THE COMFORT HOUSES

- experiences from praxis

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Supported by: Saint-Gobain Isover A/S

Content

- Introduction to passive houses and COMFORT HOUSES
- Presentation of THE COMFORT HOUSES
- The design processes behind the COMFORT HOUSES

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The project: The COMFORT HUSENE

The 10 COMFORT HOUSES

- is designed and constructed by 9 different consortiums
- is constructed according to the German passive house standard
- show architectural and technical possibilities
- is a learning process to the building industry

The vision is to get the Danish building industry into the elite

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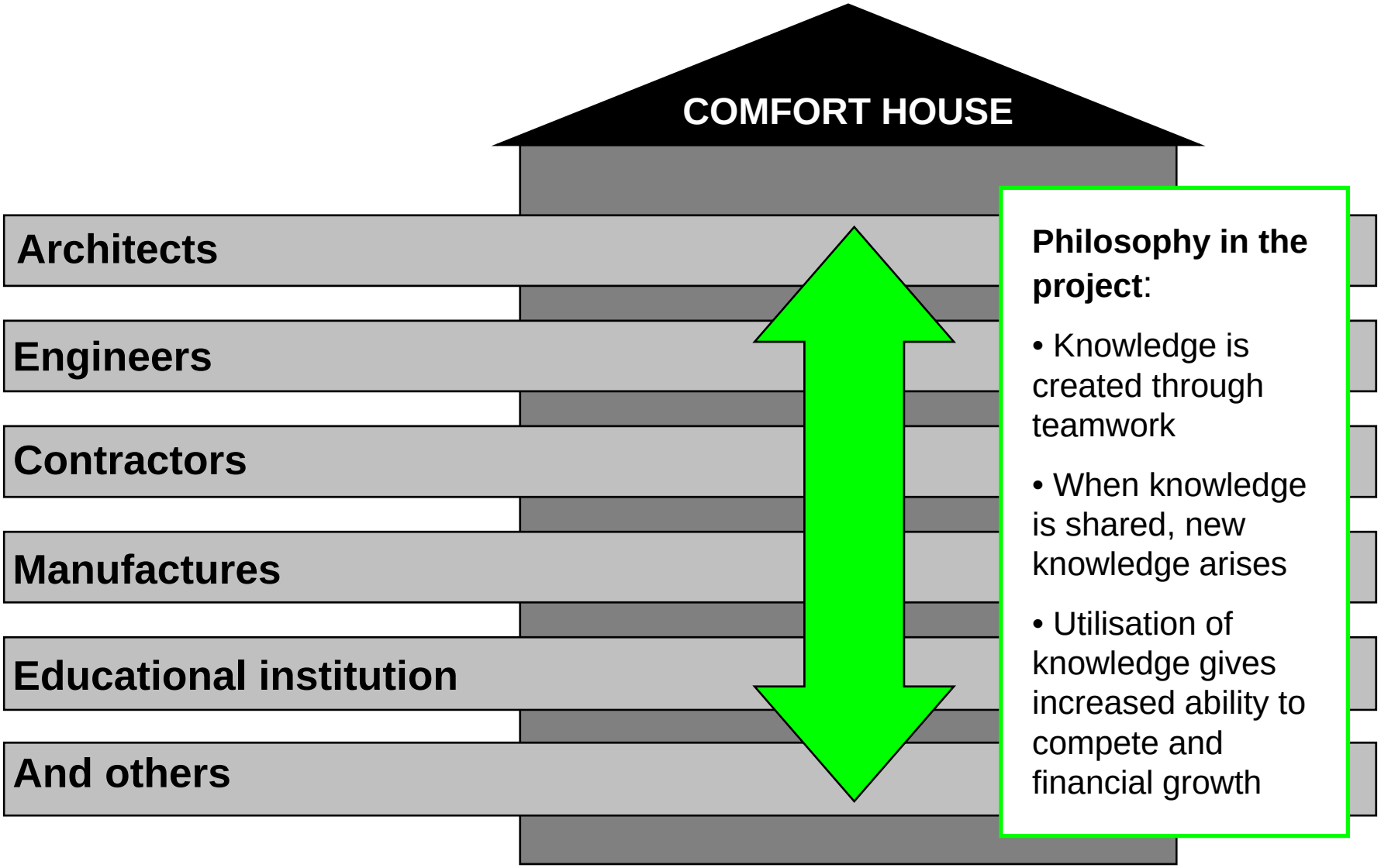
The project: Teamwork and learning



