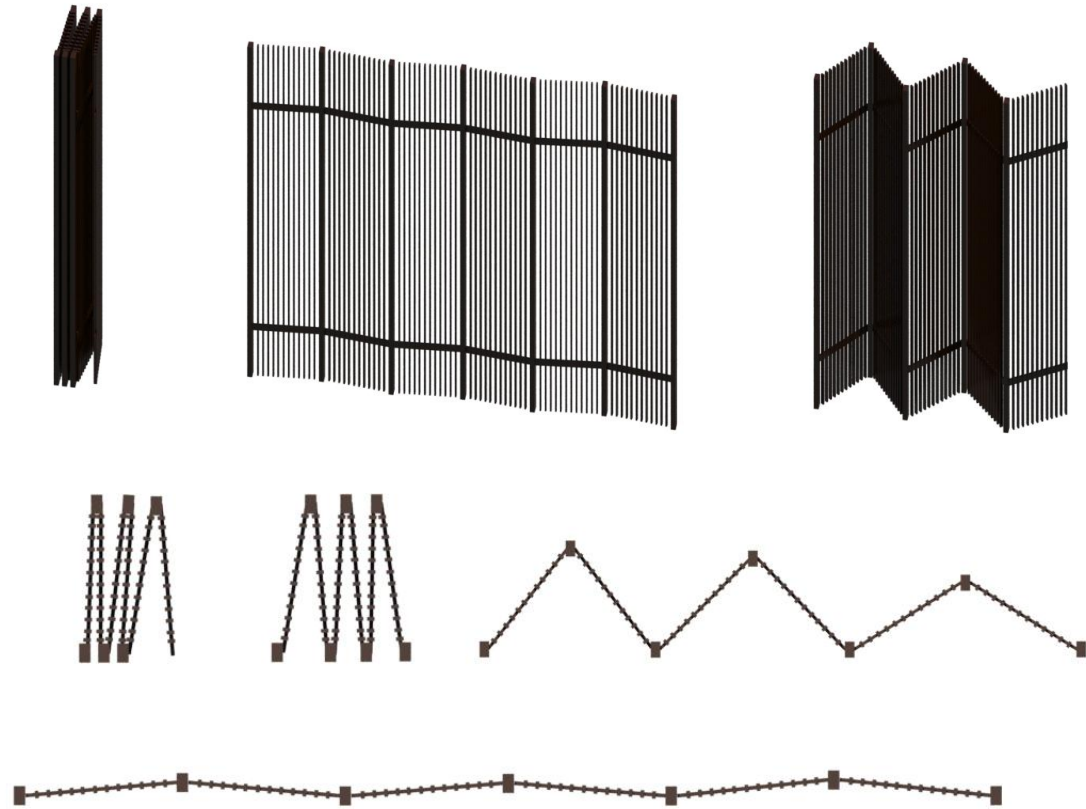
- Geothermal ventilation and heating  
exchange of air  
cooling  
ecological  
maintenance free



# SHADING

- Shading panels

Variable and movable shading panels from vertical segments makes comfortable environment in the hot weather. (They are also good for climbing green vegetation.)



