

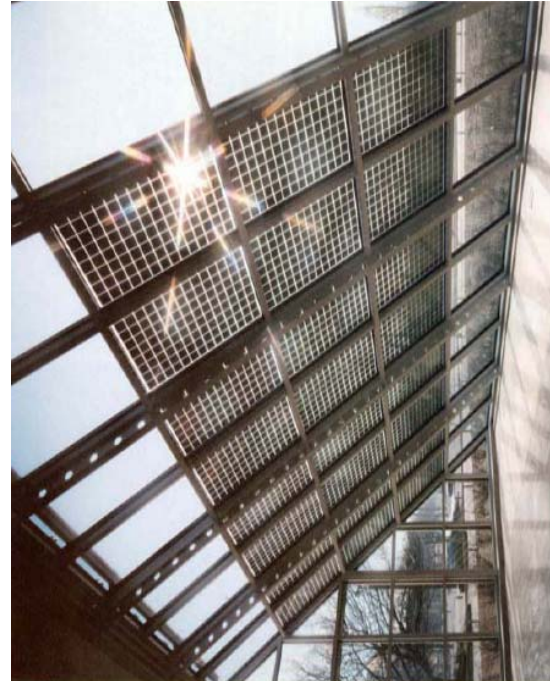
GUIDELINE

INTEGRATED ENERGY DESIGN

Katharina Bramslev
Green Building Alliance



The 9 steps to a low-energy building *the process*



An INTEND-product

The following partners contributed to the guide:

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- Per F. Jørgensen, KanEnergi AS, Norway
- Katharina Bramslev and Erik Hammer, Green Building Alliance, Norway
- Arne Forland-Larsen and Hanne Lehrskov, The Engineering College of Aarhus, Denmark
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- Nicole Holanek, Austrian Energy Agency
- Afroditi Synnefa, National and Kapodistrian University of Athens Department of Building Physics, Greece
- Michael Wilson and John Solomon, London Metropolitan University, United Kingdom
- Kirsten Sander, architect maa, KS architects Energy Service and The Green House, Denmark



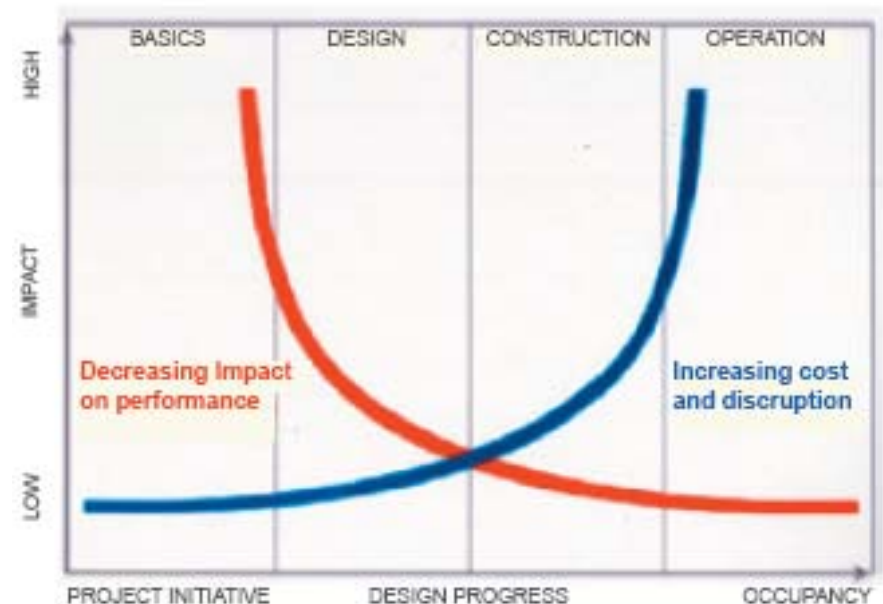
Intelligent Energy  Europe



Why Integrated Energy Design?



