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# Building design and performance

Dilemmas between the demand and the complexity in reality

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# What do we want from a building?

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- **Sheltering**



# What do we want from a building?

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- **Convenience**



# What do we want from a building?

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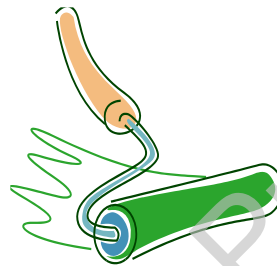
- **Comfort**



# What do we want from a building?

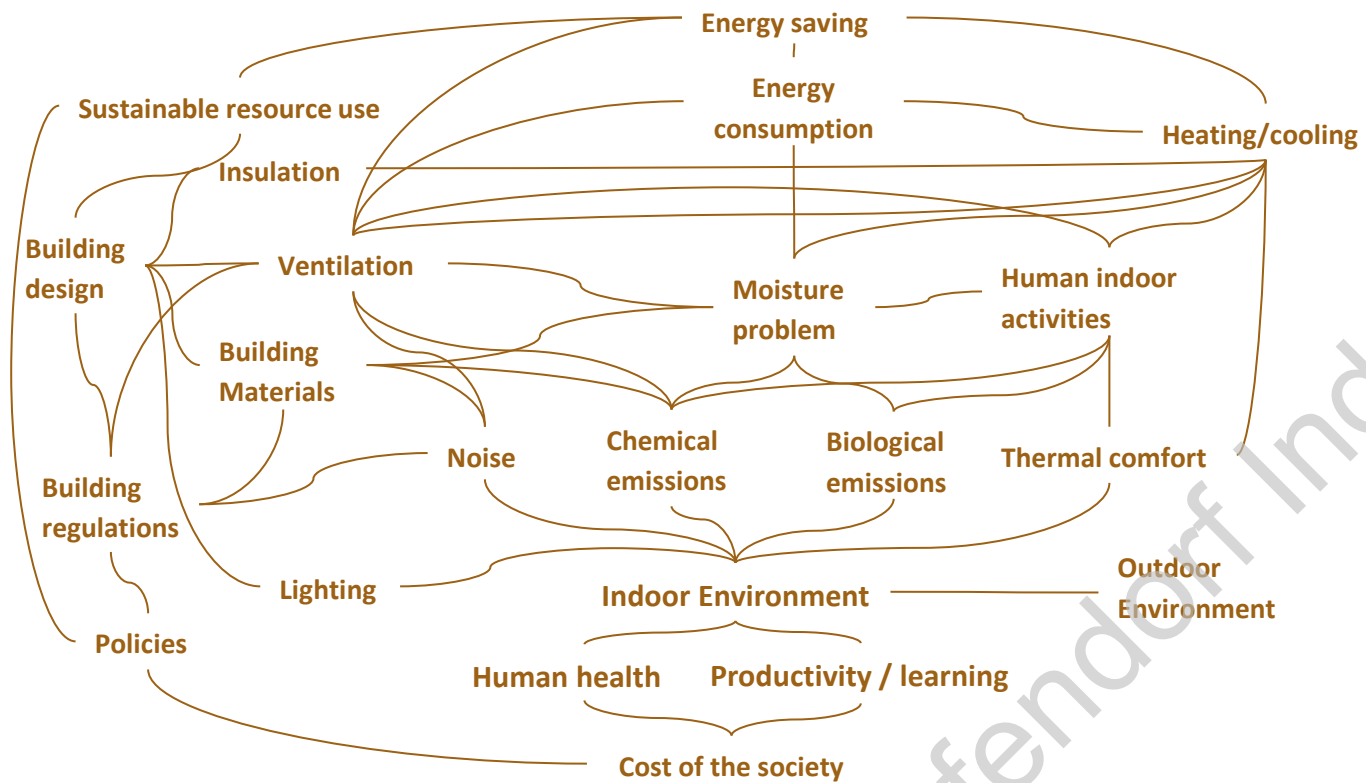
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- **Aesthetics**









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# Builder's idea house

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- **Thick wall**
- **Small window**
- **Nobody lives there**



# Controlling indoor climate

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- Climate shell
- Ventilation
- Heating / Cooling

Affected by:

- Exterior climate
- Activities – Cooking, Manufacturing etc
- Users – Number and their activities
- Materials
- ...

