



Technical Aspects of Energy Conservation in Buildings

Ralf Bermich
City of Heidelberg, Germany
www.heidelberg.de

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Heidelberg Energy Concept

- Efficient energy supply with district heat from CHP, natural gas and renewable energies
- Energy advice and funding for the citizens
- Energy efficient development of new building areas
- Low energy standard
- significantly lower heating demand than standard of federal state of germany
- Efficient use of electricity

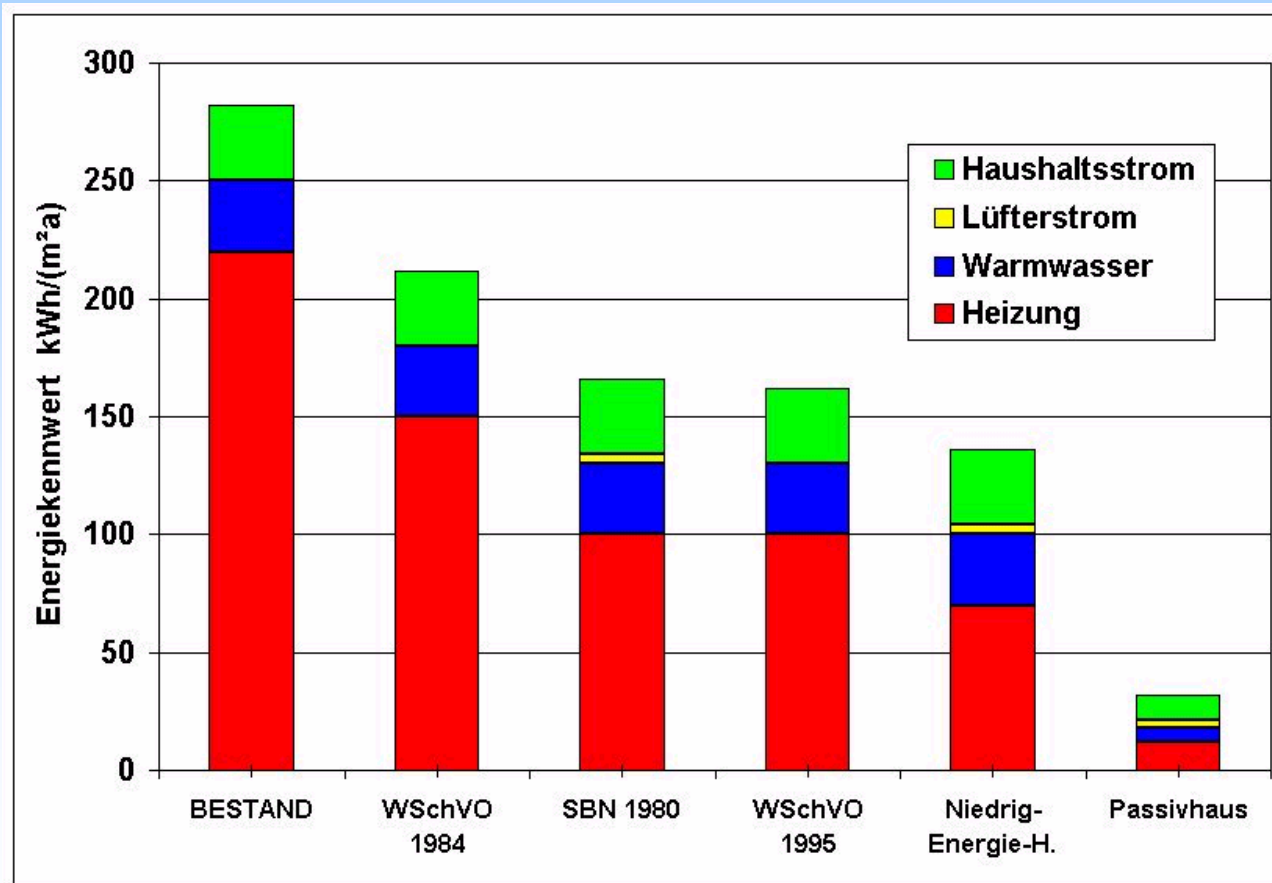
Energy efficient building construction

- Very good insulation of walls, roofs and basement
- Windows with high quality double or triple glazing
- Perfect details - avoid heat bridges
- Air-tight construction
 - check by blower door test
- Passiv solar energy
- Avoiding cooling demand
 - sun shading in summer
 - natural cooling sources