The conventional
design process

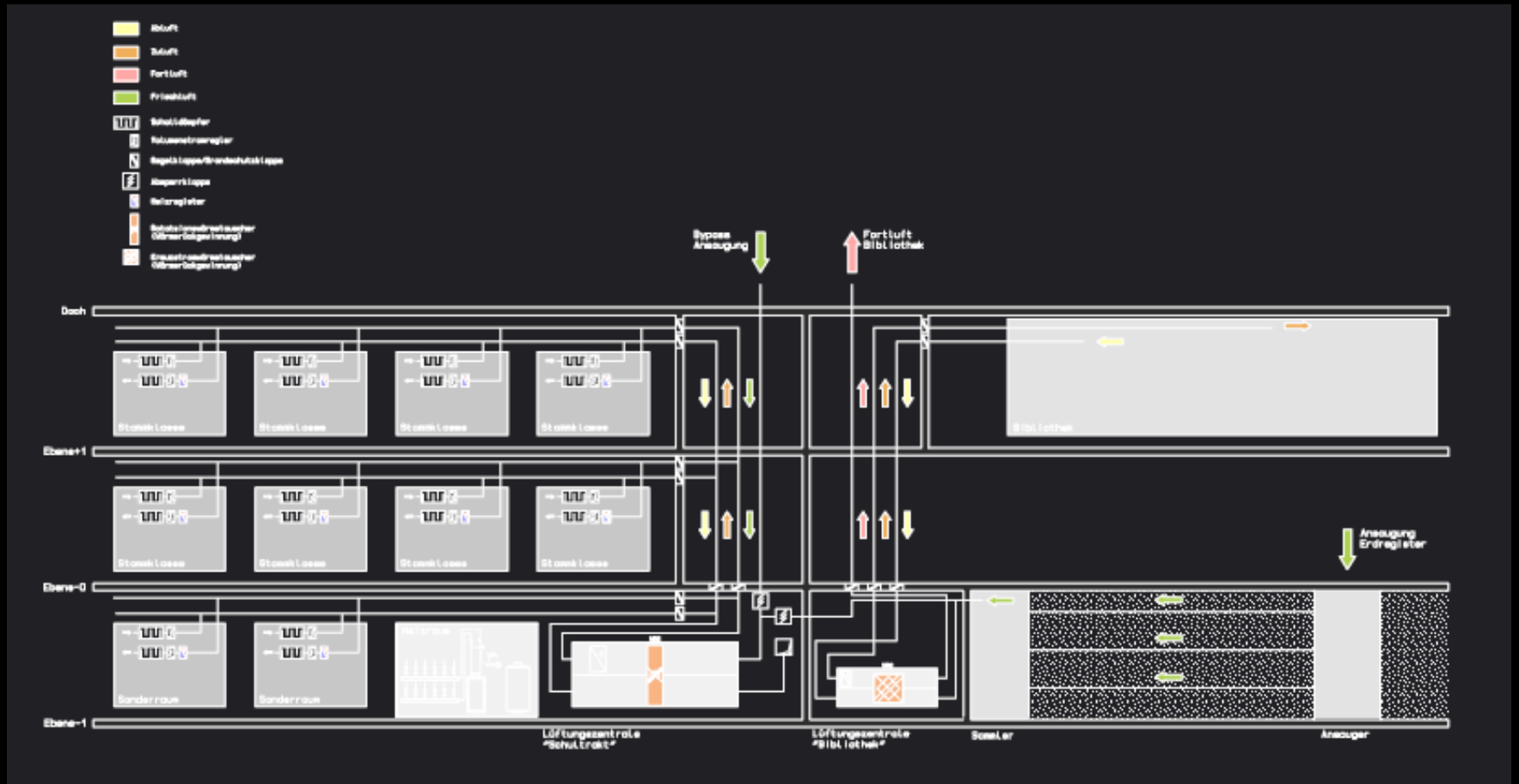






HAUPTSCHULE KLAUS arch: DIETRICH







HAUPTSCHULE KLAUS arch: DIETRICH UNTERTRIFALLER

STEP 1

select a multi-disciplinary
design team from day 1

PROGRAMMING
Design team

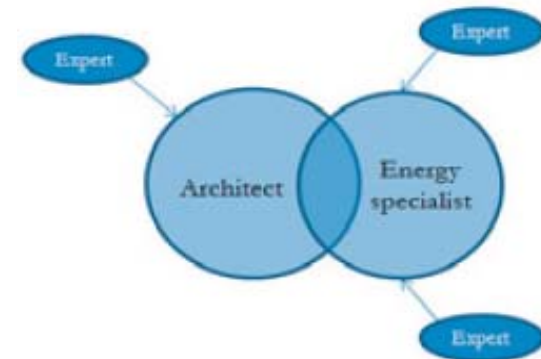
CONCEPT DESIGN
Design team

DETAILED DESIGN
Design team

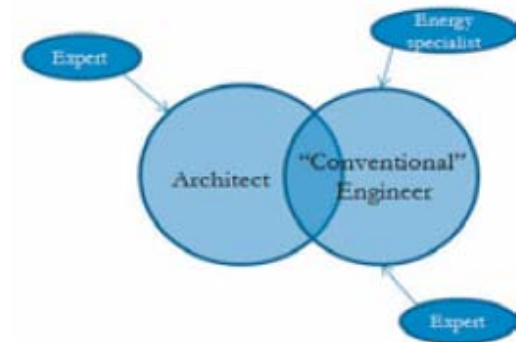
CONSTRUCTION
Design team

OPERATION
User

The IED design process



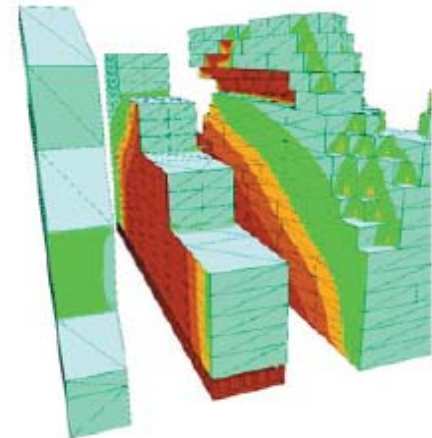
CONCEPT DESIGN PHASE



DETAILED DESIGN PHASE

STEP 2

analyse the **boundary conditions**



STEP 3

make a **Quality Assurance Program** and **Quality Control Plan**

Project example – Headquarter of the Assurance Company Storebrand, Oslo Norway

