

# THE GROWING STEEL HOUSE

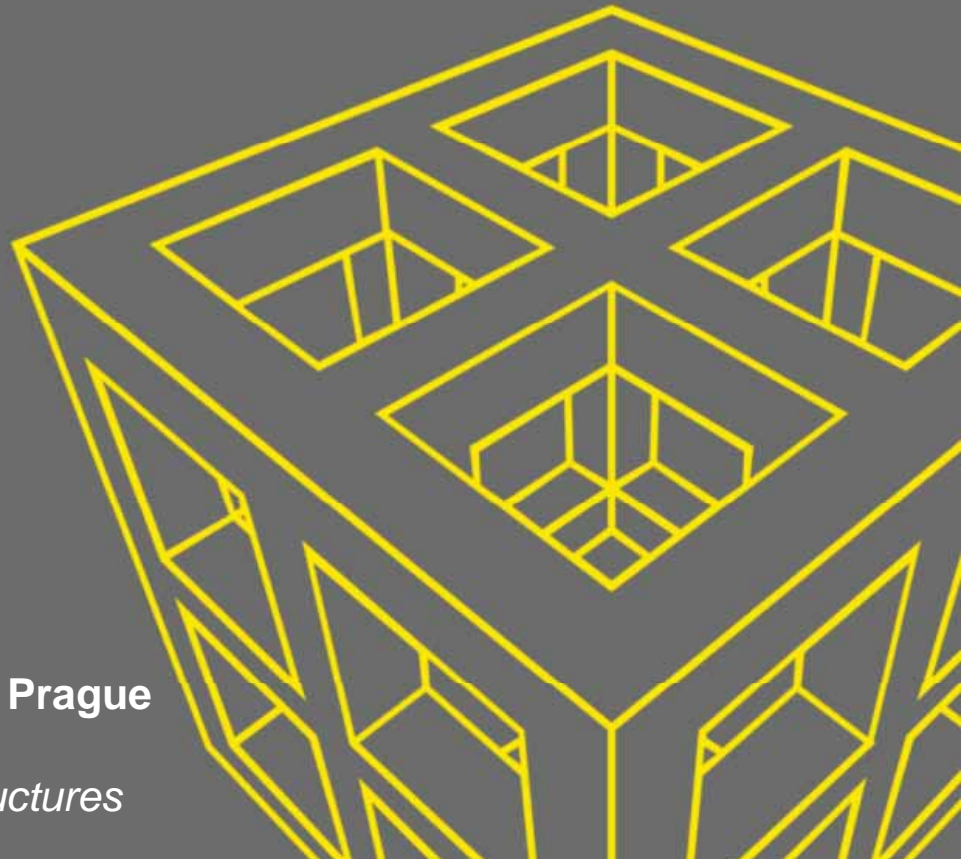


family rules

Lukáš Turek

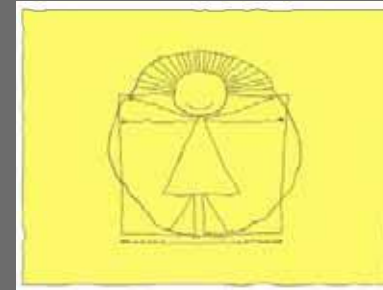


**The Czech Technical University in Prague**  
Faculty of Civil Engineering  
*Department of Steel and Timber Structures*



# MOTIVATION

## The Growing steel house



Low cost housing

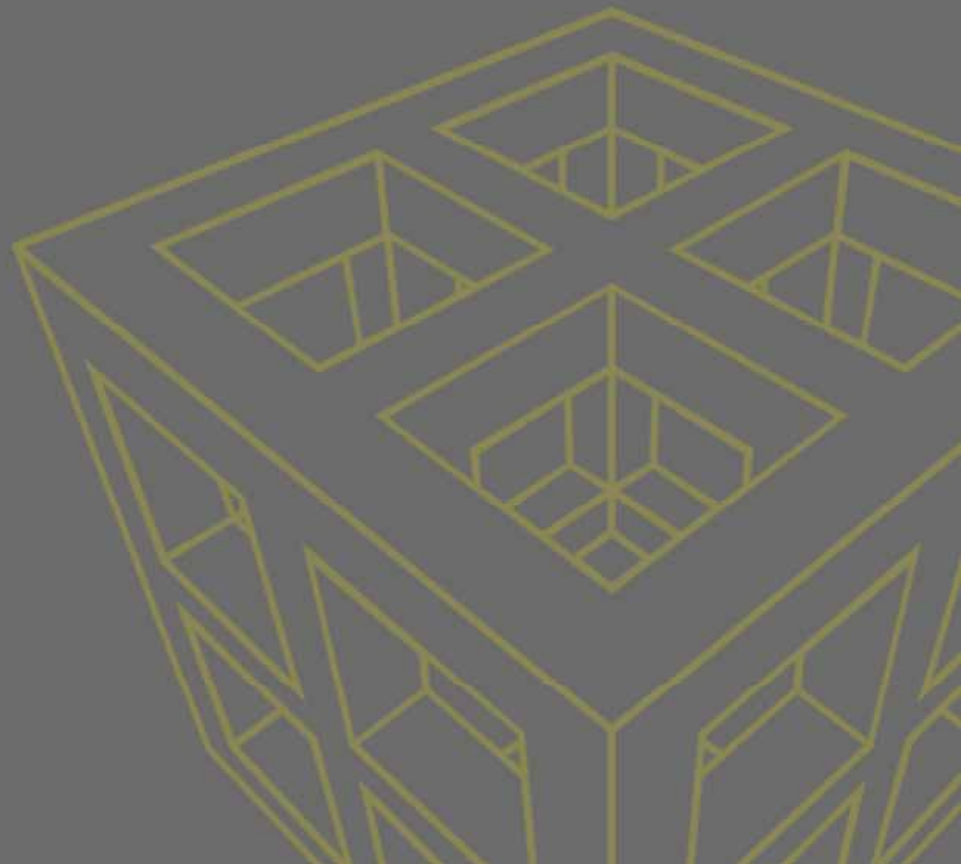
Three phases of disposition according to family

Functionality and variability of system

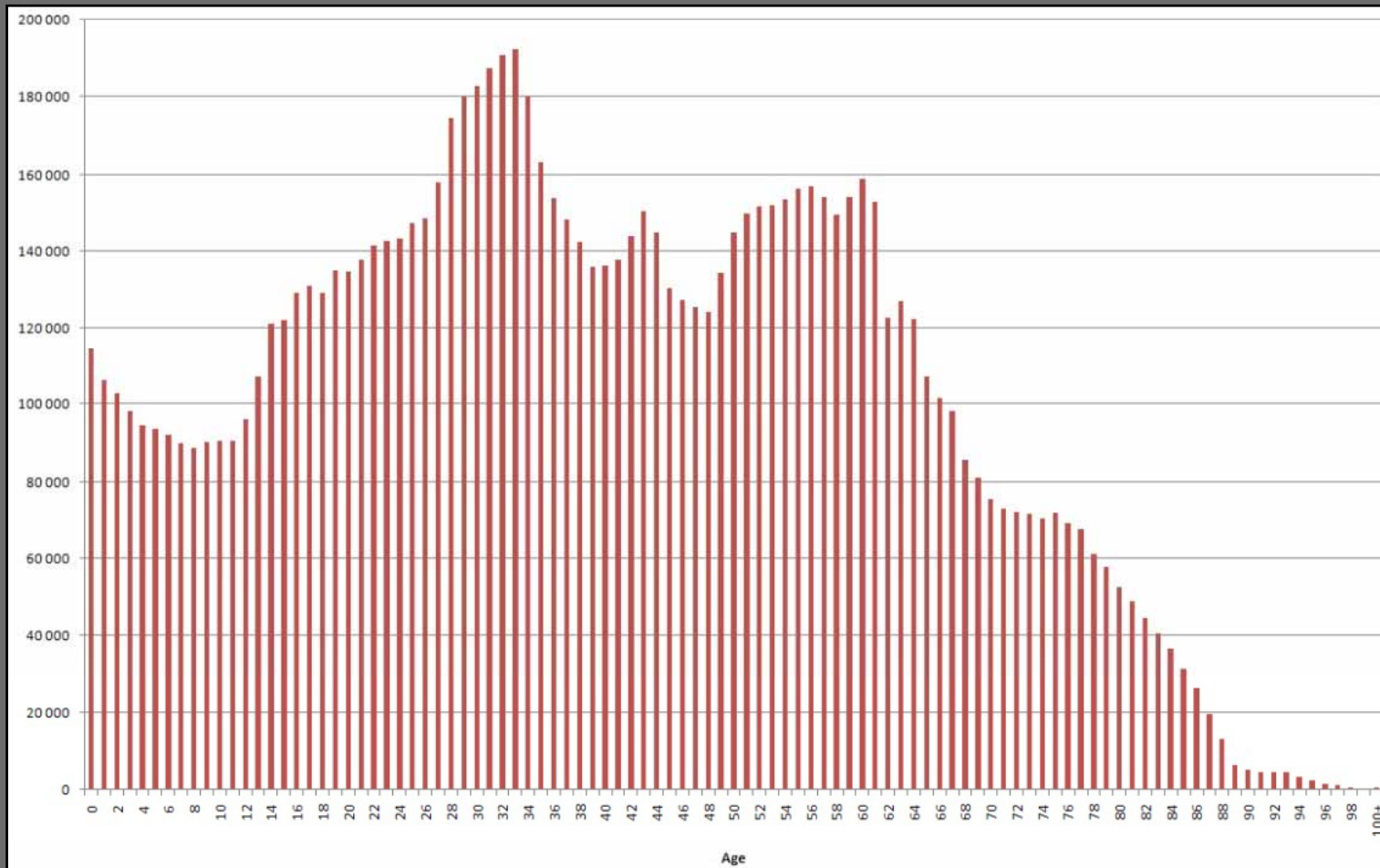
Low energetic and passive standard

# LIST OF CONTENTS

- Introduction
  - Socio economic
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  - Building physics
  - Pros and Cons
- Summary
  - Future planning

