



Integrated building and system design for increased exergy performance

Ilari Aho
Uponor Corporation

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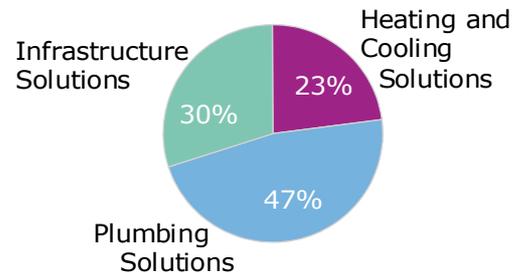
Uponor in brief



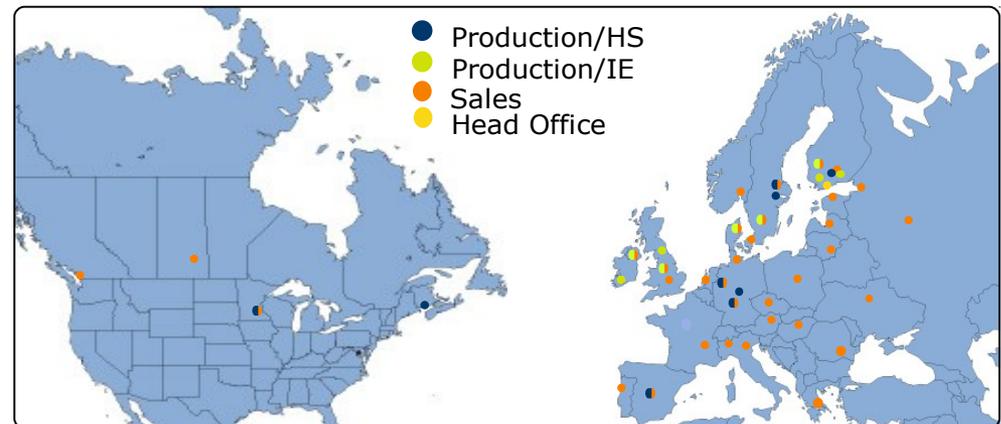
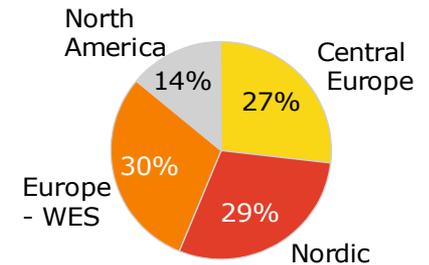
- Leading provider of
 - radiant heating and cooling solutions
 - flexible and reliable plumbing systems
 - infrastructure solutions in Europe and North America

- Net sales for 2007: EUR 1,2billion
- Subsidiaries in 22 countries, 17 production units in 9 countries
- Personnel: c. 4,700

Business groups



Regions



The Exergy Concept

- Exergy is the ability of an energy flow to do work
- Exergy combines the quality and quantity of energy
- Exergy analysis is established practice in power plant optimisation, industrial ecology, etc
- First applications to the building sector in the 1990s
- Exergy in practice:
Match the quality of supplied energy to the quality needs of the demand side