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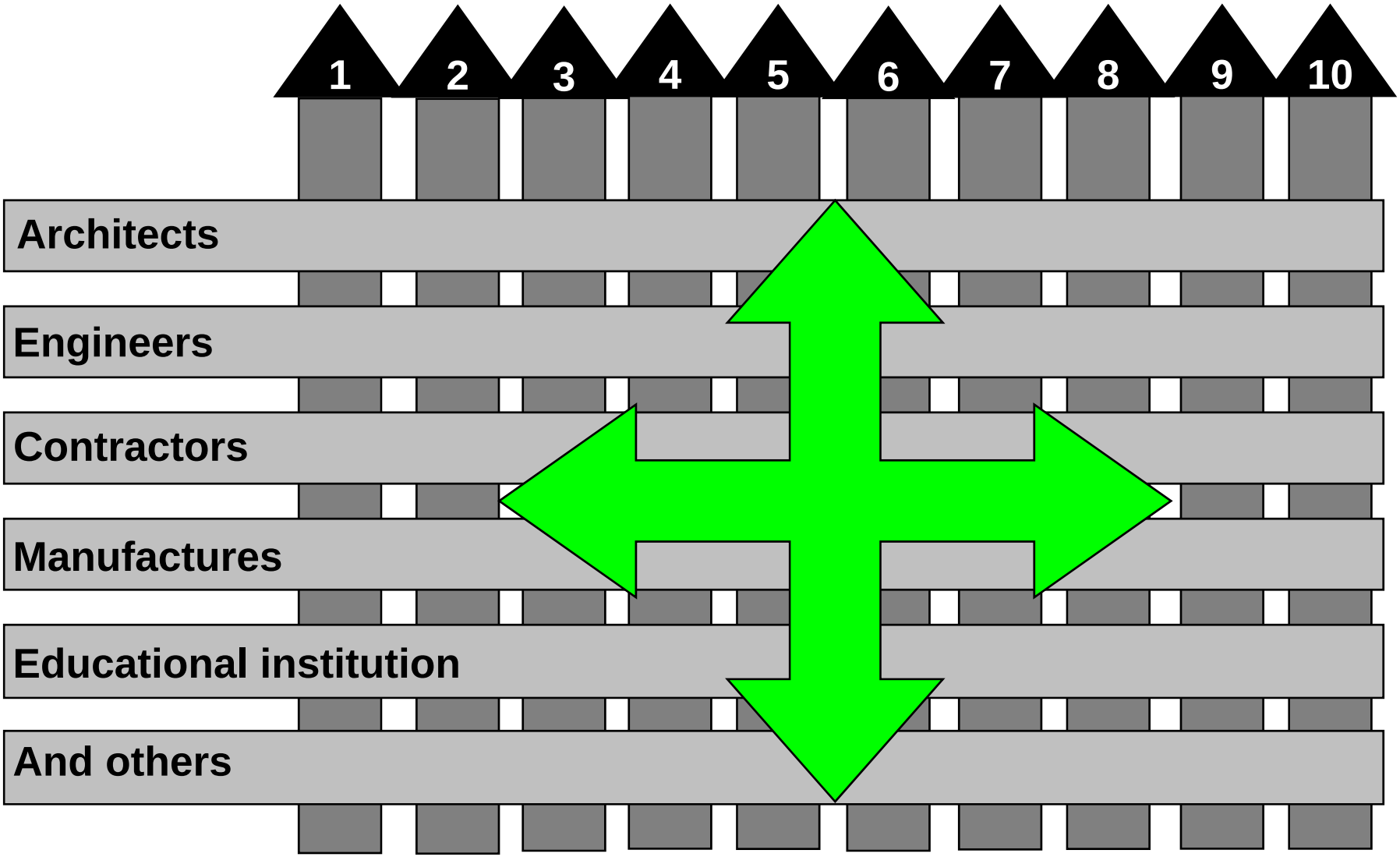
The project: Teamwork and learning



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The passive house – the COMFORT HOUSE

- The passive house criteria:
  - Space heat demand: 15 kWh/m^2 per year net m^2
  - Primary energy demand: 120 kWh/m^2 per year net m^2
  - Air tightness: 0,6 h^{-1}

- A COMFORT HOUSES is more than a passive house
  - Air quality
  - Thermal comfort
  - Noise
  - Daylight