Main topics in the Quality Assurance Program:

1. **Comfort**
 - Indoor Air Climate
 - Logistics
2. **Sustainability**
 - Energy budget of 125 kWh/m² (Norwegian energy labeling B)
 - Use of renewable energy
 - Use of sustainable materials
 - Waste management
 - Transport
 - Water efficiency
3. **Functionality**
 - Flexibility
 - Life cycle costs
4. **Universal design**
5. **Aesthetics**



STEP 4

arrange a **kick-off** workshop

Agenda

1. Overall goals
2. What is IED
3. How to co-operate in the project
4. Main challenges
5. Important milestones and follow-up



STEP 5

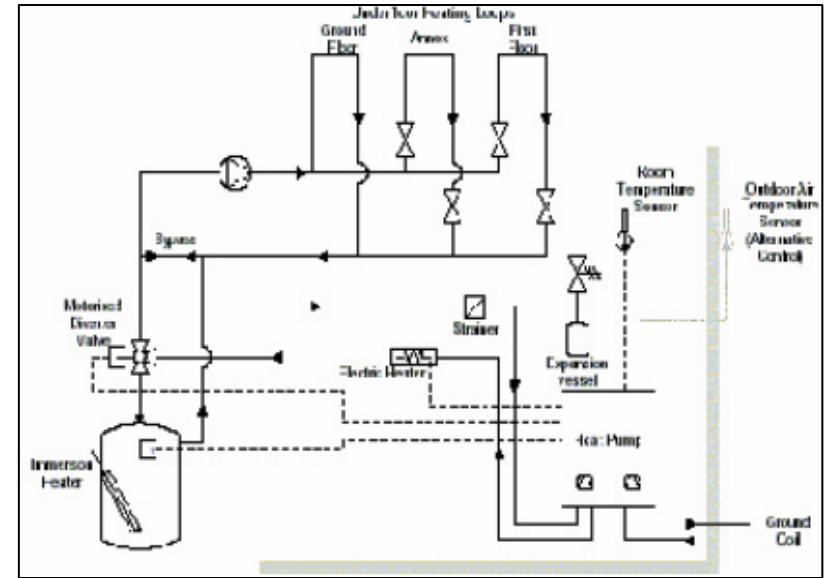
facilitate **close cooperation** within the design team