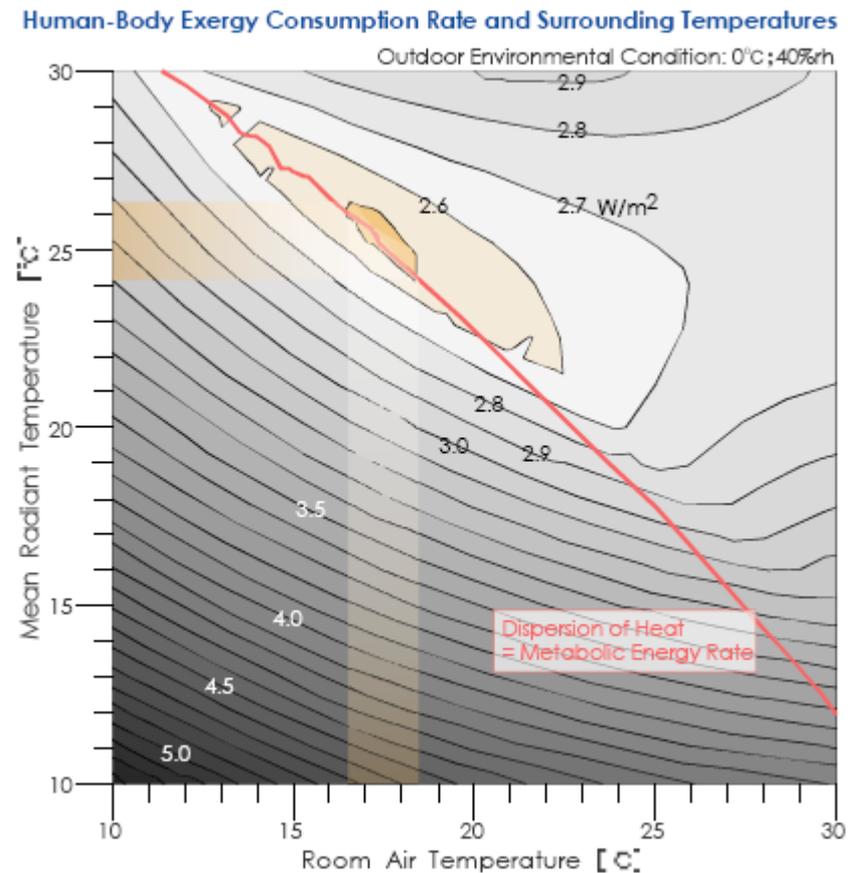
HEATING AND COOLING WITH FOCUS ON
INCREASED ENERGY EFFICIENCY AND IMPROVED COMFORT



Edited by Mia Ahl-Juulius

Indoor comfort and the exergy concept

- The human body's minimum exergy consumption rate occurs when mean radiant temperature is higher than the mean indoor air temperature.
 - consistent with perceived thermal comfort
- High-comfort and low exergy heating strategies are built on
 - efficient insulation
 - passive solar utilisation
 - moderate radiant heating with large surfaces
- A similar analysis can be done for cooling systems under summer conditions.



Source: Musashi Institute of Technology, Japan

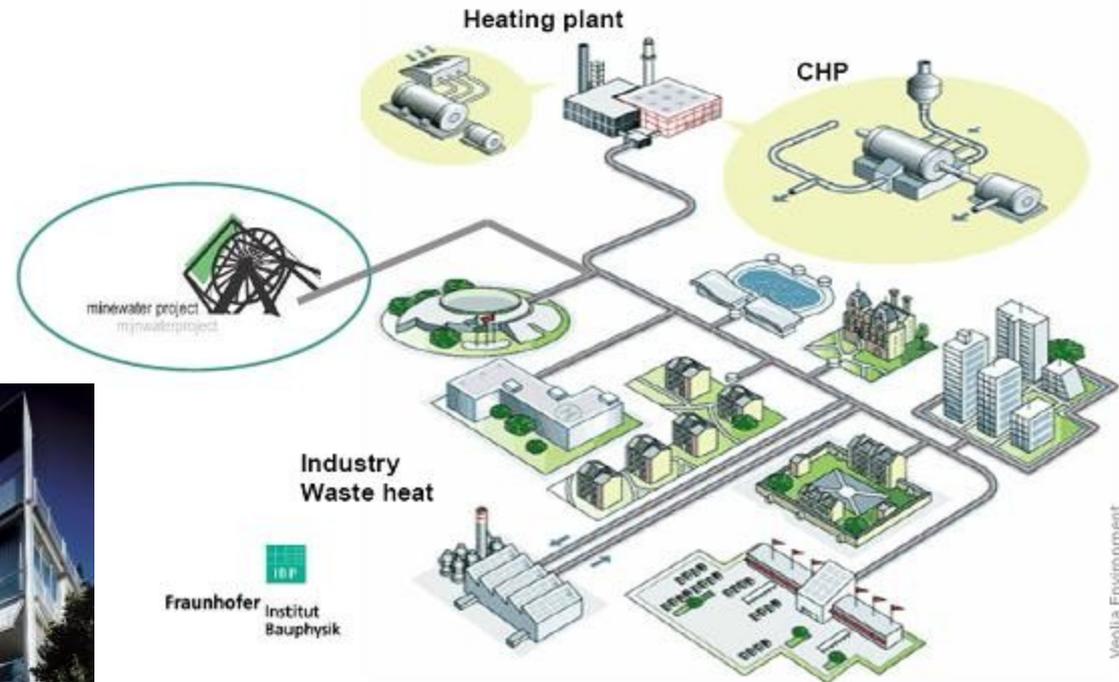
Exergy performance is delivered at the community level