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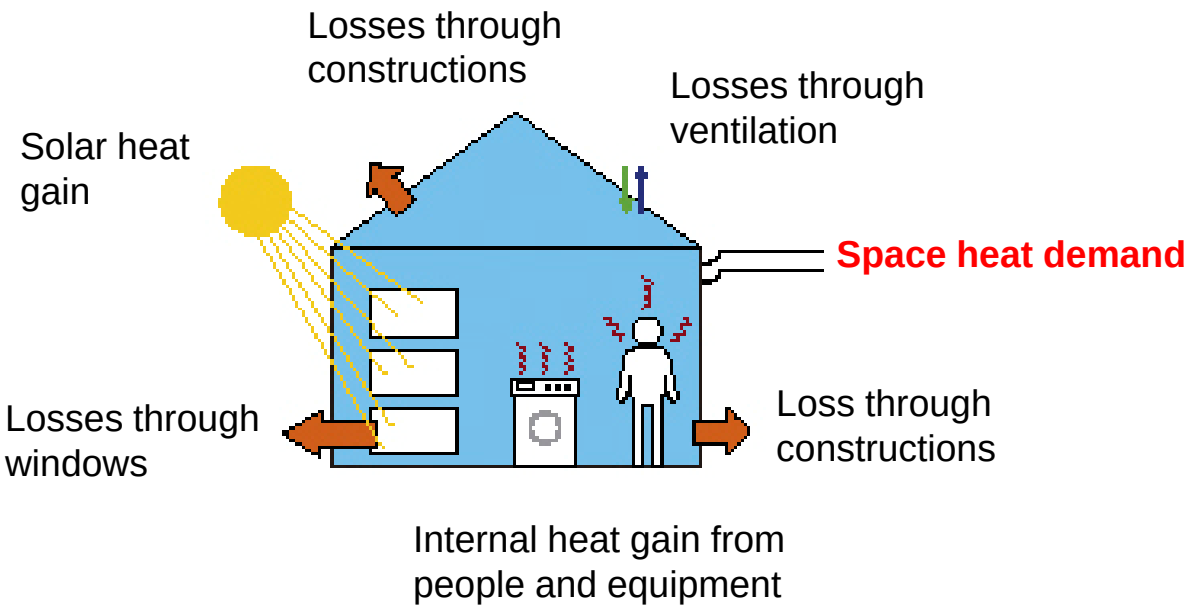
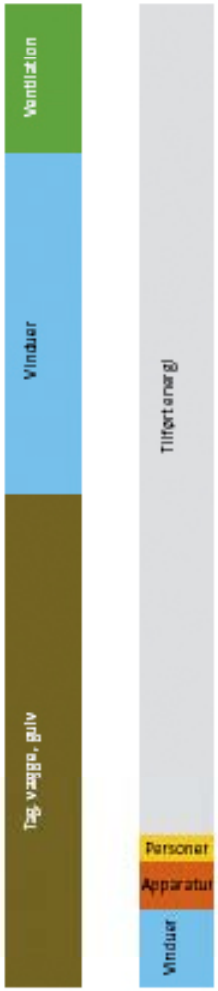
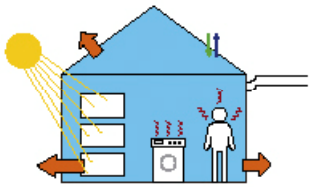
Space heat demand



Space heat demand

A standard building





A passive house

Max. 15 kWh/m^2 year

A passive house is optimized by:

Reduce the losses:

- Low U-value for constructions
- Low U-value for windows
- Reduce building envelope

Increase the gain:

- Recovery of 70-80% of the ventilation loss
- Optimal placment of windows

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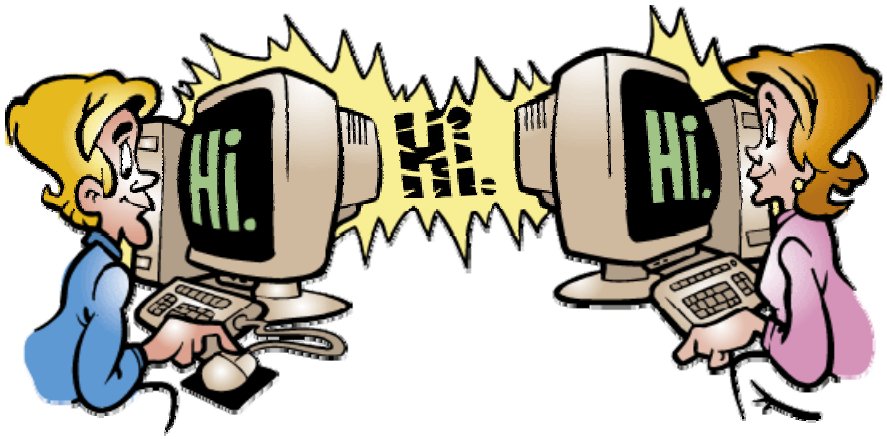
Primary heat demand

- All the energy for the building
  - Space heat
  - Hot water
  - Ventilation
  - Cooling
  - Electricity for technique
  - Electricity for household



Max. 120 kWh/m^2 year

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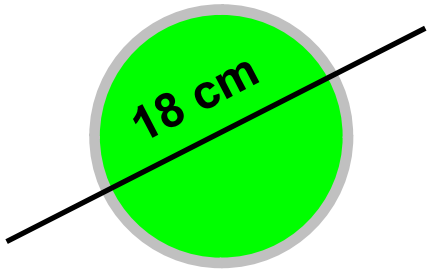
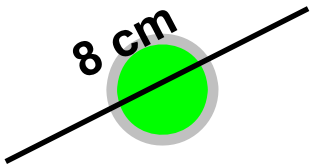
Air tightness