The conventional design process



The IED design process



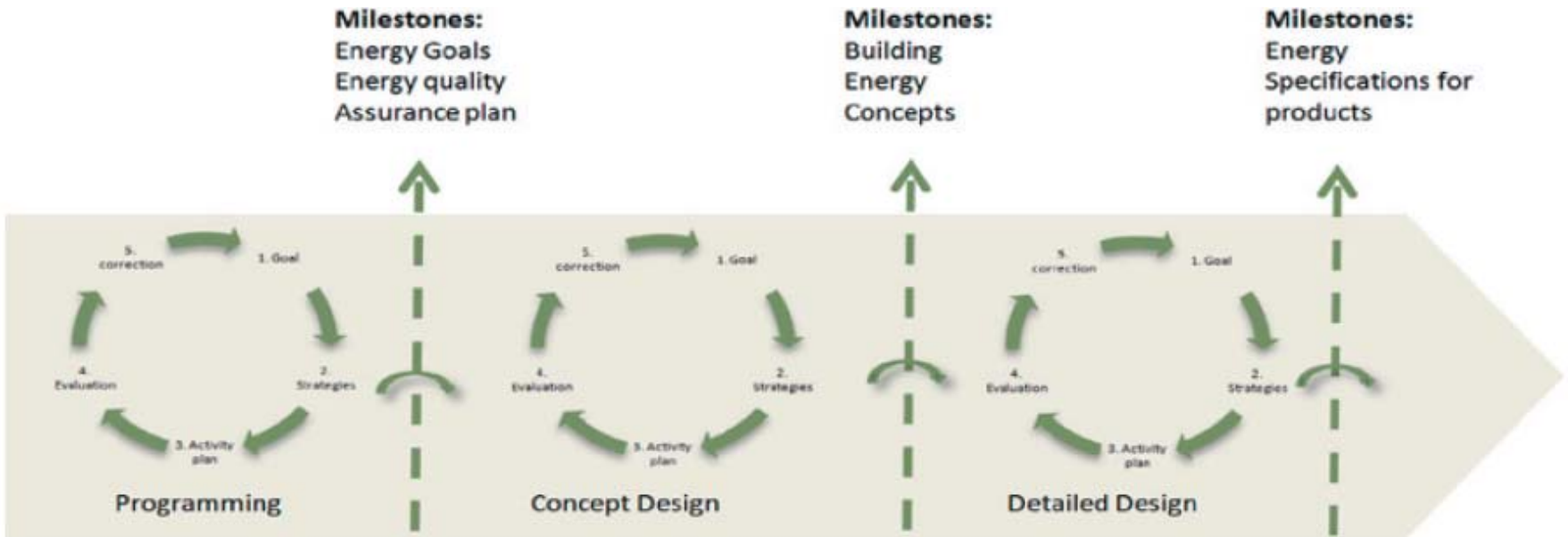
Sustainability

=

Sustainability ?

STEP 6

update the control plan and document the energy performance



Energibudsjett		Energibru	Energibru
Energipost			
Romoppvarming		70352 kWh	
Ventilasjonsvarme (varmebatterier)		20378 kWh	
Oppvarming av tappevann		12027 kWh	
Vifter (ventilasjon)		24445 kWh	
Pumper		9500 kWh	
Belysning		36130 kWh	
Teknisk utstyr		72254 kWh	
Romkjøling		0 kWh	0.0 kWh/m²
Ventilasjonskjøling (kjølebatterier)		22024 kWh	9.2 kWh/m²
Total		267109 kWh	111.3 kWh/m²

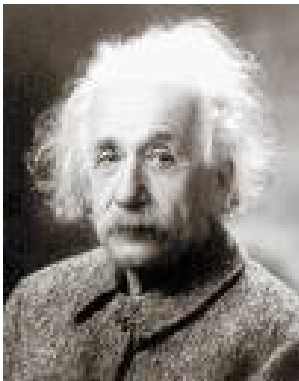
Energibudsjett		Energibru	Energibru
Energipost			
Romoppvarming		70352 kWh	
Ventilasjonsvarme (varmebatterier)		20378 kWh	
Oppvarming av tappevann		12027 kWh	
Vifter (ventilasjon)		24445 kWh	
Pumper		9500 kWh	
Belysning		36130 kWh	
Teknisk utstyr		72254 kWh	
Romkjøling		0 kWh	0.0 kWh/m²
Ventilasjonskjøling (kjølebatterier)		22024 kWh	9.2 kWh/m²
Total		267109 kWh	111.3 kWh/m²