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# Reducing energy use - heating

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- Shape
- Few windows



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# Many conflicting goals

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Some typical:

- Energy
- Cost
- Comfort/Health
- Aesthetics

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# Examples of problems

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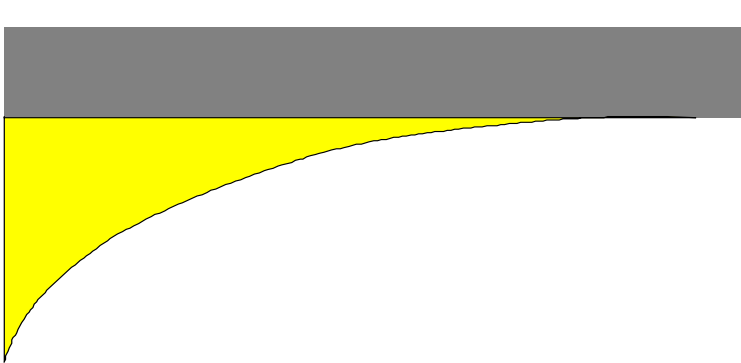
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# Slab foundations - moisture and heat

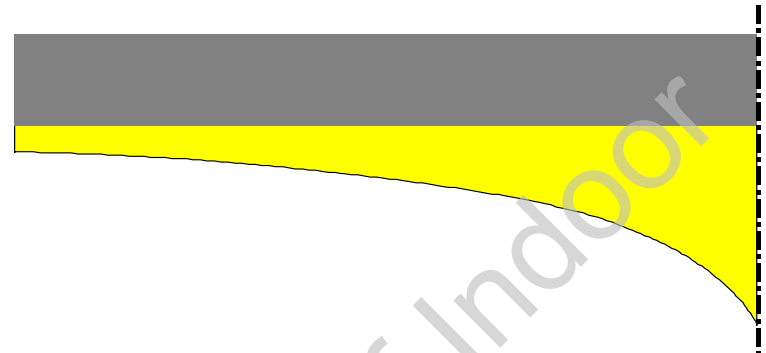
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Optimizing insulation under a concrete slab foundation concerning energy and moisture causes completely different solutions.

**Heat**



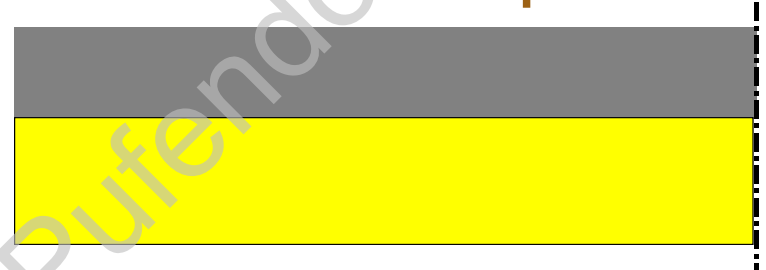
**Moisture**



**Heat & Moisture**



**Heat & Moisture in practice**



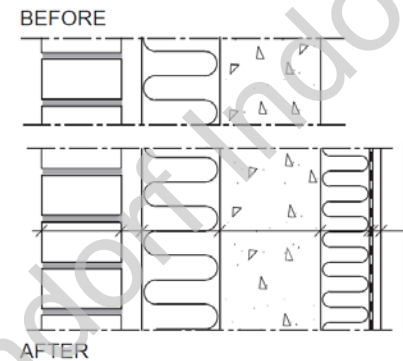
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# Miljonprogrammet - Lack of information

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- Adding interior insulation since brick exterior was considered to be in good state.
- Insufficient examination of the building failed to find formaledehyde-urea foam injected after completion



- Ventilation schedule



# Windows – placement in walls

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- Aesthetics decide placement
- Energy demands add more insulation which makes it more difficult to fasten windows
- Solution will be more costly and adds risk possibly shortening life expectancy