Demand in DK



Passive house

Max. 0,6 h^{-1} (50 Pa pressure difference)

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THE COMFORT HOUSES

More info at **www.komforthusene.dk**

KOMFORT HUSENE

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The COMFORT HOUSES – Bjerg Arkitektur

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The COMFORT HOUSES – Lunderskov Nybyg

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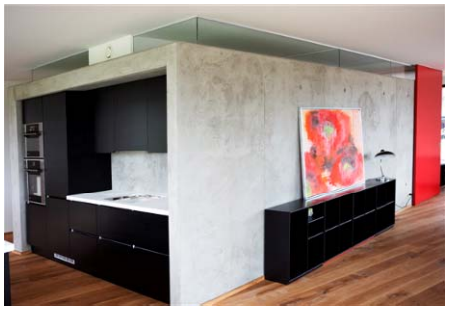
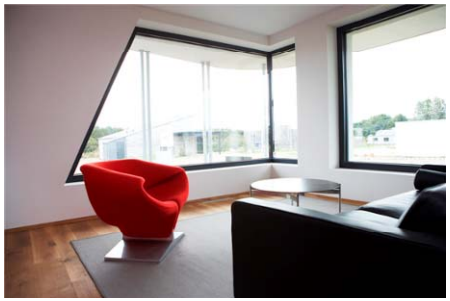
The COMFORT HOUSES - Kuben





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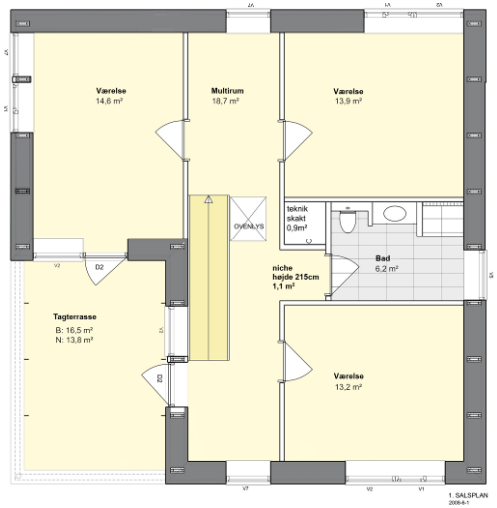
The COMFORT HOUSES - Villa Vision 1



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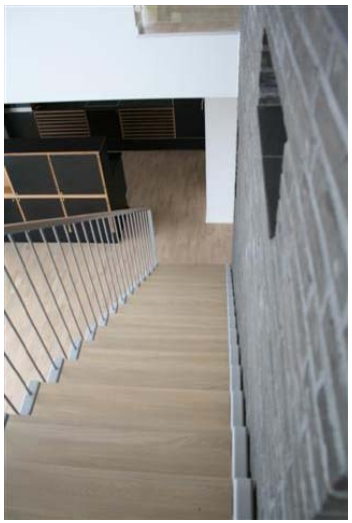
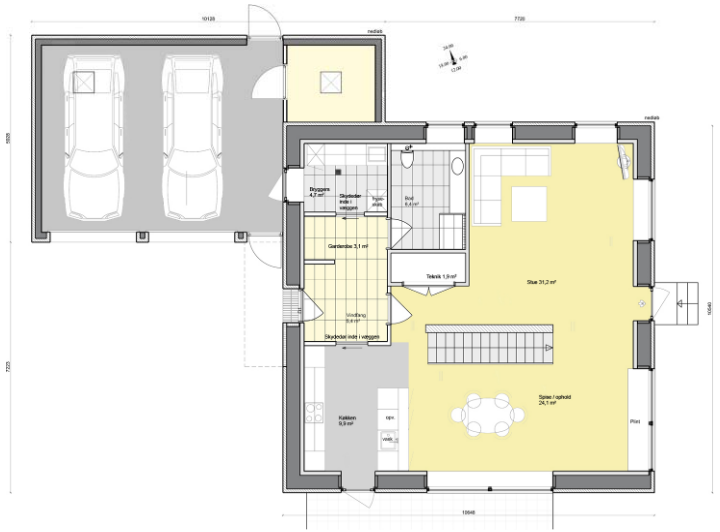
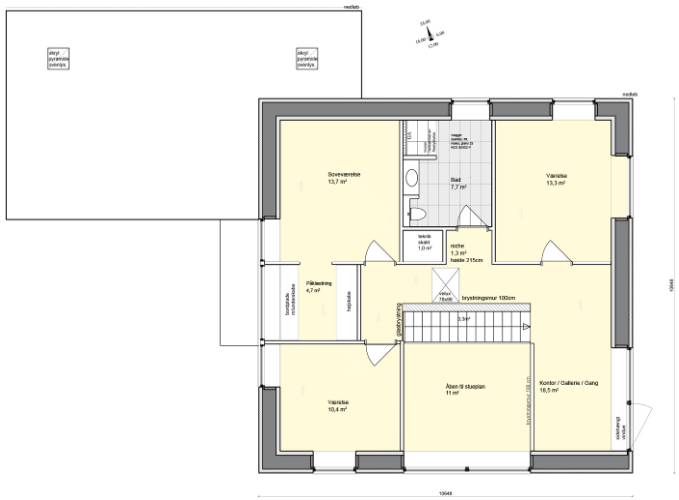
The COMFORT HOUSES - Villa Vision 2