Heat demand of different building standards

Old houses, german federal state standards, low-energy and passive houses



Low-energy house

- Insulation
 - walls: 16 - 22 cm
 - roofs: 30 cm
 - basement: 10 cm
- Insulation materials
 - glass-fibre wool
 - recycling paper
 - polystyrene foam
 - foamglas
- Windows with high quality double glazing
- Ventilation system
- Very good and healthy living quality



Passive house standard

- Optimized insulation
- Windows with high quality triple glazing
- Ventilation system with heat recovery
- Maximum heat demand:
15 kWh / m² a
- Maximum heat power :
10 W / m²





**Passive house sports hall
for an elementary school in Heidelberg**

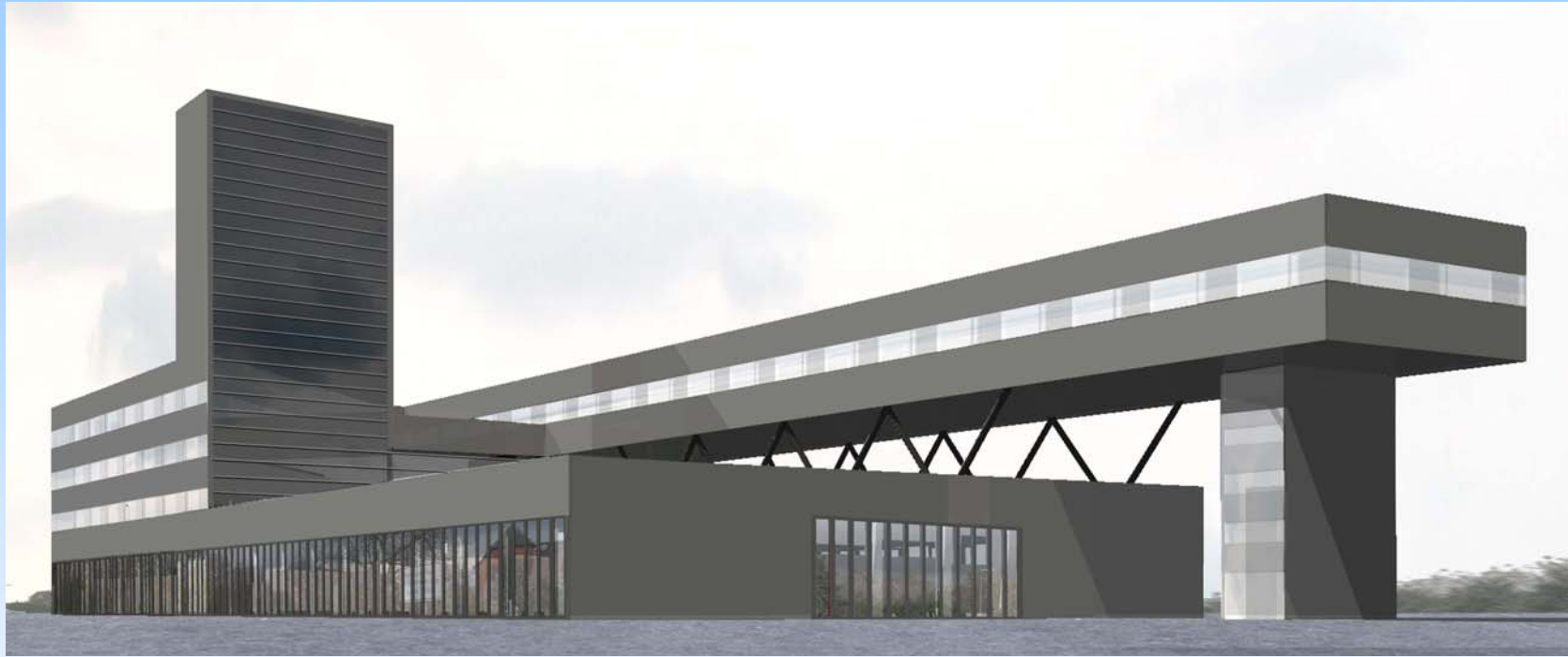
Passive house sports hall Insulation details



Roof insulation: 40 cm
Wall: 30 cm
Basement: 24 cm



**Office Building in passive house standard (front)
and retrofitted industrial building (background)**



The new passive house building for Heidelberg fire brigade will be finished in spring 2007



