

The history of the modification of residential buildings

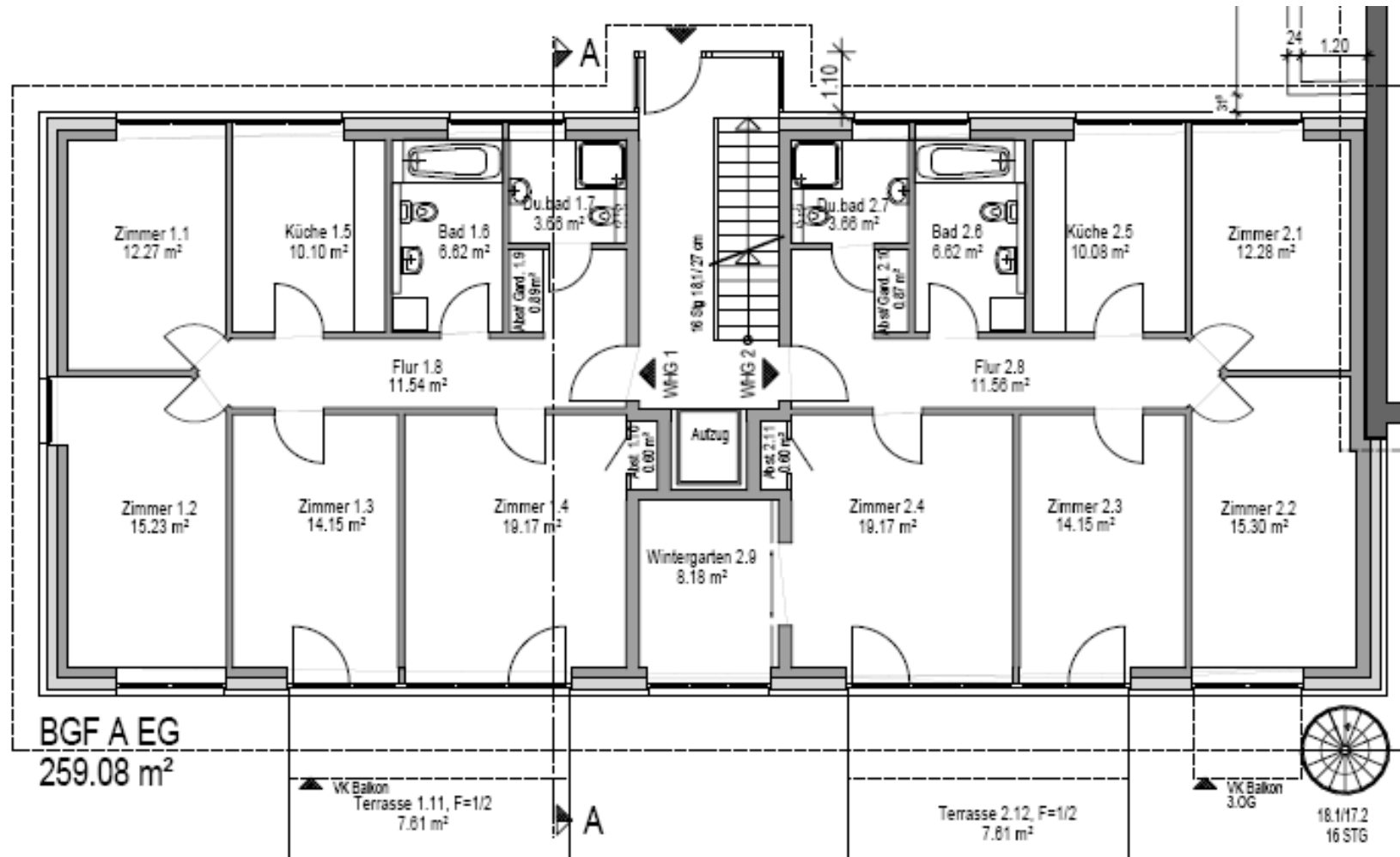
An example of a building with 8 apartments