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The COMFORT HOUSES - Thyholm

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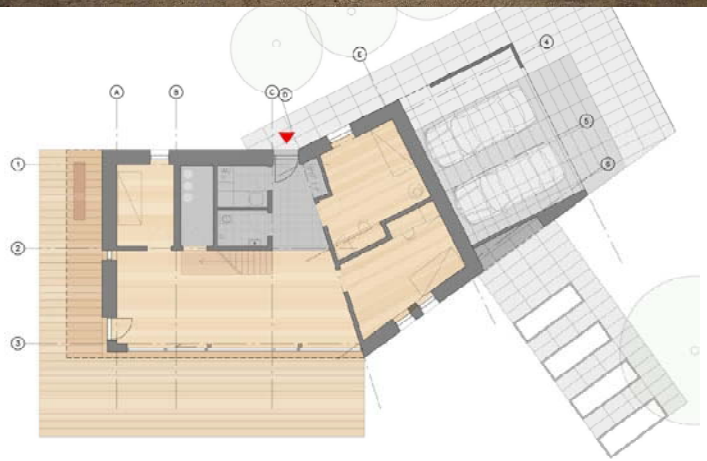
The COMFORT HOUSES - Rambøll



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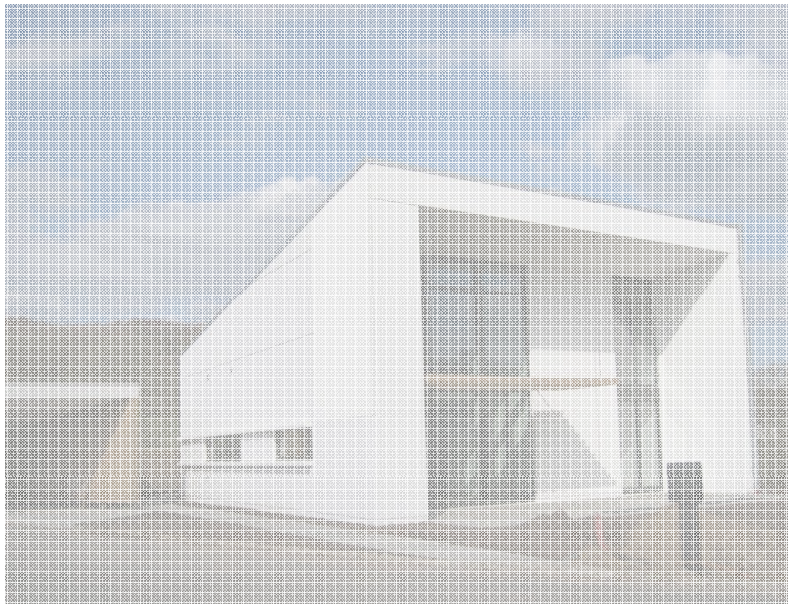
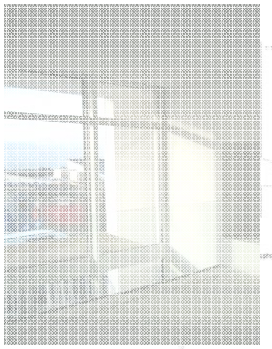
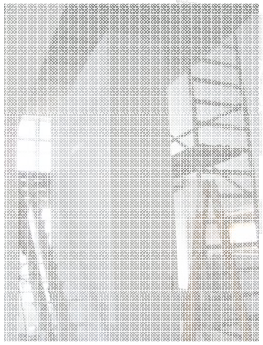
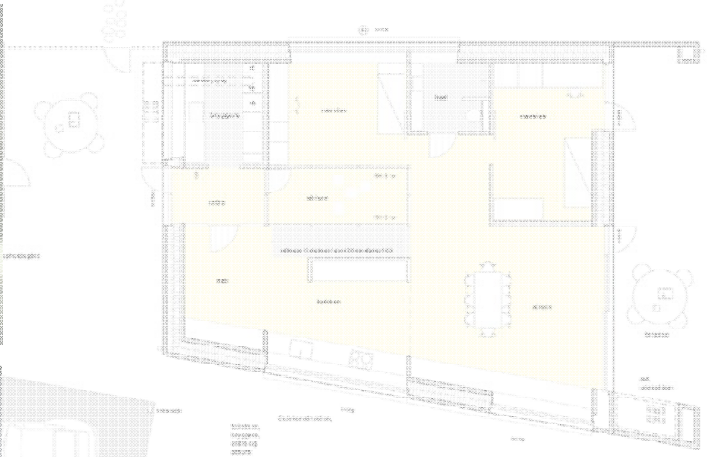
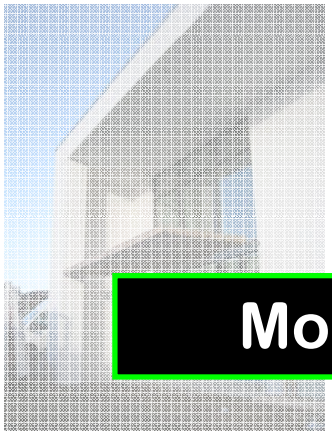
The COMFORT HOUSES– kWh-huset