High-performance buildings

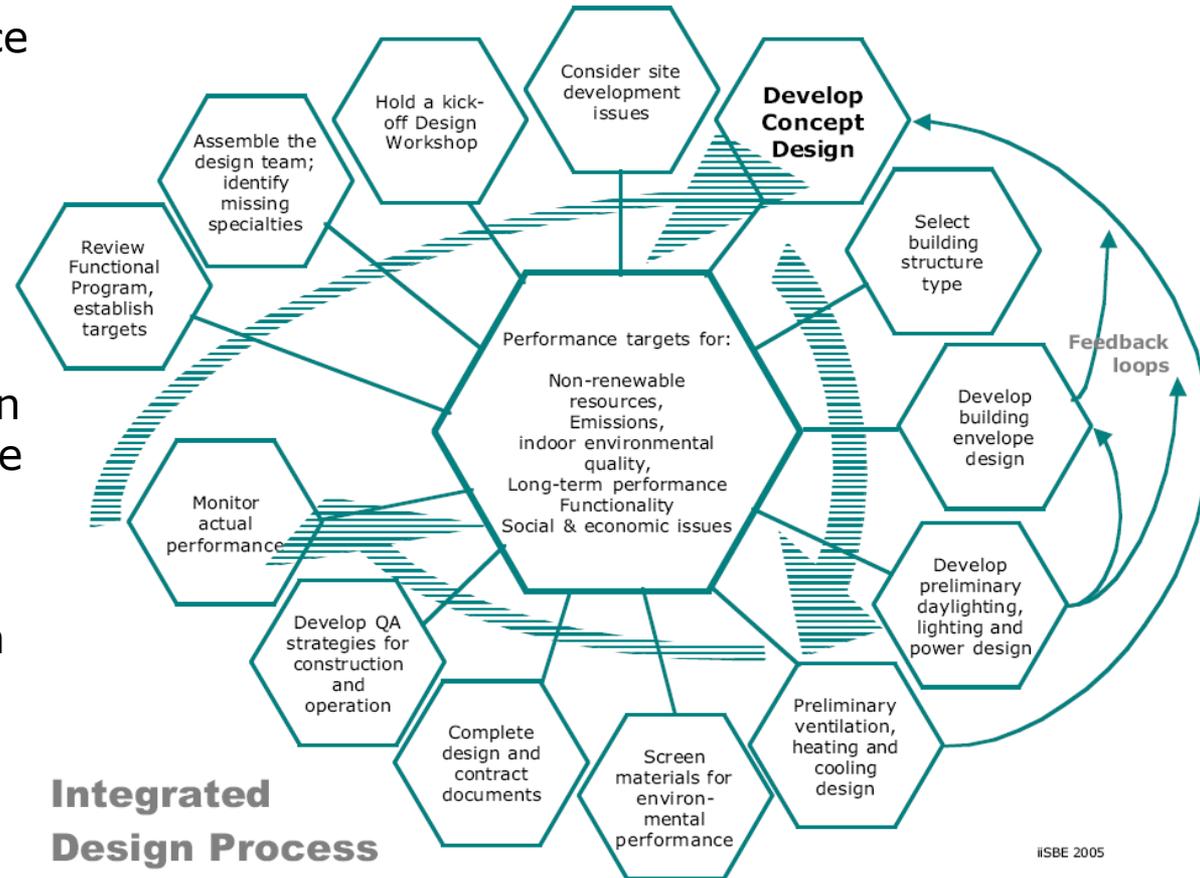
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LowEx Supply structures



Integrated Design Process

- Explicit design targets for building performance as a whole
- Multidisciplinary teams from the start
- Performance verification and approval during site operations
- Commissioning for high performance
- Build for usability, operability and maintainability



Centre for Sustainable Building (ZUB), Kassel, Germany

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The construction of the ZUB office, research and exhibition building is an example of what today's state of the art of technology for low energy demand and sustainable building can look like.