Energibudsjett			
Energipost	Energibru	Spesifikk energibru	
Romoppvarming	70352 kWh	29.3 kWh/m²	
Ventilasjonsvarme (varmebatterier)	20378 kWh	8.5 kWh/m²	
Oppvarming av tappevann	12027 kWh	5.0 kWh/m²	
Vifter (ventilasjon)	24445 kWh	10.2 kWh/m²	
Pumper	9500 kWh	4.0 kWh/m²	
Belysning	36130 kWh	15.1 kWh/m²	
Teknisk utstyr	72254 kWh	30.1 kWh/m²	
Romkjøling	0 kWh	0.0 kWh/m²	
Ventilasjonskjøling (kjølebatterier)	22024 kWh	9.2 kWh/m²	
Total	267109 kWh	111.3 kWh/m²	

STEP 7

make **contracts** that encourage energy efficiency

- *Partnering*
- *Performance contracting* based on e.g. achieving an energy goal



You can't solve the challenges of tomorrow with the solutions of yesterday

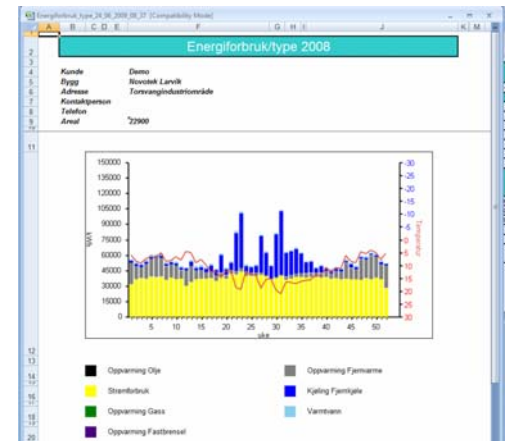
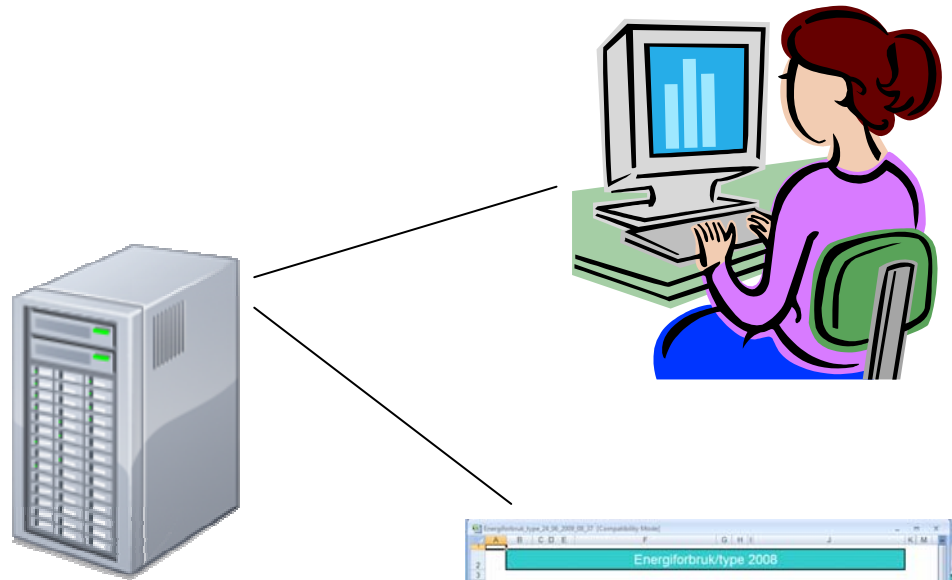
STEP 8

motivate and **educate** construction workers
and **apply quality tests**



STEP 9

make a **user manual** of operation and maintenance



Download the guide at www.Intendesign.com

Main design concerns, with sub-categories of design issues. Adapted from Steemers 2006 - Intend - Windows Internet Explorer

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Main design concerns, with sub-categories of design issues. Adapted from Steemers 2006

The characteristics of the conventional design process is often as follow:

- 1)The architect and the client agree on a design concept, consisting of a general massing scheme, orientation, fenestration and, usually, the general exterior appearance as determined by these characteristics;
- 2)The mechanical and electrical engineers are then asked to implement the design and to suggest appropriate systems to achieve acceptable indoor climate.

However as shown on the figure below cooperation early in the design phases offer opportunity for large impacts on performance to the lowest cost and disruption. Therefore is it important to cooperate early in the design phase immediately after the idea arise.

Early cooperation is not without difficulty and the architects and engineers need to adapt their working methods and to change the way they communicate. The IED Guideline will help you though that process so you can capable of making good quality low-energy buildings at lowest cost.

Guideline:
The process of IED

Integrated Energy Design

Some principles of low energy building design

100%

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