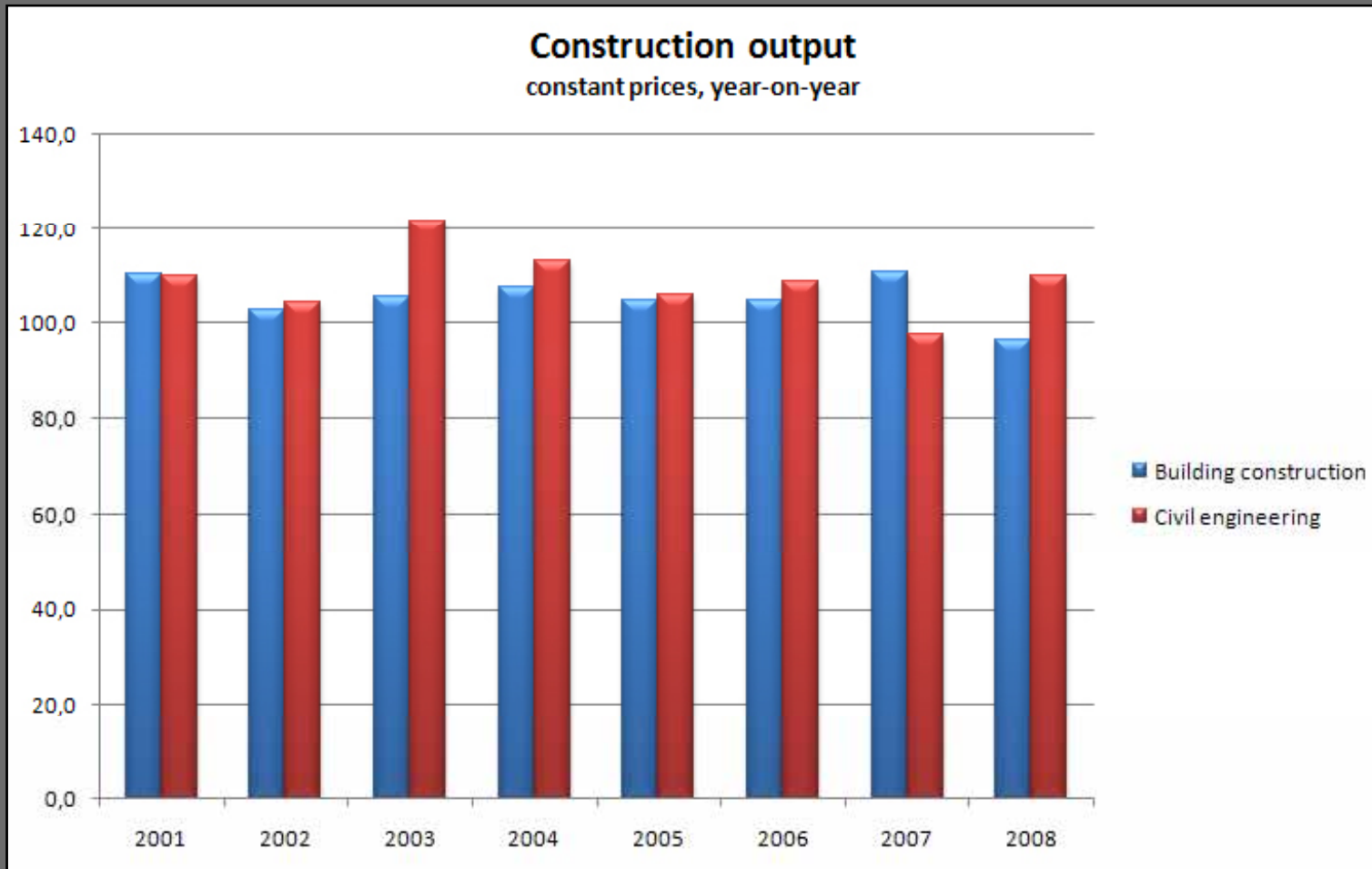


# SOCIO – ECONOMICAL CONDITIONS



Sorting the population by age

# SOCIO – ECONOMICAL CONDITIONS



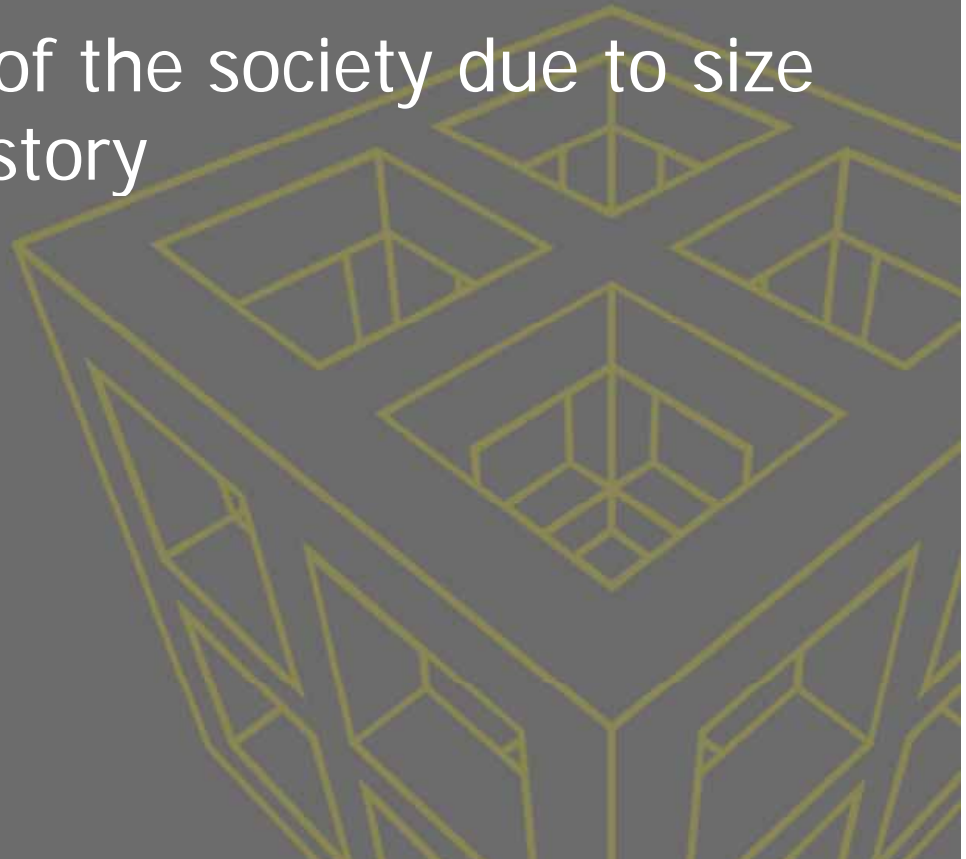
Today high investments into infrastructure

# LOW - COST HOUSING

Capital city 1 500 – 3 000 €/m<sup>2</sup>.

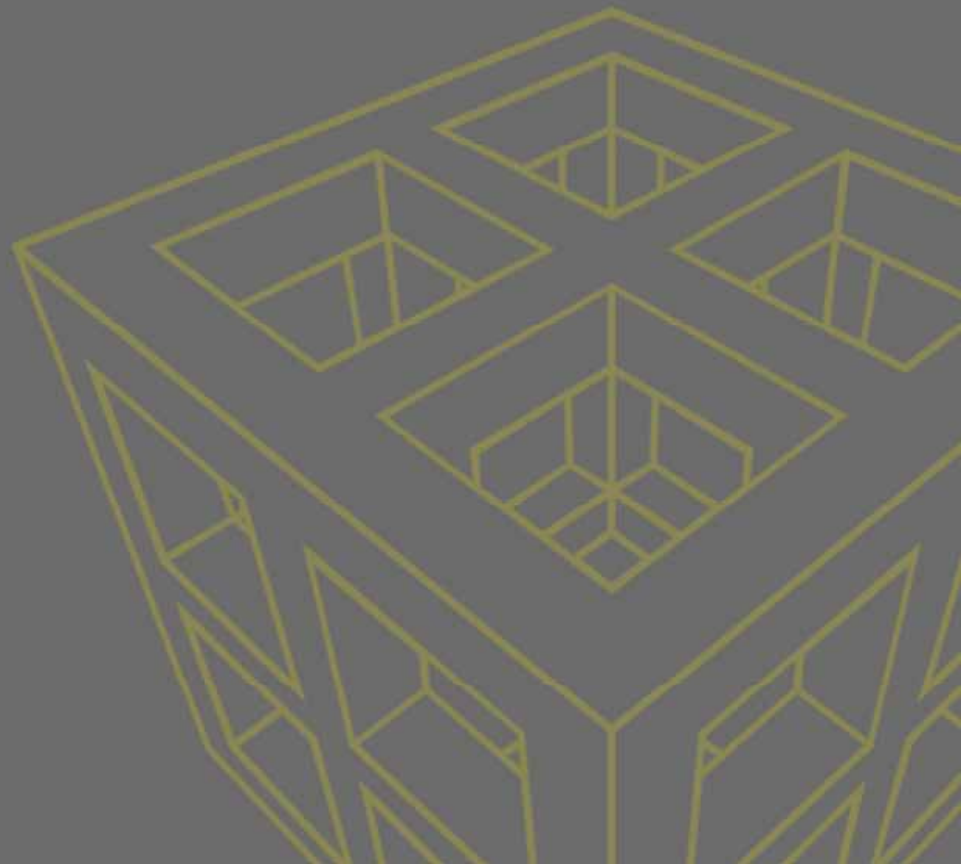
Outskirts of large cities 800 – 1 400 €/m<sup>2</sup>