Planned as an example of a low energy building, the new office of about 1300 m² is attached to an existing preserved building and consists of three different main parts: one for exhibitions and



events, one for offices, and an experimental part for different kinds of research in innovative building techniques and building services.

A special focus was given to the realisation of a sustainable cooling concept, using a renewable energy source: the coolness of the ground underneath the building.

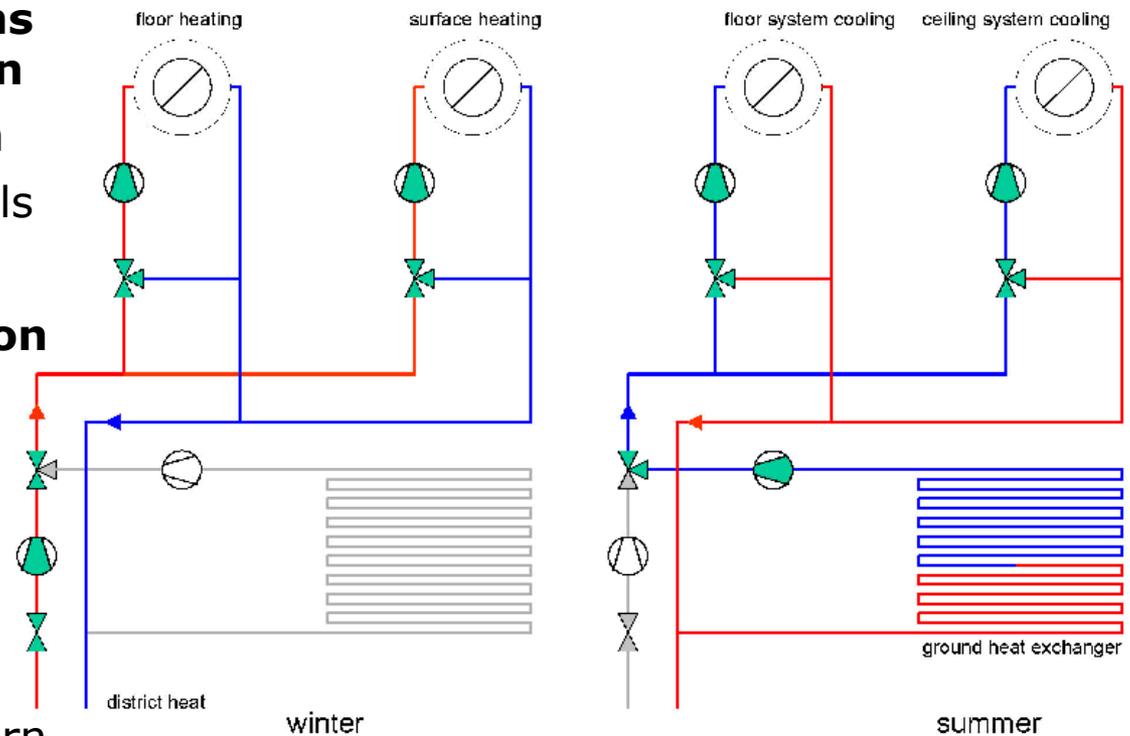
The ZUB energy concept

- **Minimised thermal losses during heating season and heat gains during cooling season**

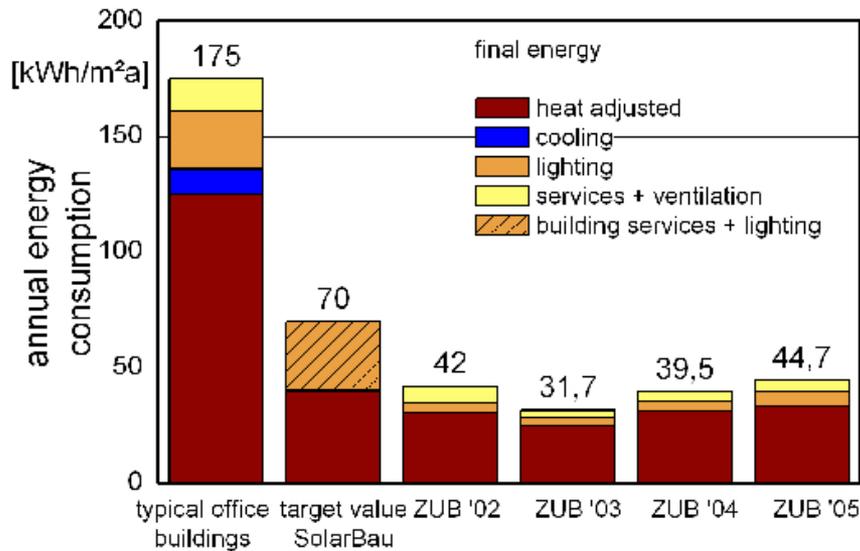
- Architectural design
- High insulation levels
- Solar gain control