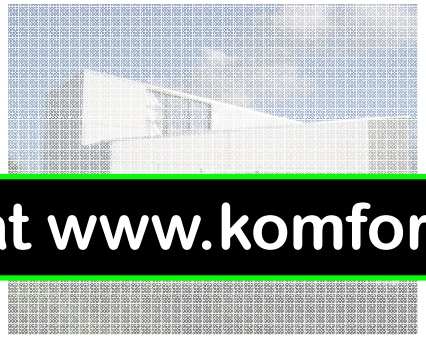


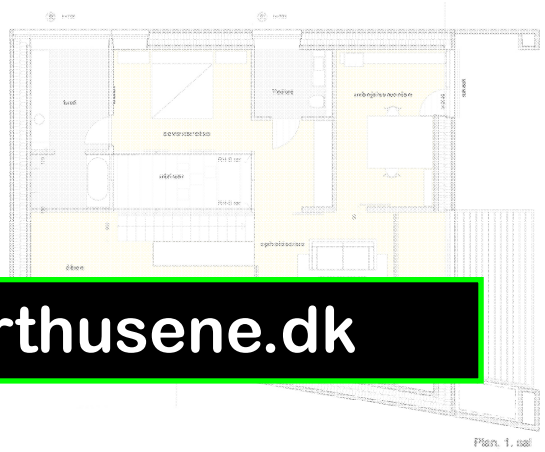












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THE DESIGN PROCESSES

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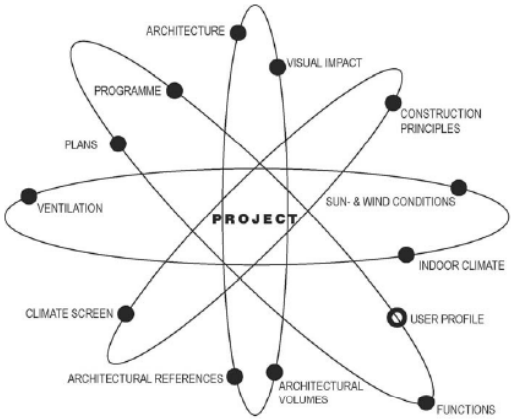
The objective of the research

The objective is to clarify the different design processes behind the first passive houses in Denmark, according to method, tools, teamwork and architectural quality.

Why talk about design processes?

- Building design is complex
- Low energy consumption and good indoor environment is often conflicting
- We use a lot resources to solve problems late in the detailing phase
- We see a lot of bad performing buildings

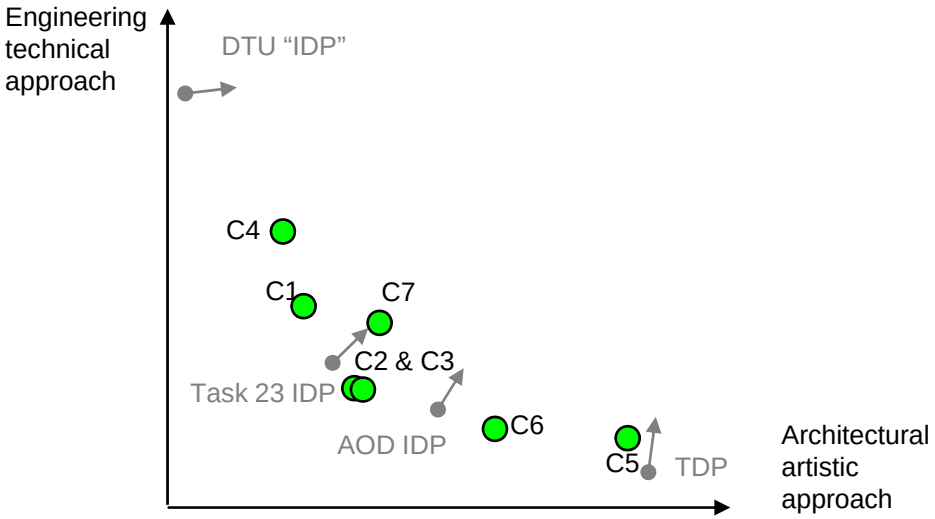


[Knudstrup 2006]