Historically low mobility of the society due to size of the country and its history

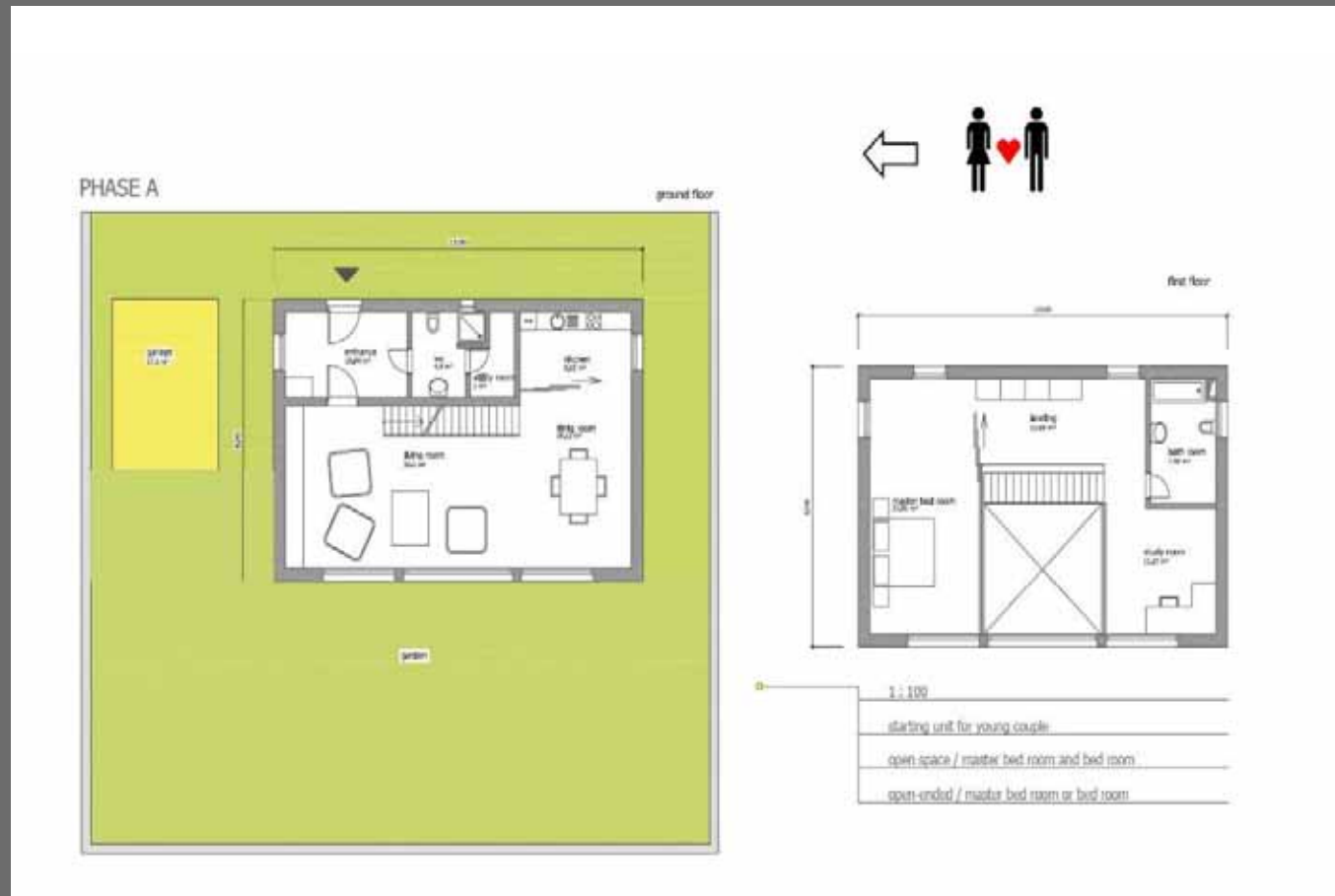


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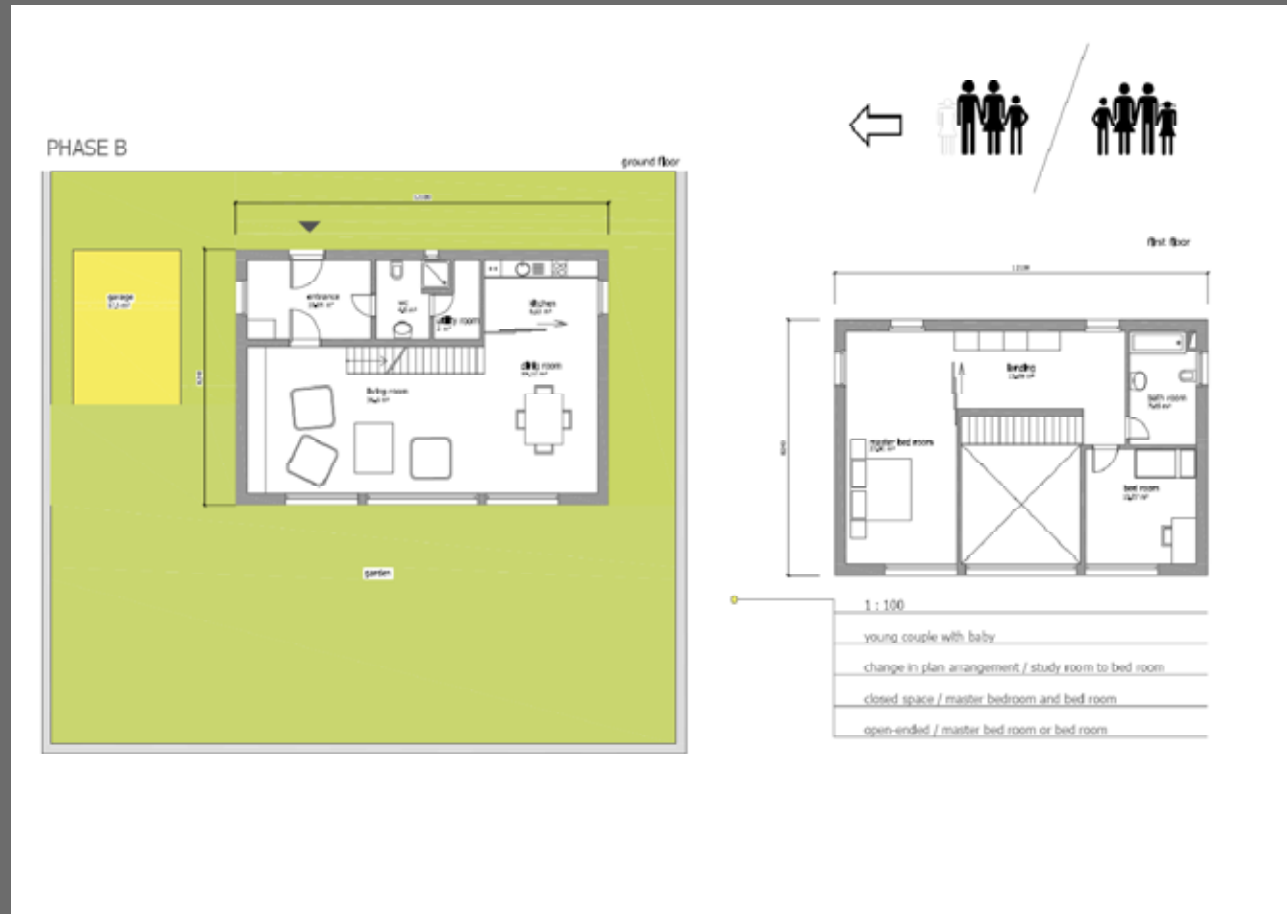
# THE GROWING STEEL HOUSE