- **LowEx system solution**

- 25-40 °C supply temperature for heating
- 16-20 °C supply temperature for cooling
- district heating return line utilisation and ground-coupled cooling

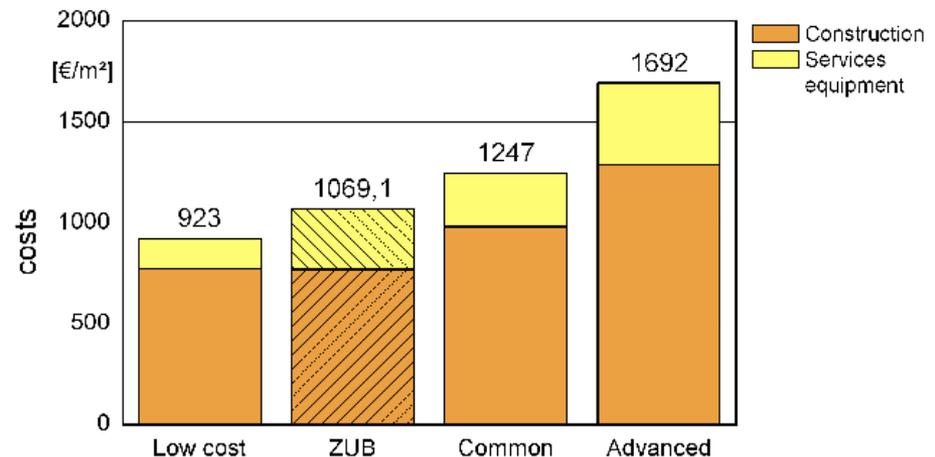


Energy and cost performance combined



- End use energy consumption brought down to 25% compared to typical office buildings...

- ... combined with highly competitive first cost.



Seglet, Karlstad, Sweden

Seglet ("The Sail") is an apartment building in the Orrholmen residential area of Karlstad. It is the first major block of flats owned by Karlstads Bostads AB that does not have a traditional heating system, and probably the first one in all of Sweden.

The building is twelve storeys high, and was erected as a densification project in an existing neighbourhood stemming from the Million Programme of the late 1960s and early 1970s, on top of a parking deck.