# PIEZOELECTRIC GENERATOR

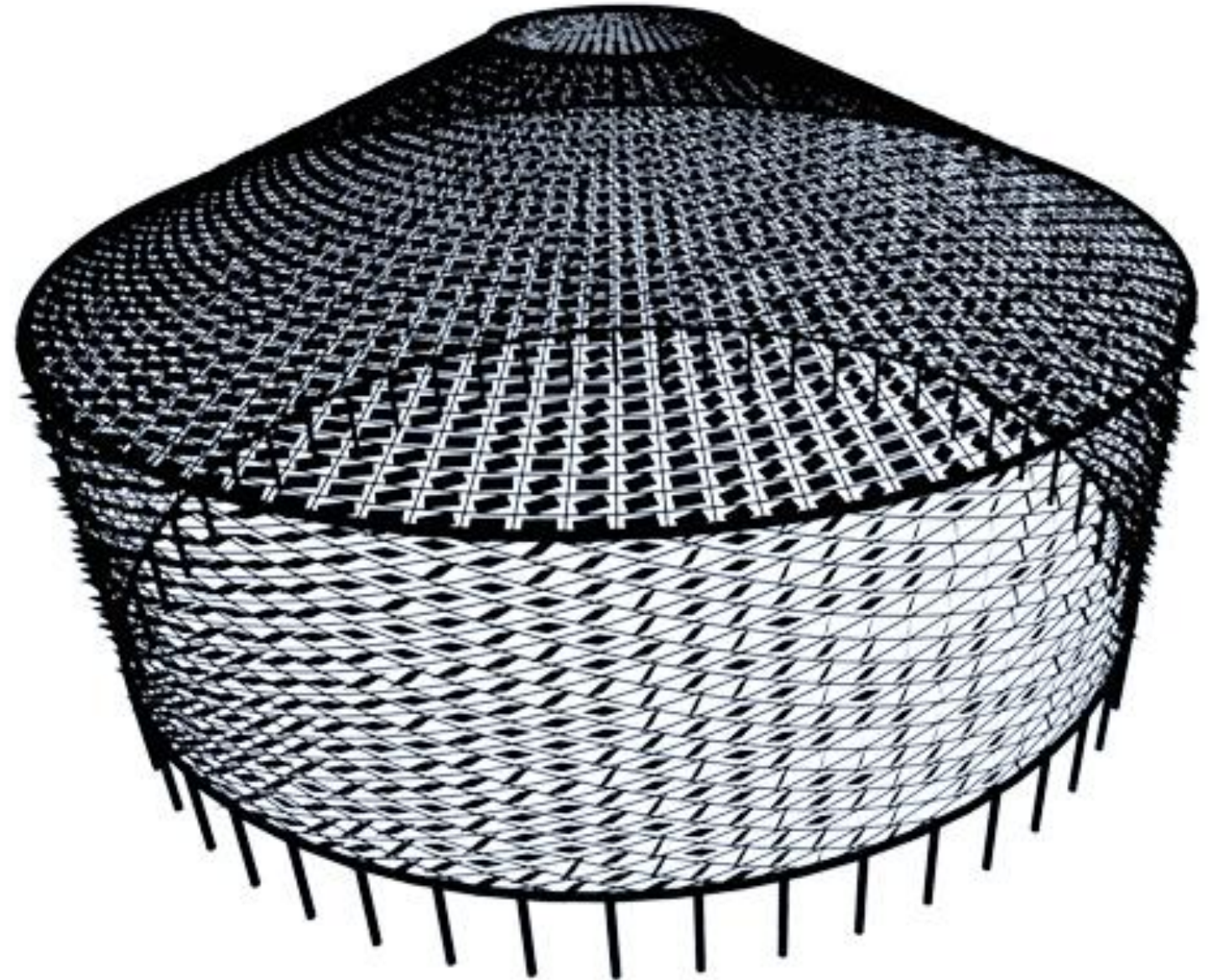
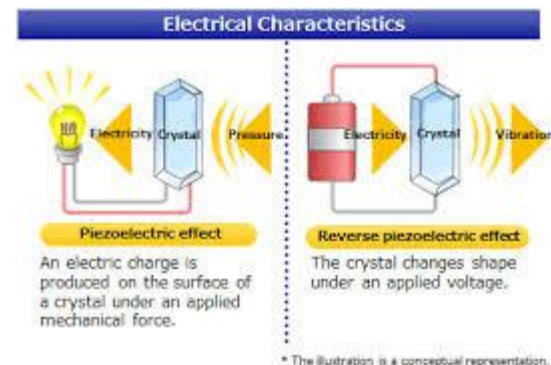
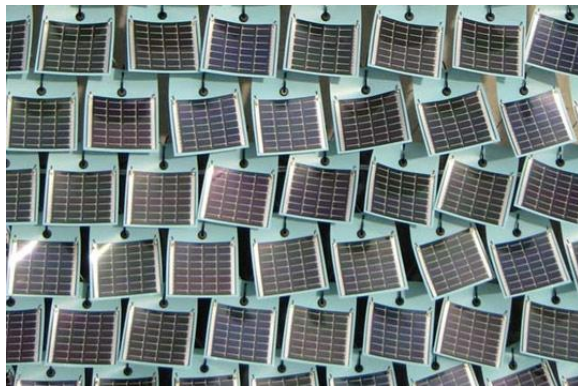
Yurt- piezoelectric generator

Yurt in the park is useful for meetings of the residents for occasions like big celebrations or weekend meetings.

It has not only this function - it also produces energy with piezoelectric generator (it is based on wind energy). This produced electric energy will be used to drive the water pump element and for lighting the park.

Producing electric energy

In the wind each element is bended and it deforms the crystal grid of metal and it makes electric voltage. With bigger power there is bigger bending - and it means bigger power of the generator







THANK YOU FOR YOUR ATTENTION