Starting unit for a young couple without children

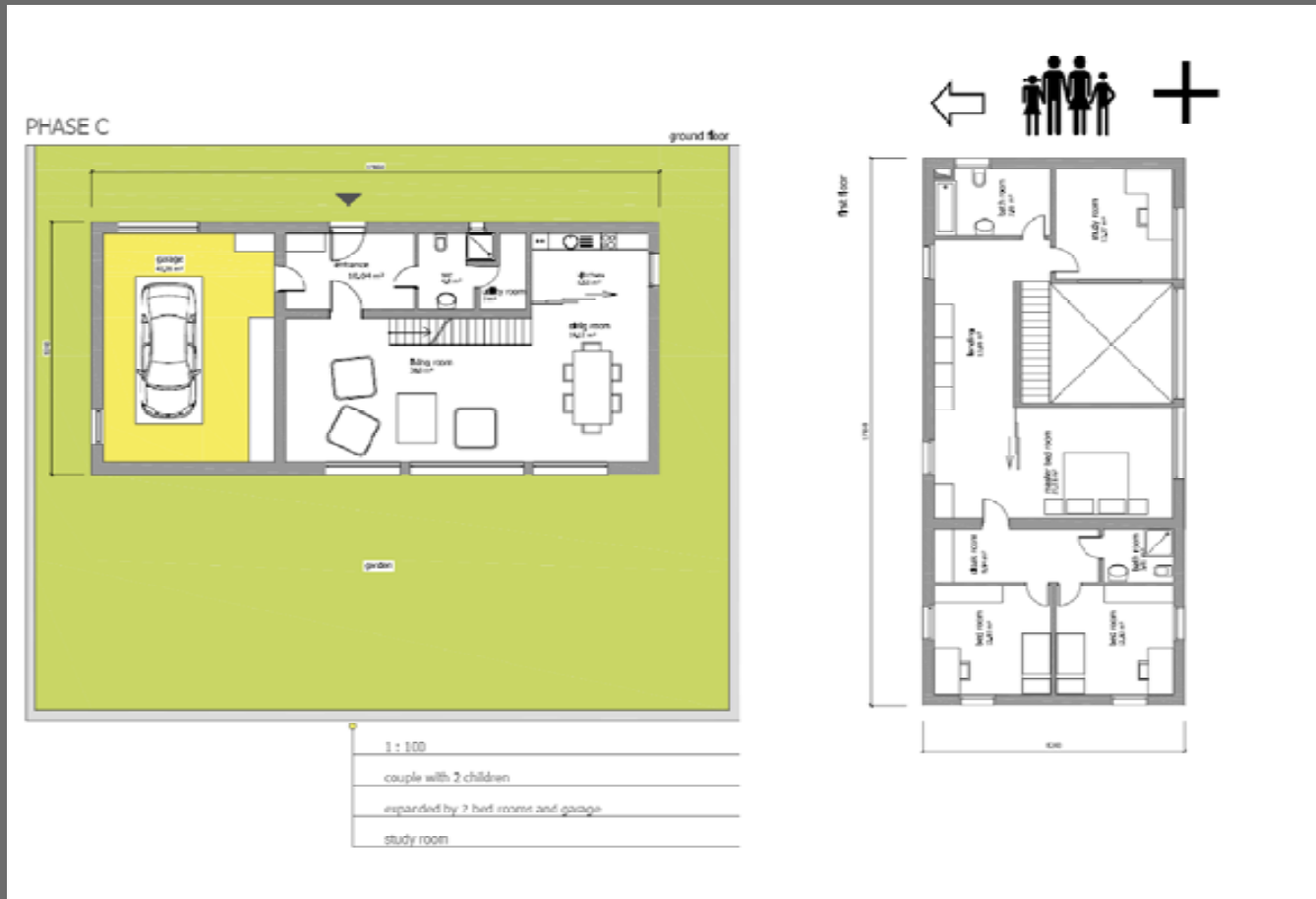


# THE GROWING STEEL HOUSE



Young couple with baby

# THE GROWING STEEL HOUSE



Couple with two children + garage

# The Growing steel house



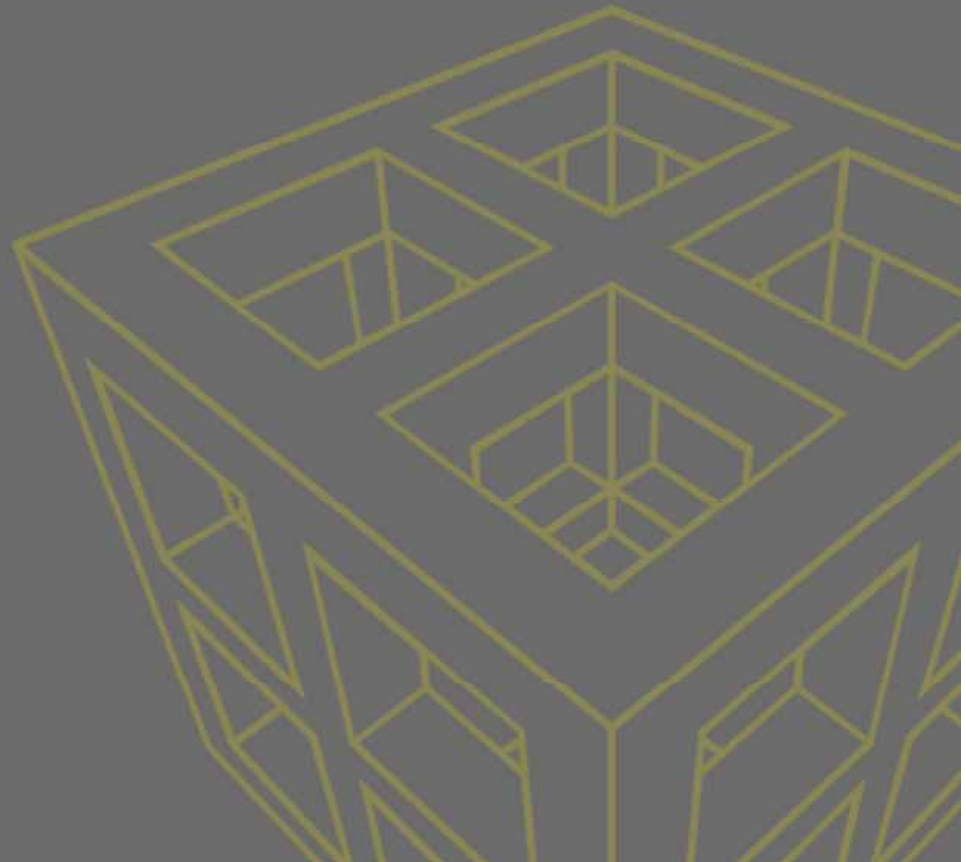
The facade is open to the garden

# THE COLOUR CONCEPT



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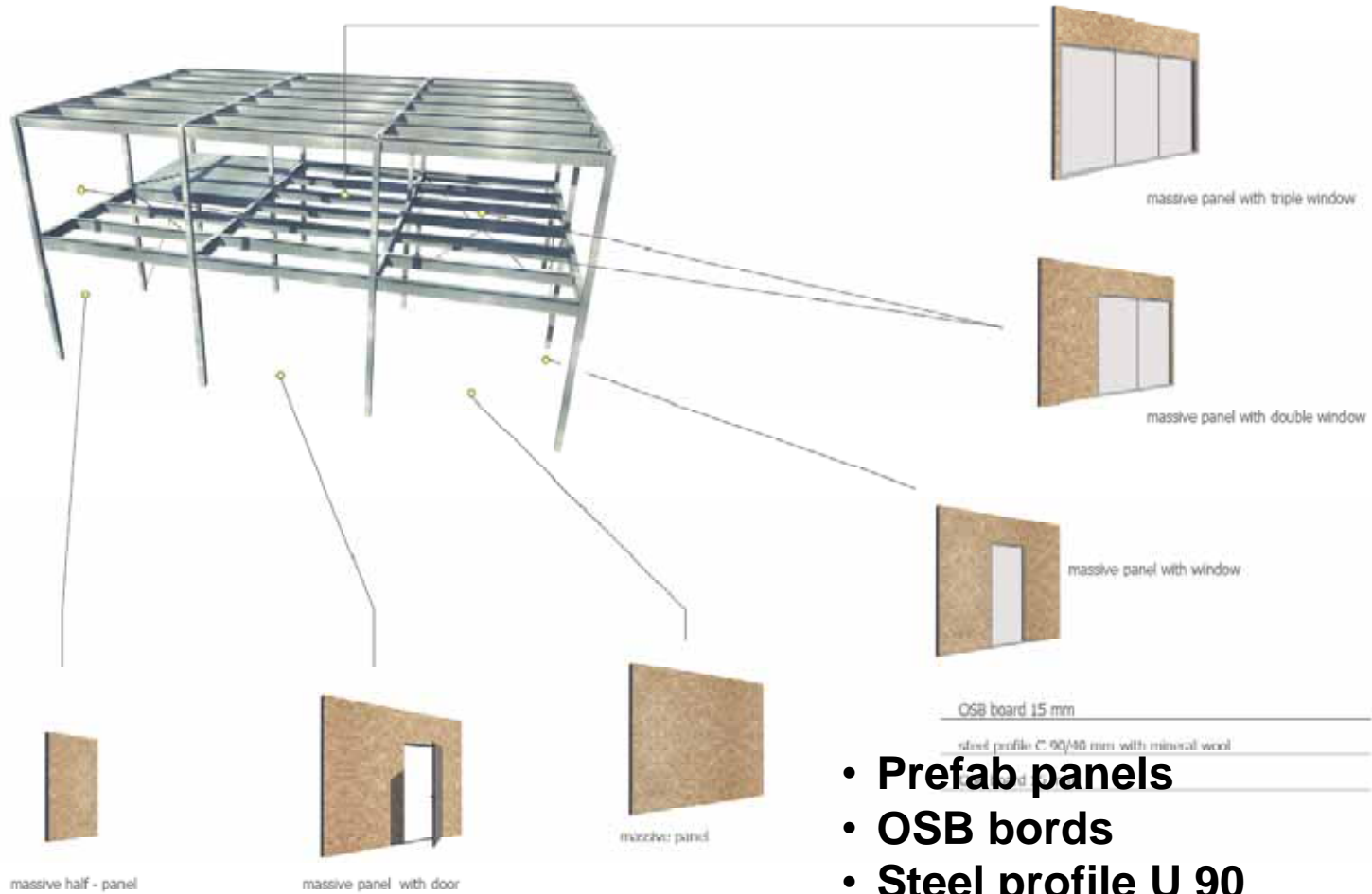
# CONSTRUCTION PART