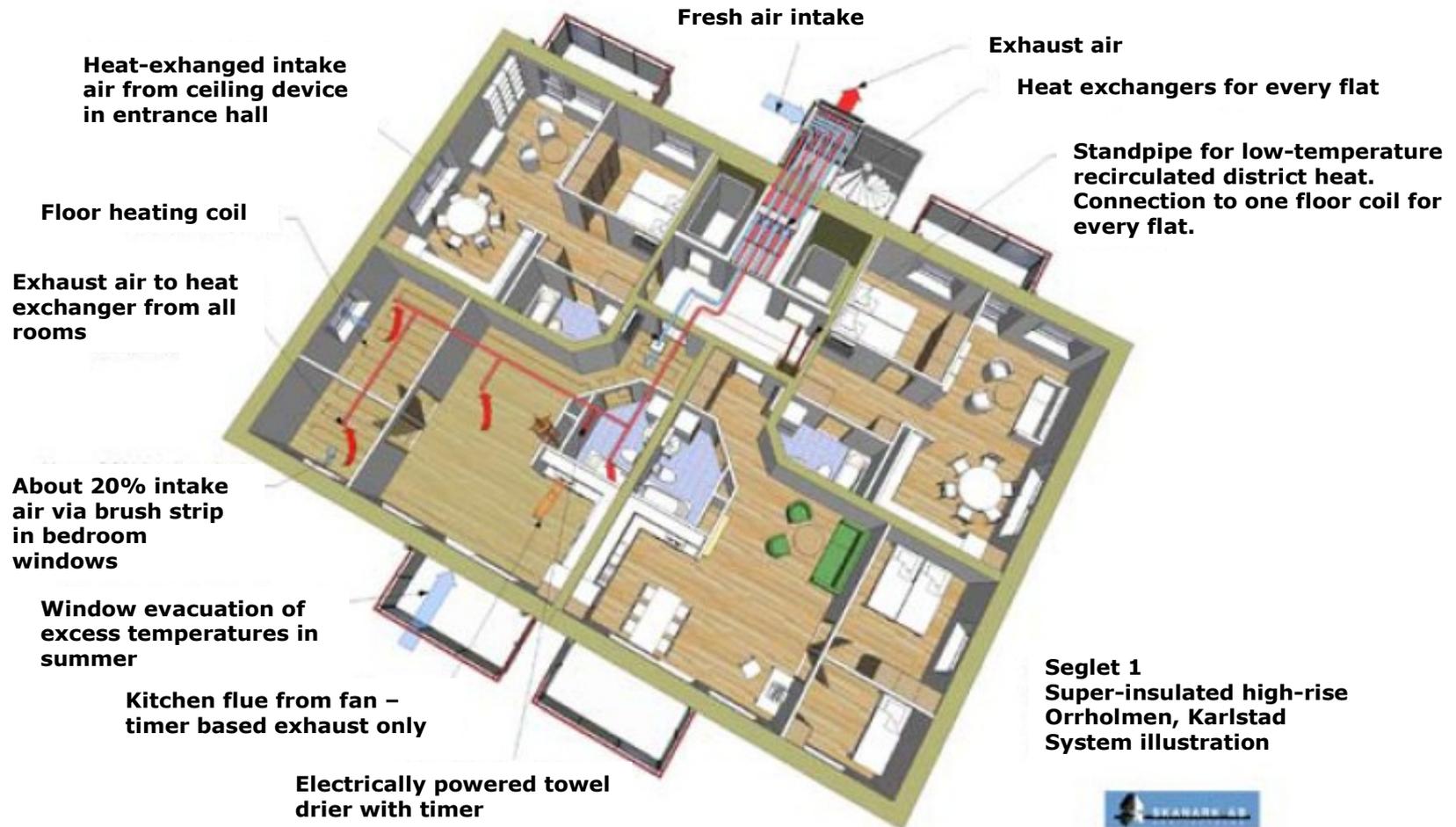
It consists of a total of 44 flats with two or three rooms plus kitchen, and was designed for extremely low energy consumption, while at the same time offering optimum residential comfort.



© Karlstads Bostads AB

Seglet design concepts

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Performance of Seglet



- Utilisation of district heating return line as heating energy source
- Heat pump for domestic hot water production
- Space heating and DHW energy consumption estimated at 20 kWh/m² (in comparison to 110-130 kWh/m² required by the national building code)

“WE WANT TO DO A MIND LEAP”.

“The purpose of the project is to accomplish, in the spirit of the Building/Living dialogue, a construction process and a high-rise with far-sighted solutions in order to inspire building proprietors to a more long-term mindset. At KBAB, we think that technical solutions for construction and installation should be simple to reproduce and significantly energy-saving. Because we believe that the energy that is not consumed will be of the greatest importance in the future. We also believe that this energy conservation can only be achieved with the aid of refined production technology and innovative solutions. Through Seglet, we want to do a mind leap and raise the bar for all who

are collectively responsible for the project's execution – from the early programme phase to commissioned and handed-over project.”



Mats Enmark
Managing Director, KBAB

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LowEx, integrated design and radiant systems

- **LowEx concepts and integrated design provide**
 - indoor comfort and reliability for end-users
 - energy and cost performance
 - productivity: more from less
 - **Implementation requires**
 - a holistic and multidisciplinary approach through project planning, design, construction and commissioning
 - new approaches, skills and an open mindset from HVAC design
- but it doesn't require**
- completely new technologies
 - high upfront investments



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simply more