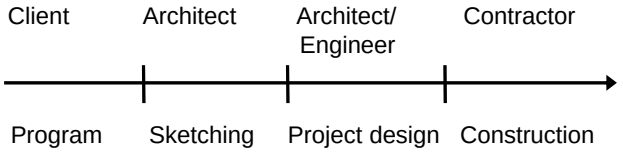
The design processes of the COMFORT HOUSES

- No methodical approach were dictated or presented form the initiators
- But they were encouraged to work interdisciplinary through teamwork

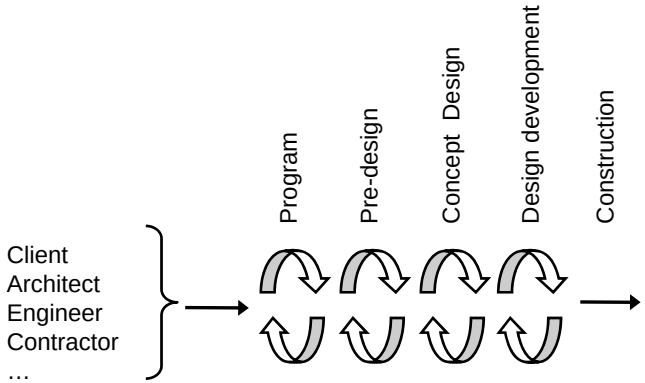
Results – the different approaches to the task



The Traditional Design Process (TDP)



The Integrated Design Process (IDP)



The different approaches are placed according to:

- the type of focus parameters in each case,
- the main actor or cooperation of different actors and
- when and how the actors are positioned in the process.

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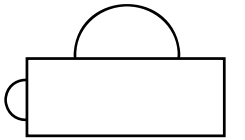
Results - teamwork

All consortiums work in a close teamwork from the beginning of the process

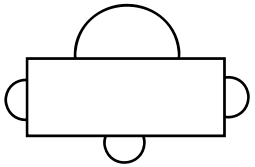
… but different interpretations of that.

Type 1

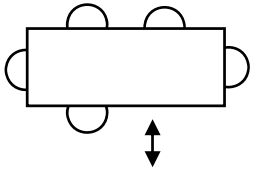


Later + ○ ○ …

Type 2

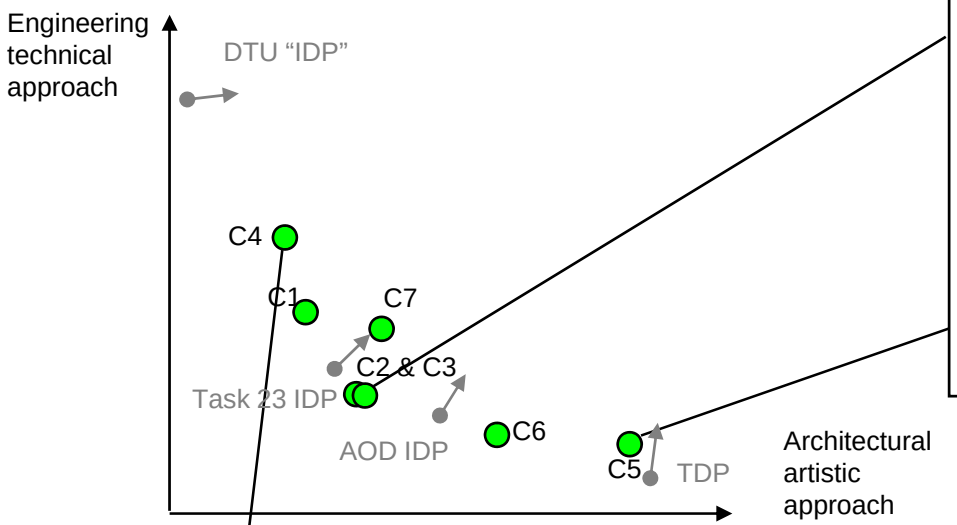


Type 3



Continually + ○ ○ …

Results – the different approaches to the task



*"**We did not think architecture and then think technique which should be stuffed into the architecture afterwards**. Or architecture first and then we had to document if the energy calculation is fulfilled afterwards. We made some sketches and calculated, considered the technique, then we made changes, considered the technique again, calculated energy - and also considered how we practically should build (the house) … We continuously did that in steps, where **we tried to keep all the things (parameters) in focus at the same time**, instead of trying to fix it or bring it in at a time where it is hard to get it integrated." (The engineer, consortium 3)*