Steel hot rolled frame

# EXTERNAL WALLS

steel frame



- **Prefab panels**
- **OSB bords**
- **Steel profile U 90**
- **Insulation**

# WALL COMPOSITION

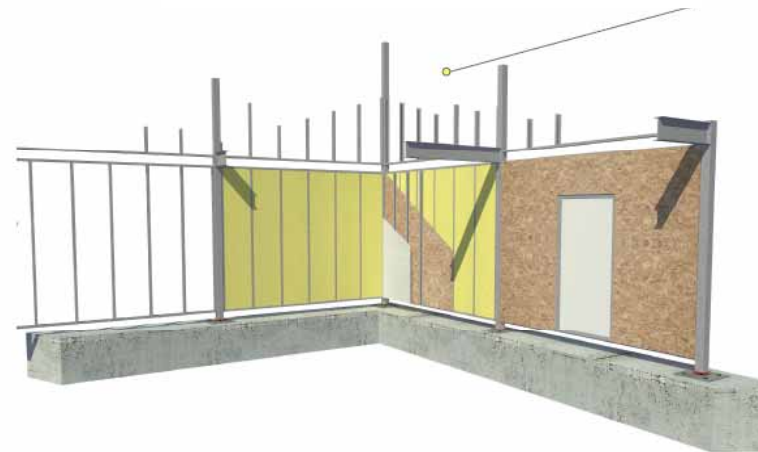


## EXTERIOR

- OSB bords
- Mineral insulation
- Air space
- Surface conditiong

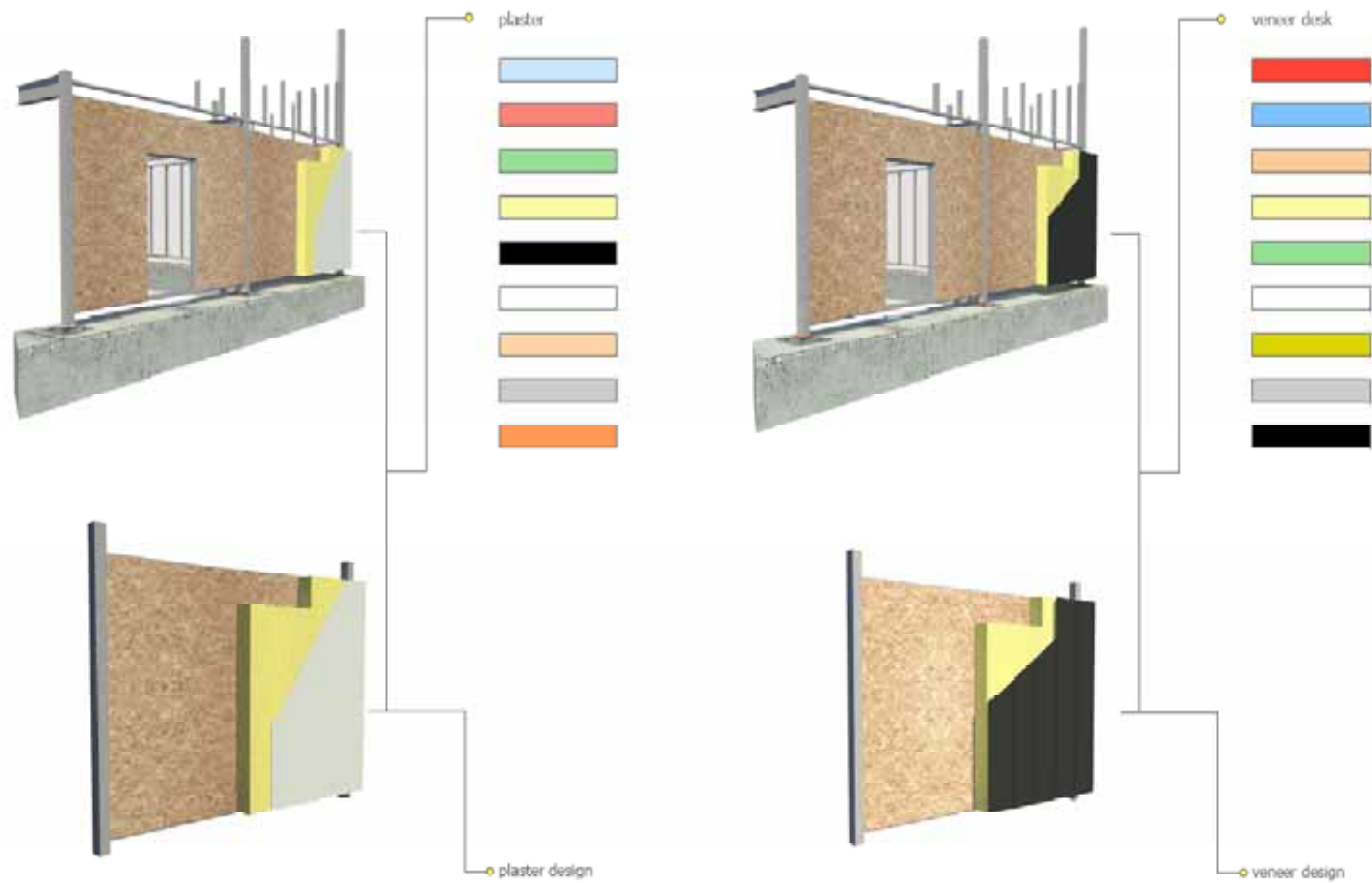
## INTERIOR

- Steel shape
- OSB bords
- Mineral insulation
- Air space
- Plaster bord
- Surface conditiong