Zero-CO₂-emission office building in Heidelberg

Single family passive houses





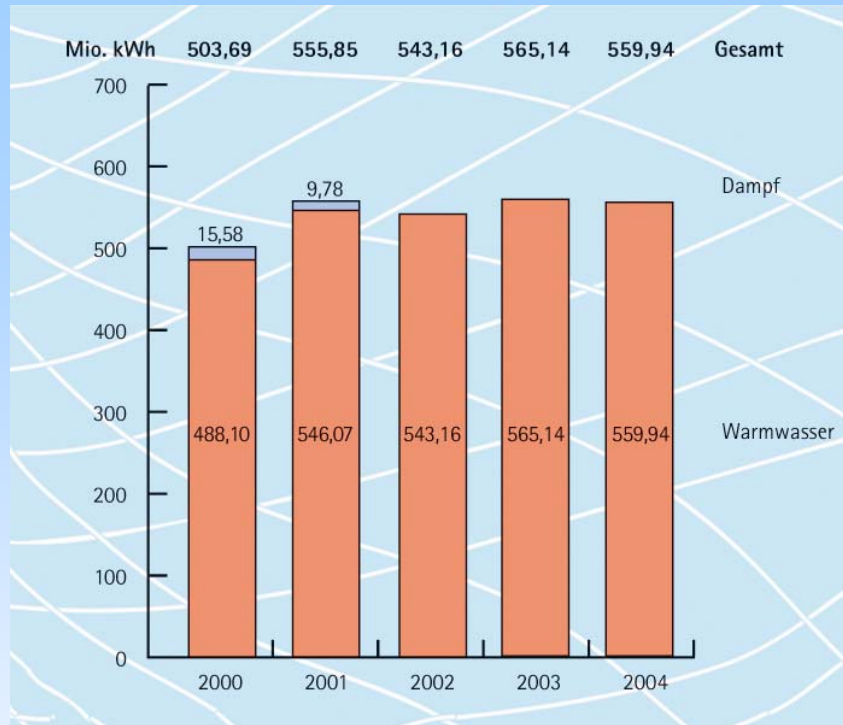
**Retrofittet residential houses „Blaue Heimat“
of the Heidelberg municipal housing society GGH
Heat demand reduced from 187 to 21 kWh / m² a**

Air-tight window detail and blower-door test



Efficient technical systems

- Heating systems with efficient energy use, low emission of pollutants and CO₂
- Cogeneration of heat and electricity
 - large scale: District heat from CHP
 - small scale: gas motor CHP units
- Heat from renewable energies
 - wood chips systems
 - biogas
 - solar thermal systems
- Ventilation systems with heat exchanger
- Optimized regulation of technical systems according to fluctuating needs



Large scale cogeneration

The Heidelberg district heat grid is supplied from a coal fired power station with a cogeneration turbine.

Primary energy factor: 0,48.

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Small scale cogeneration of heat and electrical power with an gas motor generator unit in an sports center in Heidelberg

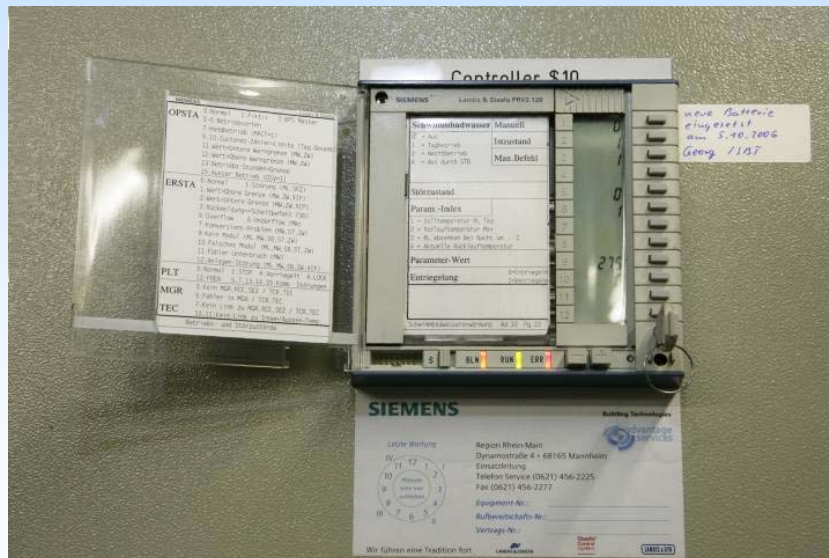
**Wood-pellets burner
(300 kW) supplies
heat for a school
building and a sports
center.**