*…ing that you in …and there was …o do that, and …! Then you …uld look like, …as and … the **…mely** …hat is before you have had the time to consider the design, because you have not had the time to calculate and you actually do not know very much (about passive houses). … What was it that we were about to do? We had to learn, but we could not use that for anything because we had promised (how it should look like) … **we could have changed a little on the windows ... But we had promised how the house should look like** and it is really the architectural idea how the window is placed and turns that direction. Then you cannot change that." (The engineer, consortium 5)*

*"Of course you would wish that there had been constructed something … a piece of architecture, right? But because it should express something that both is typical to a Danish standard house, at the same time something that the contractor could bring out to the market and at the same time be the cheapest, then it **had a lot of constrains in relation to the architecture** … The technical part is the heaviest in a single-family house in one storey. I think so as an architect. It means that **you do not sit down and sketch by a loose hand**. You draw a rectangle and send it to the engineer and ask: ´Is it better now? ´ There is no architecture in that, in principal. ´Should it be a little lower? Arh 20 cm lower ceiling inside´ … **It has been a challenge according to think architecture and at the same time think of a passive house in one storey** … "(The architect, consortium 4).*

Results – Architectural qualities

- Architectural qualities is changes or disappear in the process because of:
  - energy calculations
  - economy
- Why do that have consequences for the architectural qualities?

Architectural qualities vs. energy and economy =

↓ ↓

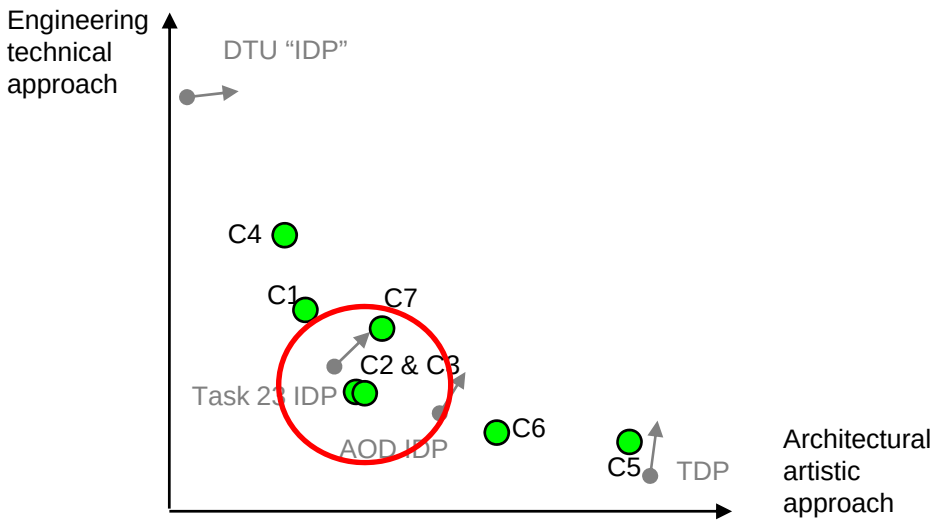
Qualitative knowledge vs. quantitative knowledge

↓ ↓

Subjective, point of views – non definable	Measurable – well defined, facts

Conclusion

I think that the future design approach should be placed in the region of Task 23 IDP and AOD IDP → Holistisk design



Conclusion

Recommendations from the consortiums

- Good teamwork early in the design process
- Work interdisciplinary
- You have to see the design task as a joint mission – all aspects concern everybody
- All have to be enthusiastic about the project
- Integrate the energy aspects in the architectural expression from the beginning
- Draw up some guidelines that should be followed
- The dialog in the teamwork have to go all the way to the craftsmen

IDP – the Integrated Design Process

Conclusion

Problems and barriers:

– Different understandings of the same things, because of different professions and their traditions

– Primarily the economy has an impact on the resulting architectural qualities.

– The architects have picked up knowledge from the technicians, but not the reverse.

– The resulting teamwork and approach vary a lot even though they all agree on close teamwork from an early stage.

– Frustration from some actors, because of to little influence on the design.

Løsninger:

– Dialog and openness to each others professions to get a common understanding of issues in the process.

– Dialog and openness to get a common understanding of both quantitative and qualitative parameters, especially the latter.

– Discuss and define the constellation of the teamwork according to the approach to the task – use an IDP.

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Løsninger:

- Use a Design Facilitator in the teamwork e.g. an architect with a lot of experience with low energy houses and the technical aspects connected to that or an architect trained in AOD IDP.
  - Overview of process and discover unclear issues.
  - Understand the architectural as well as the engineering language.
  - Can assist communication between professions

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Questions?

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