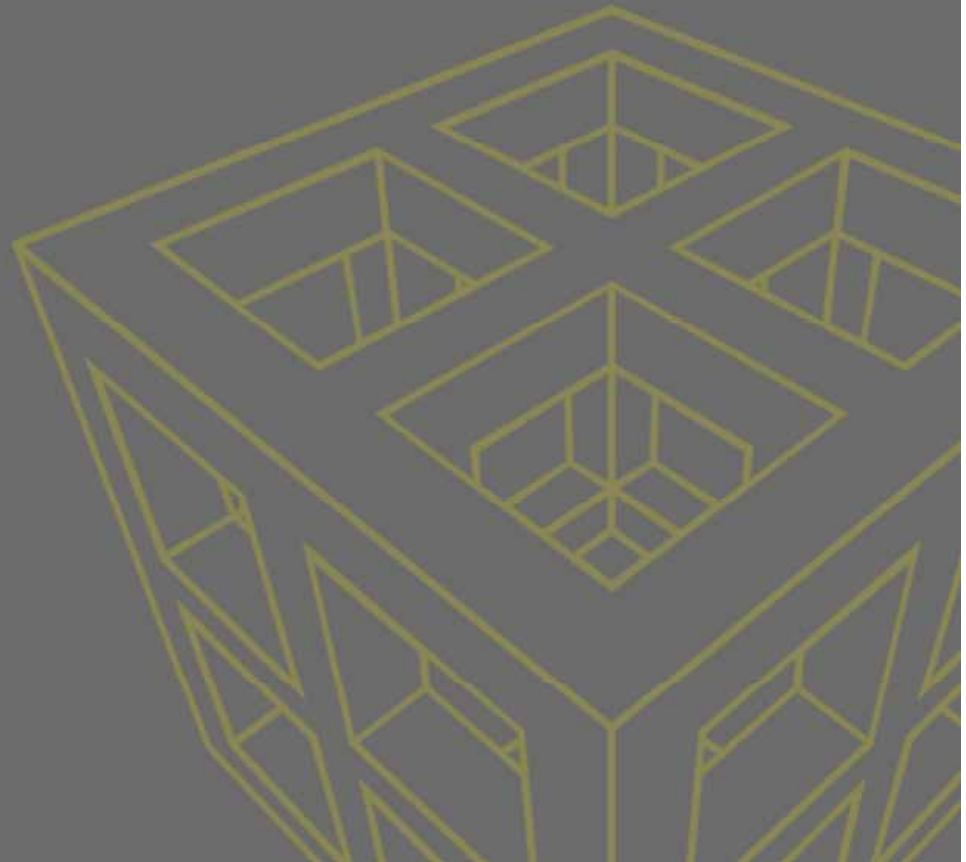


# COLOUR COMPOSITION



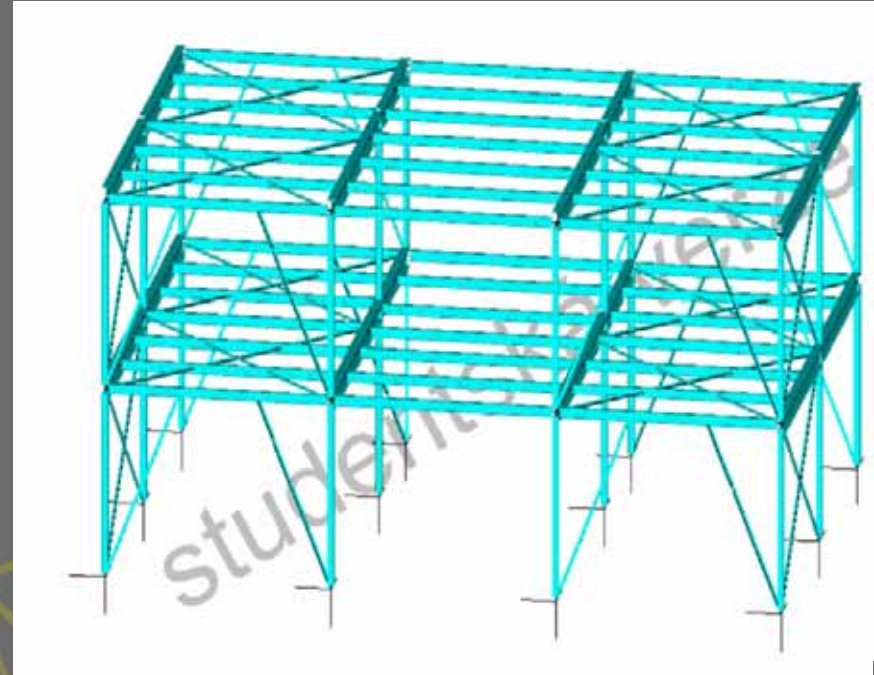
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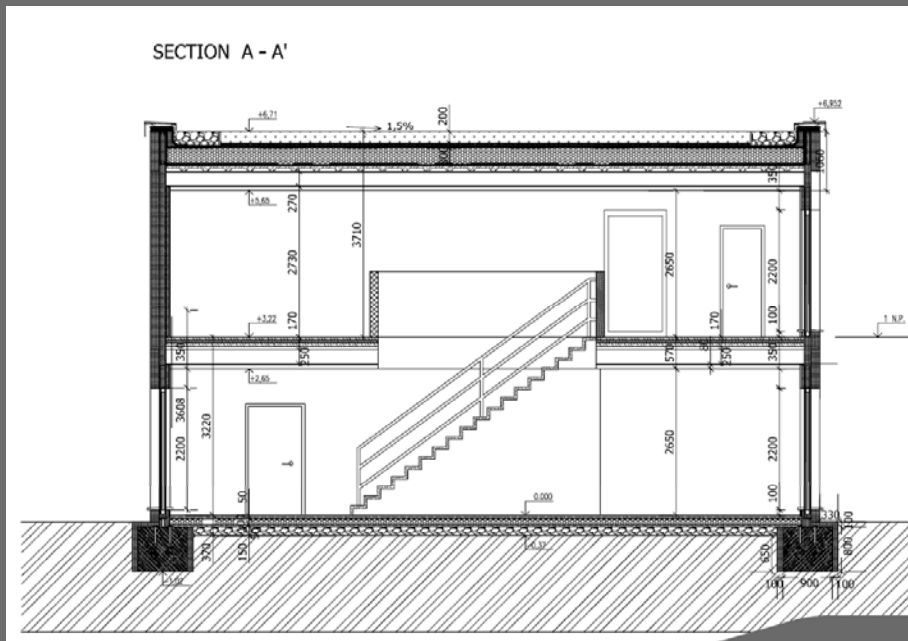
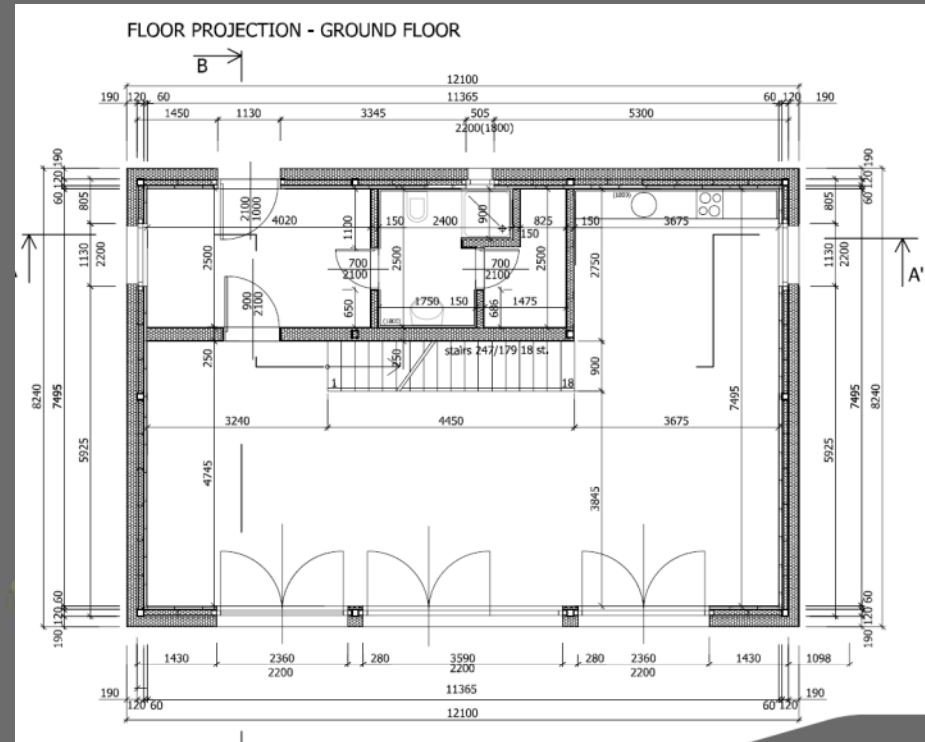
# STRUCTURAL DESIGN

- Loading
  - Wind load  $0,67 \text{ kNm}^2$
  - Snow load  $2,4 \text{ kNm}^2$
- Elements
  - Purlins IPE160
  - Beams IPE270
  - Columns tube  $120 \times 120 \times 5$
  - Bracing tube  $38 \times 4$