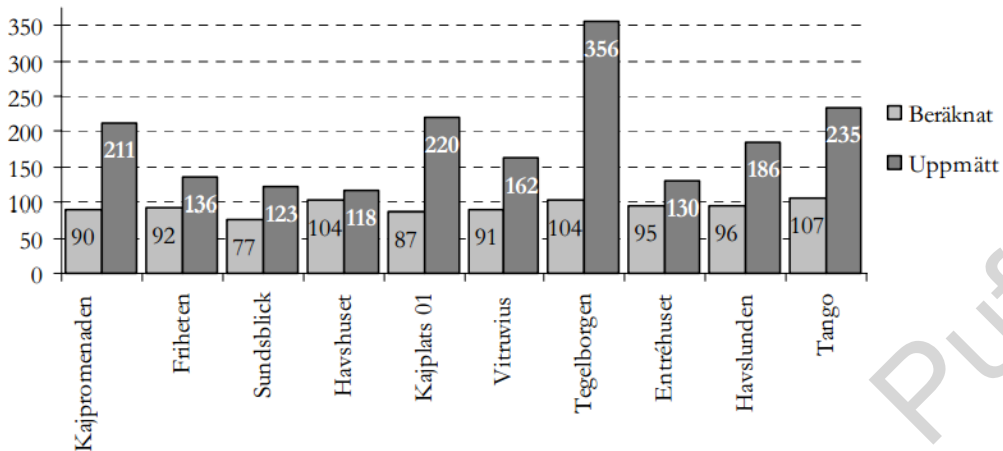
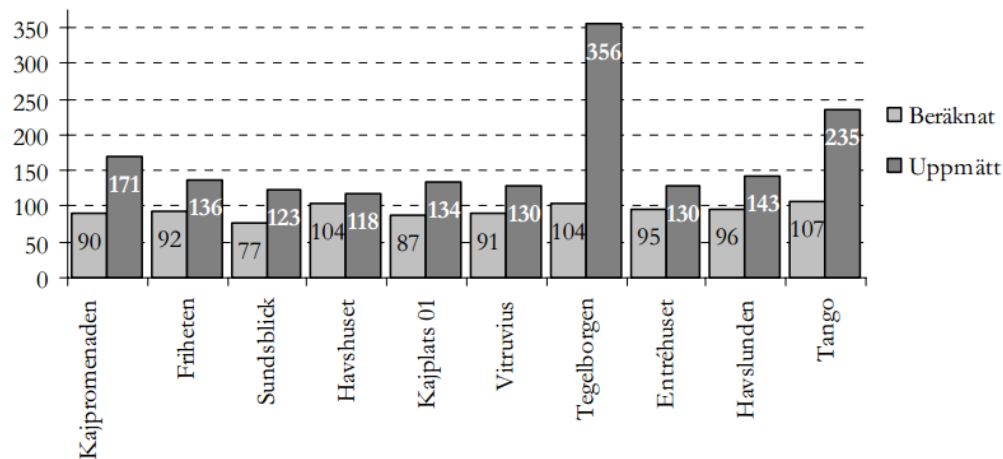
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# Bo01 – simulating energy use

Energi [kWh/(m<sup>2</sup>·år)]



## Energianvändning i nybyggda flerbostadshus på Bo01-området i Malmö

Annika Nilsson  
Licentiatavhandling



Annika Nilsson, 2003

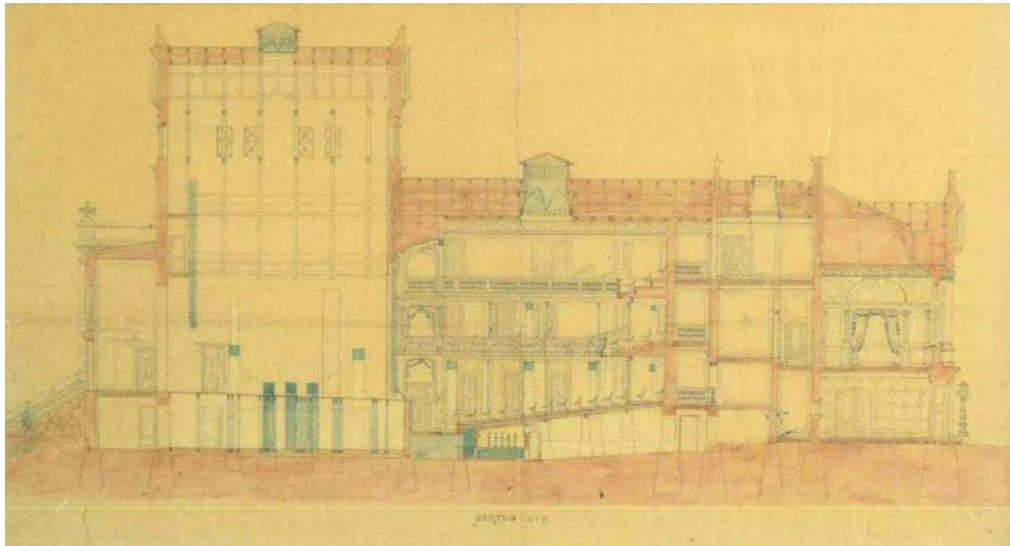


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# Historical buildings - changes

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- Adding HVAC system to a theatre causes shrinkage in wooden beams – effects on murals?
- Churches – changing heating and use affects moisture states affecting murals etc



# Examples of problems

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- Energy saving/moisture safety
- Climate change/Rules of thumb
- Higher demands/complexity
- Wet rooms - moisture safety/accessibility
- Thickness of cast-in-situ concrete between floor levels
- Comfort/complexity

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# Priorities will vary

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- Priorities and timescale of involvement varies:
  - Build to use
  - Build to let
  - Build to sell
- Decisions are based on priorities and consequences of breaking rules.
- Marketed solutions might not handle everything that has to be considered.



# Priorities??!?!?

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- What should be handled? When? By whom?
- Regulations...
- ...based on knowledge
- Combinations of emissions
- Pushing the limits increases risk.
- Climate change
- ....

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# Thank you!

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