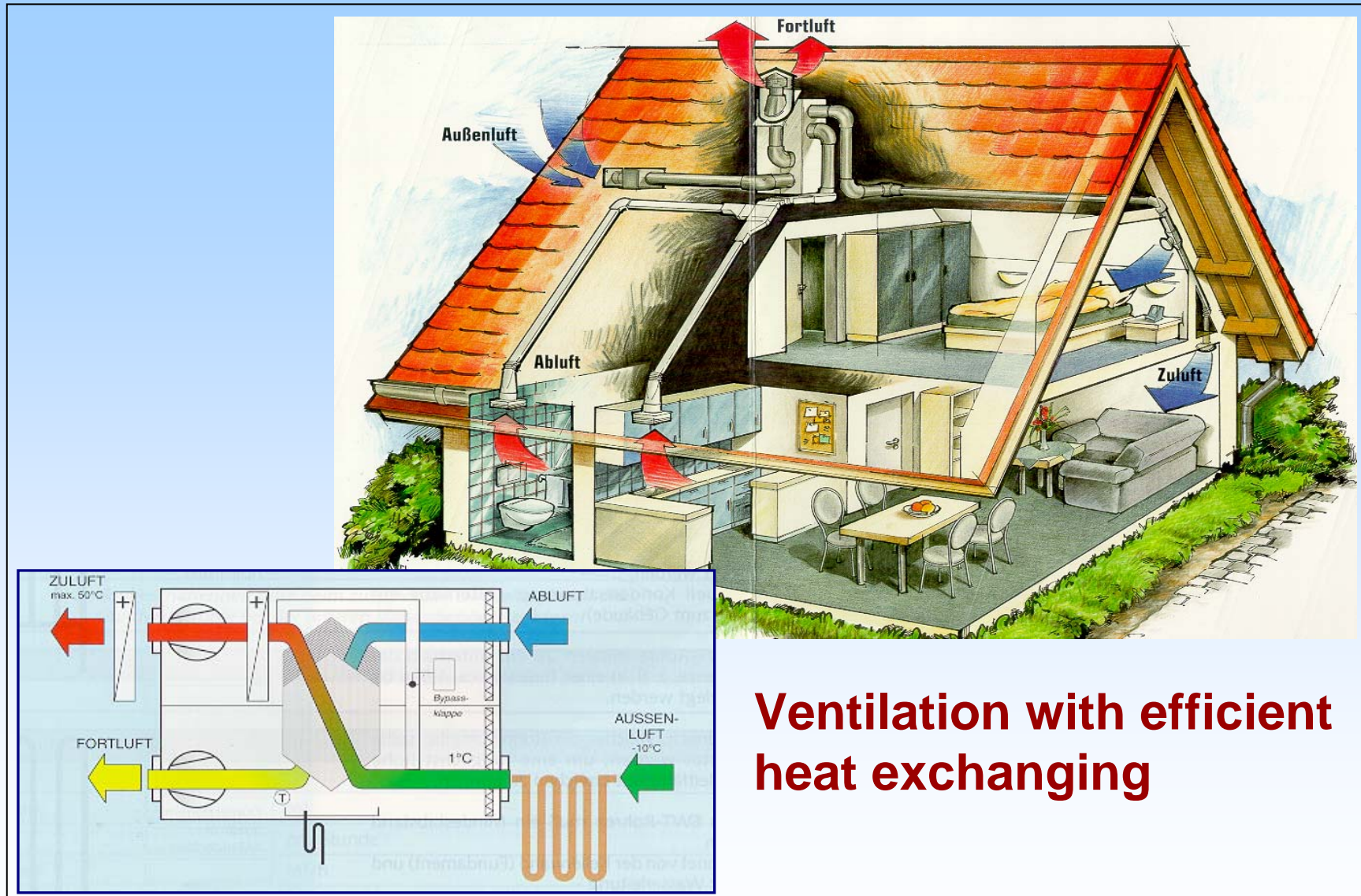
Biogas system with CHP unit at the Heidelberg Zoo

Insulation of all components of heat distribution and optimized regulation





Solar thermal system at Marie-Baum school
Hot water for the kitchen



Ventilation with efficient heat exchanging



Olympic training center Heidelberg: Humidity controlled regulation of the ventilation system saved 50 % of electricity and heat consumption

Photovoltaic installations on the roofs of schools produce solar electricity



Conclusions

- Heat consumption of the building stock can be reduced up to 90 % with market available technologies
- Energy standard of new buildings can be improved by a factor of 4 compared to usual buildings
- Electric can be improved significantly by optimized system design and demand management
- Energy efficiency is economical for investors
- Energy efficiency stabilizes regional economy
- Energy efficient residential and office houses have an improved living quality
- Reduced energy consumption improves air quality

Lets take the chances!