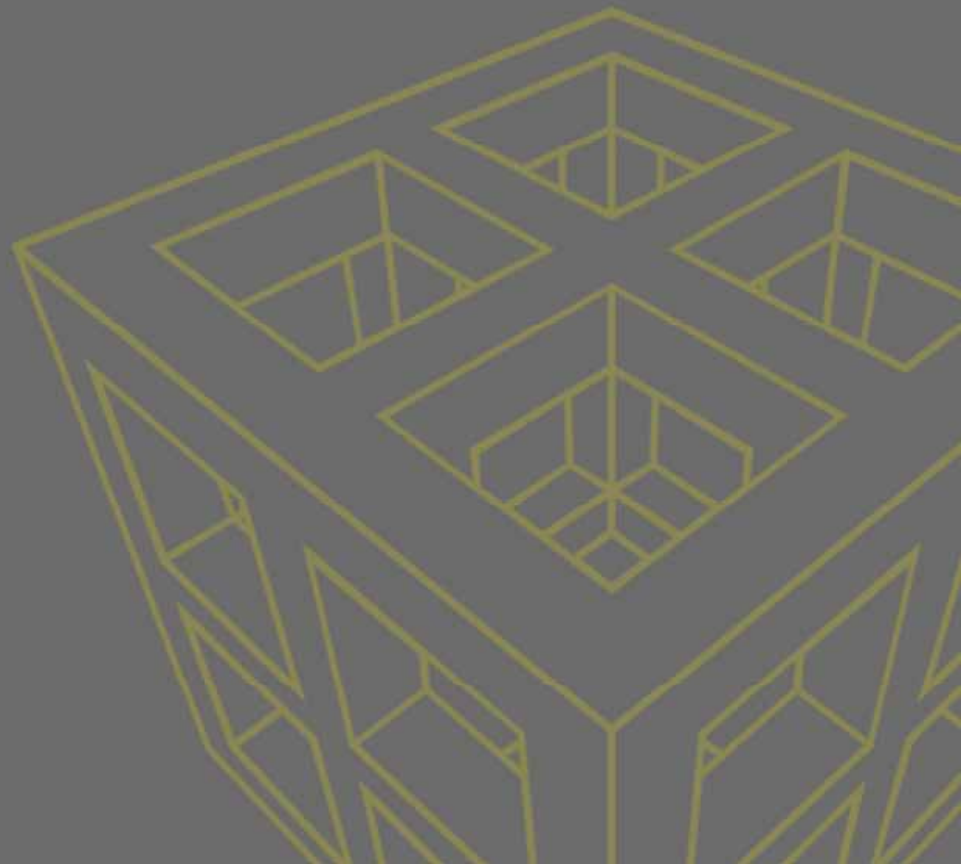
# STRUCTURAL DESIGN

- Plan view
- Section



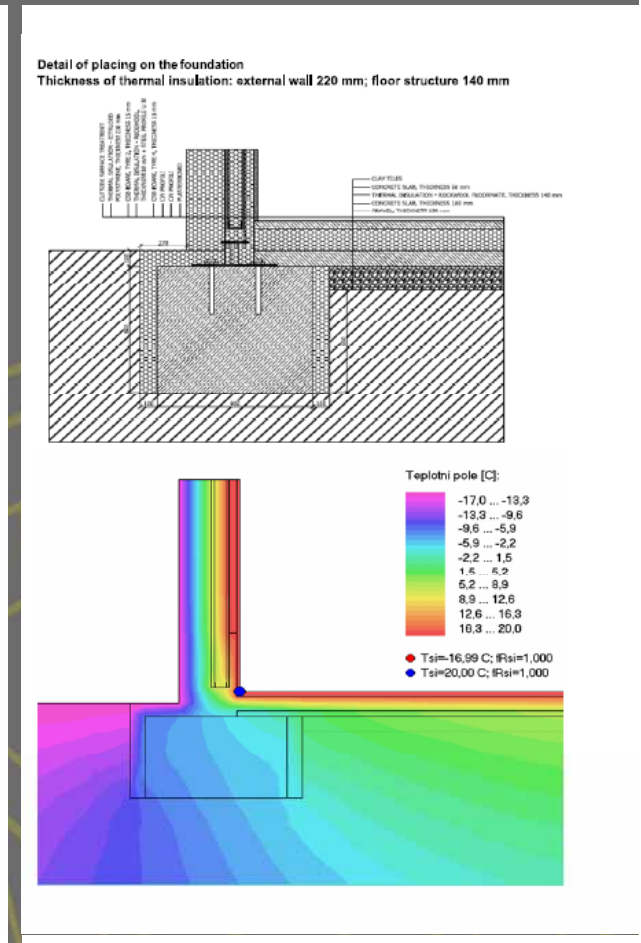
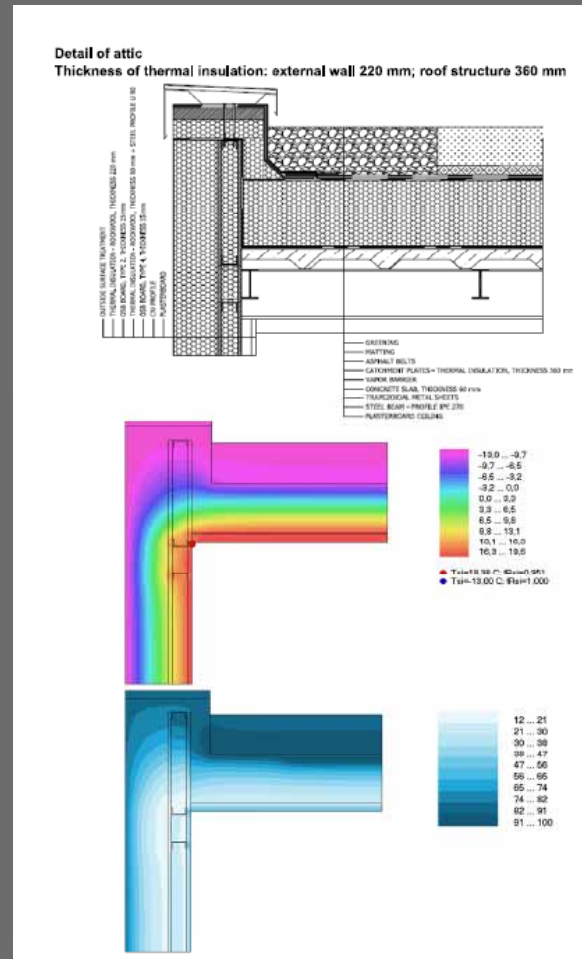
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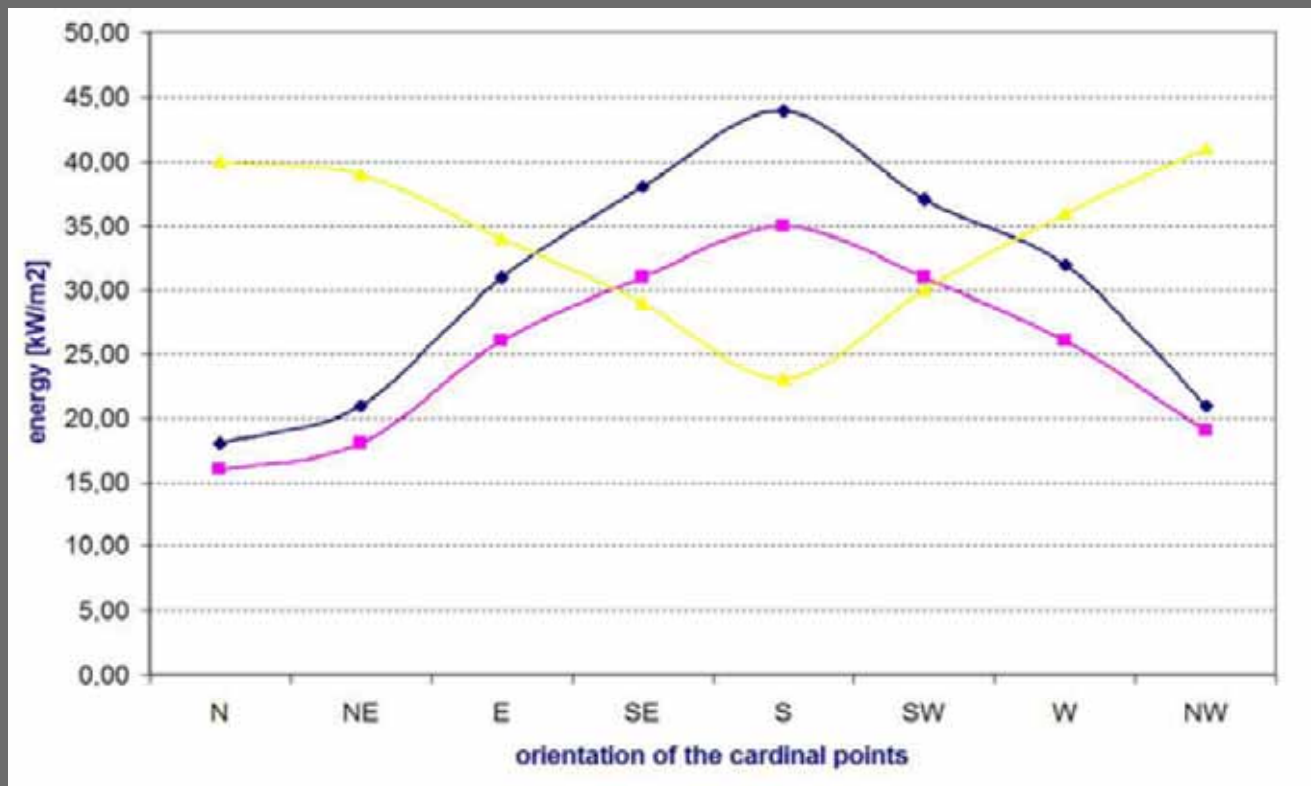
# BUILDING PHYSICS

- Roof
- Attic
- Foundation
- Panels
- Window flanning
- Wall corners



# BUILDING PHYSICS

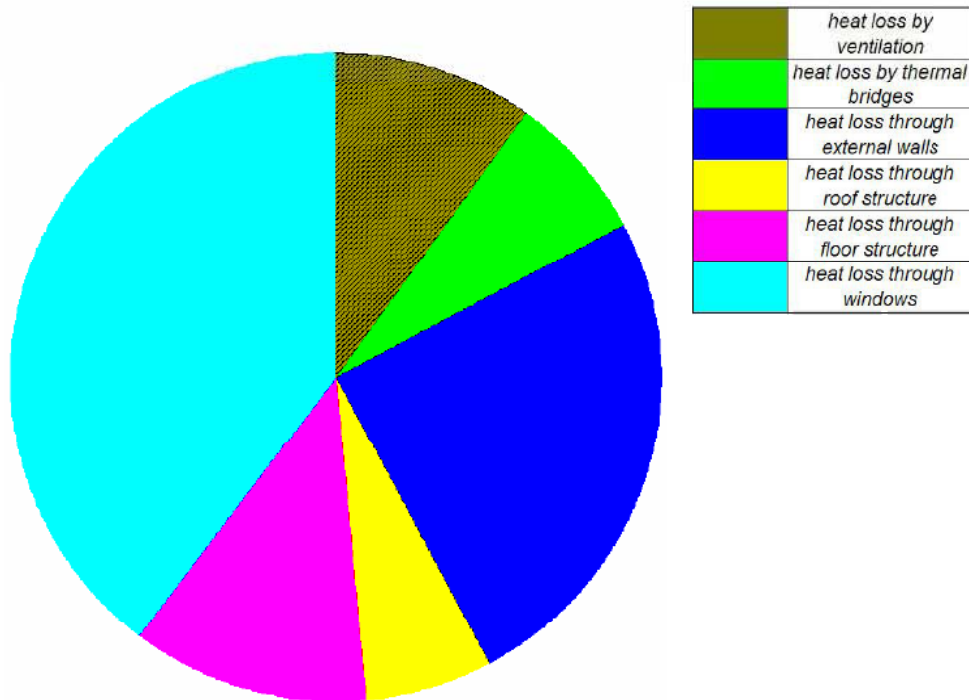
- South - orientation
- Less than 20 kWh/m<sup>2</sup> per year



# BUILDING PHYSICS

- South - orientation
- Less than 20 kWm<sup>2</sup> per year

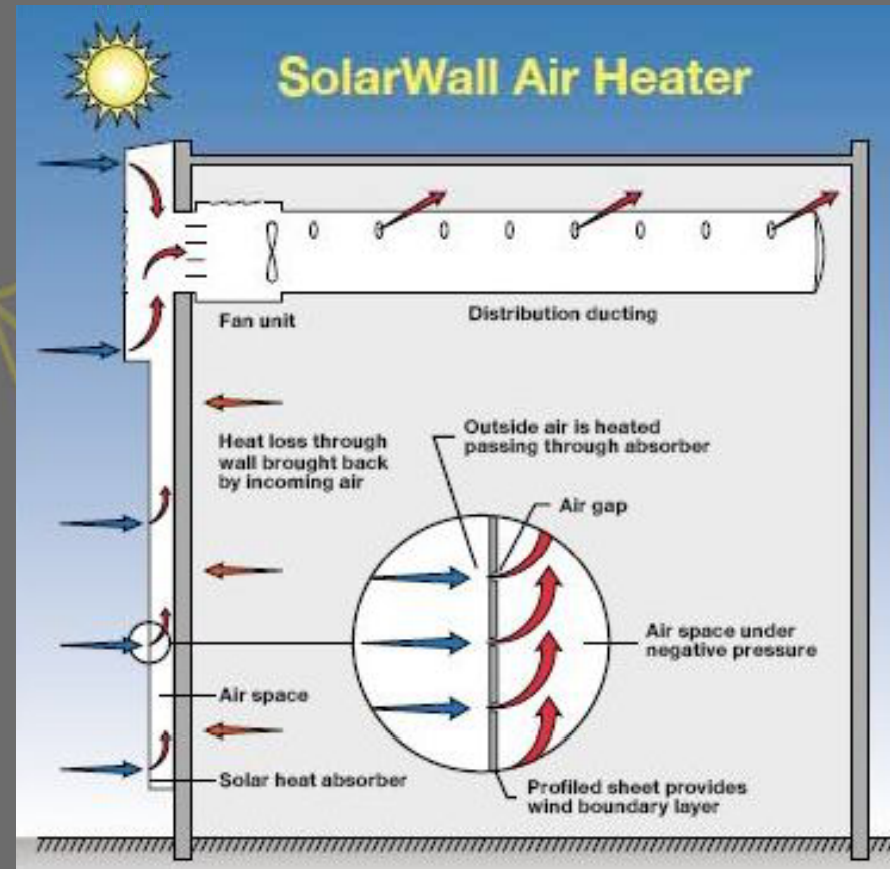
Specific heat loss of the building





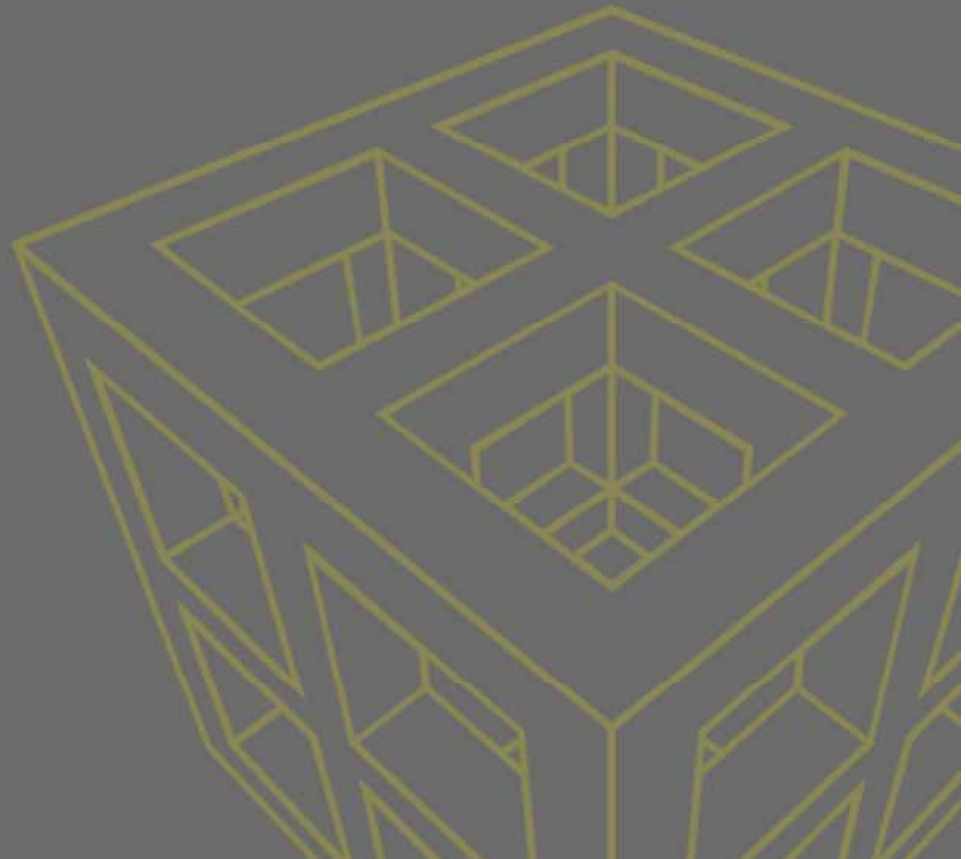
# BUILDING PHYSICS

- South - orientation
- Less than 20 kWh/m<sup>2</sup> per year
- For winter heating



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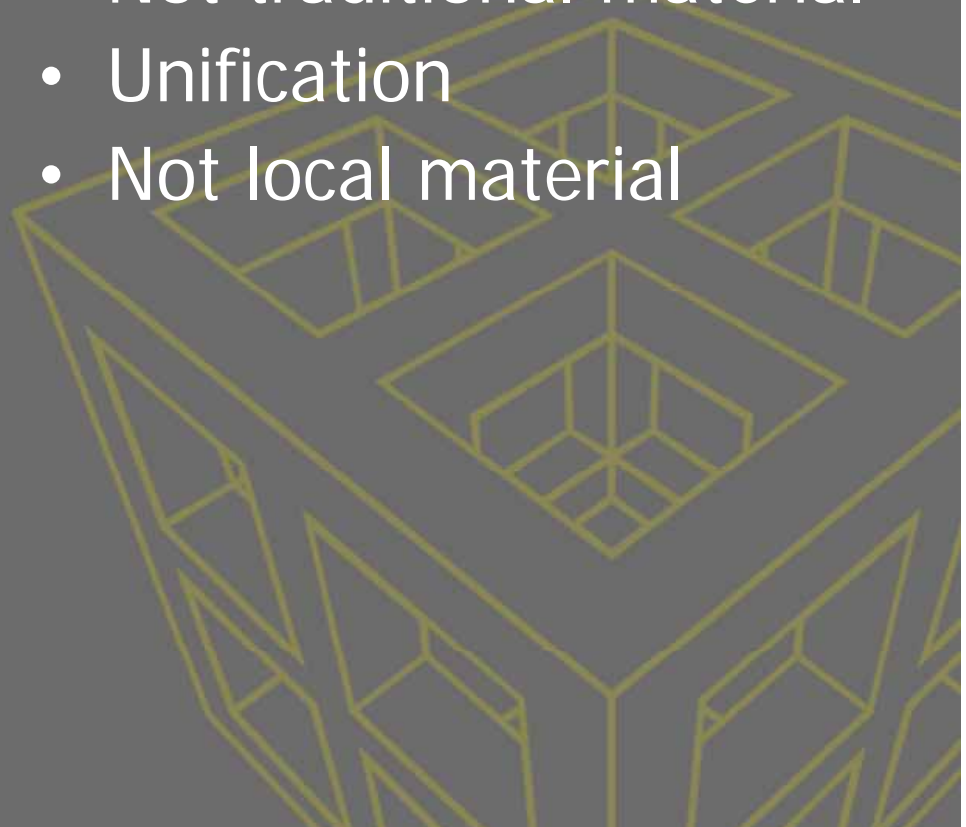
# PROS AND CONS

## PRO

- Variability
- Low energy house
- Disassembling
- Recycling

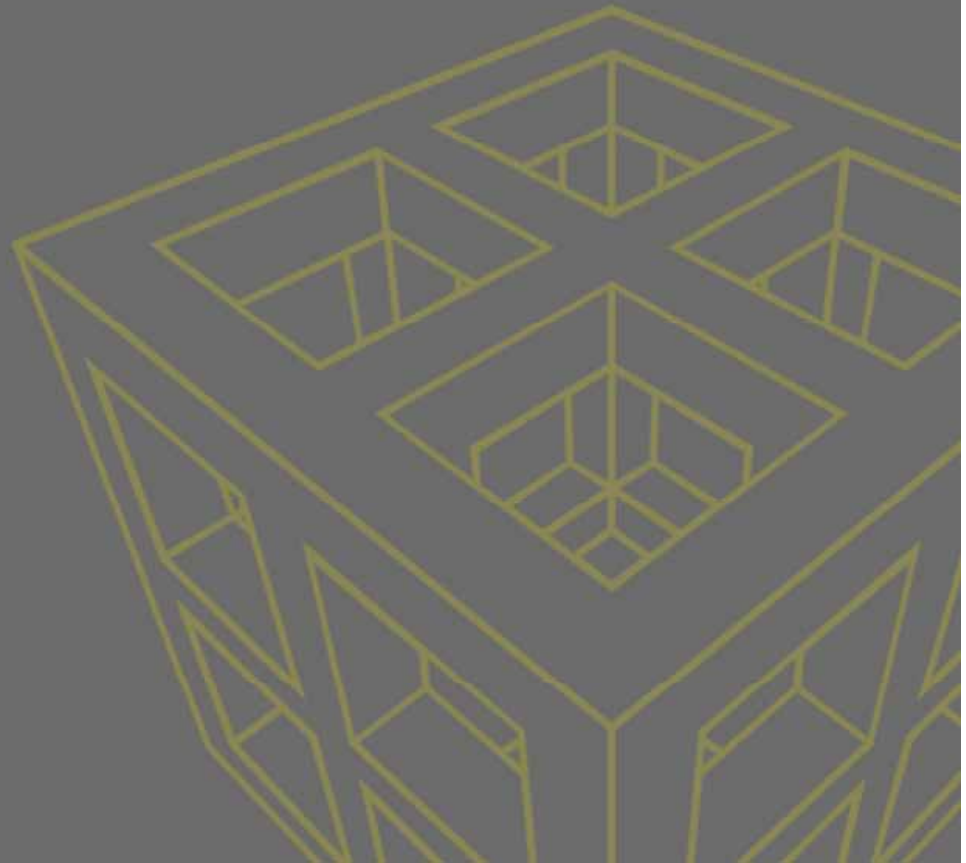
## CON

- Not traditional material
- Unification
- Not local material



# FUTURE NEEDS

- Building services
- Structural detailing
- Construction planes
- Environmental impact
- Economical dimensions



# THANK YOU FOR YOUR ATTENTION

[fire.fsv.cvut.cz/affordable\\_houses](http://fire.fsv.cvut.cz/affordable_houses)

Students / design: tereza pavlů - structural design; petr schorsch - structural design; lukáš turek - architectural concept and solution;

Students /collaboration on the text part : tomáš horálek - socio-economical evaluation; jakub holeček - socio-economical evaluation; pavel jenýš - traditional housing concept; rostislav mazáč - socio-economical evaluation; zdeňka staňková - traditional housing concept; oldřich švec - socio-economical evaluation; kristina trnková - traditional housing concept; zuzana šulcová - web Page

Teachers / consultations: františek wald - head; karel mikesš – manager; petr hájek - sustainability building concept; jan tywoniak - building energy concept