The building construction in the years

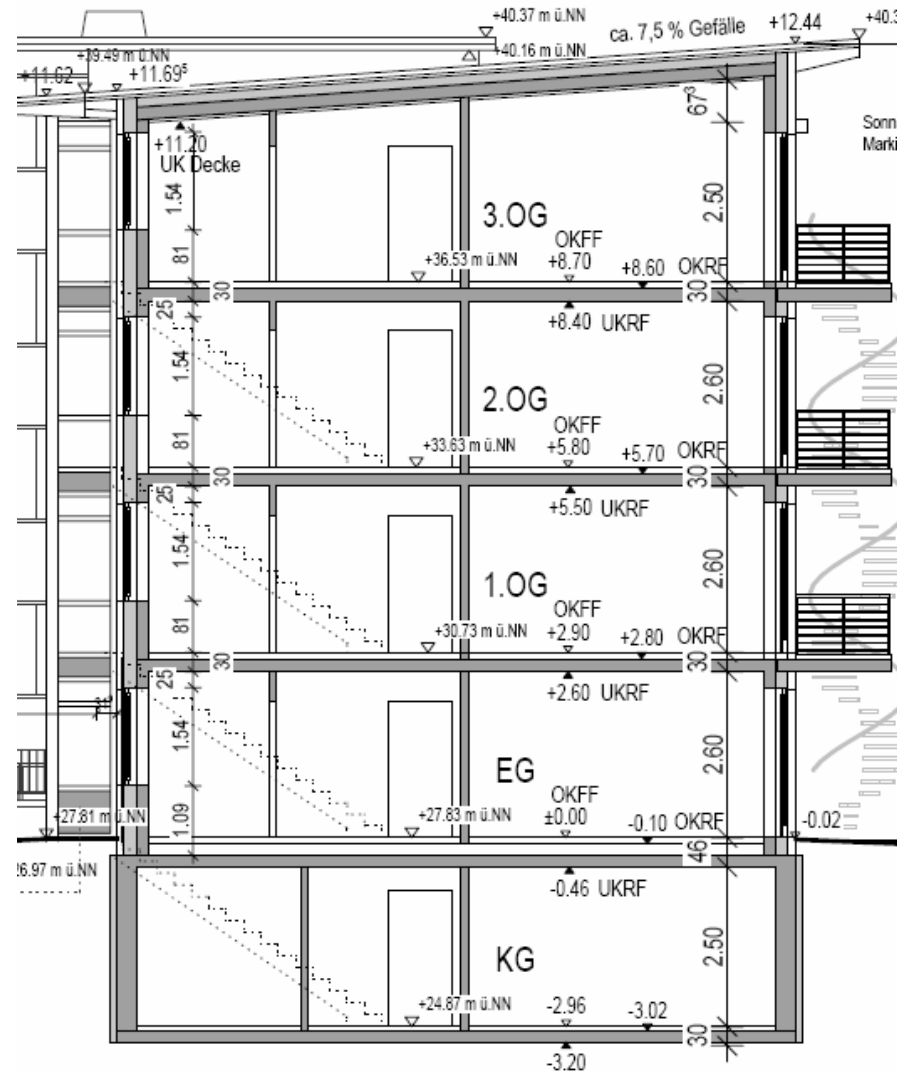
- 1950
- 1980
- 1999
- 2007
- 2010

Planning Aspects of the energy efficient Construction of residential buildings

A Building with 4 floors with 2 apartments on each floor



A Building with flat roof and cellar



Planning Aspects of the energy efficient Construction of residential buildings

The building measurements:

length : 24,00 mtr.
Width : 10,60 mtr.
Height : 11,60 mtr.
Volume : 2950 cubic metre
total space : 944 square metre



Planning Aspects of the energy efficient Construction of residential buildings



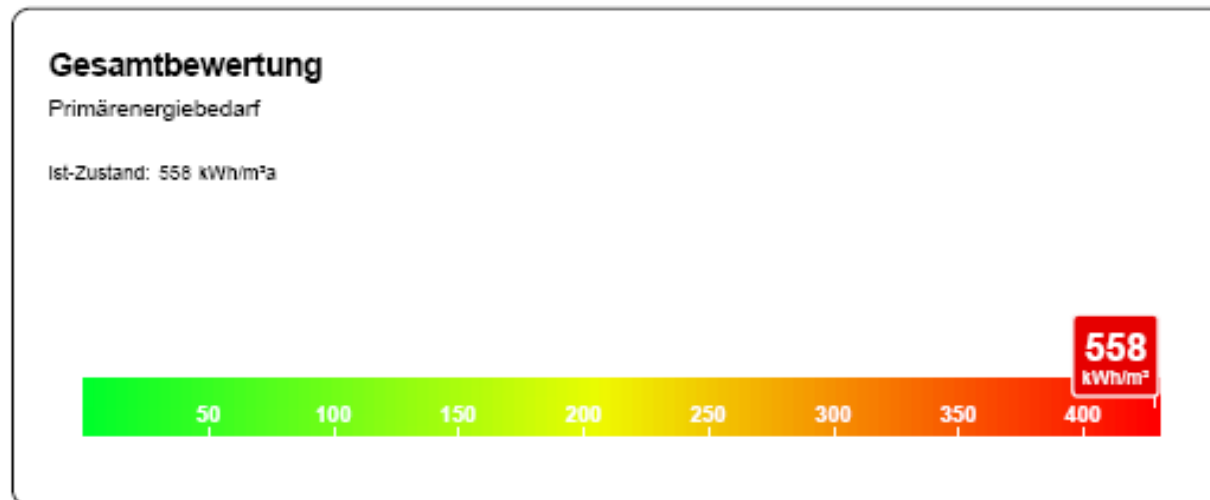
The building construction in the year 1950

<u>Component</u>	<u>Details</u>	<u>Energy-number</u>
Outside wall	: brick, airspace, brick	1,50 W/m ² K
Windows	: woodframe, single glass	5,20 W/m ² K
Flatroof	: massive concrete	2,10 W/m ² K
Groundfloor	: massive concrete with stone	2,20 W/m ² K
Heating systems	: boiler with oil burner, radiators, pipes without isolation	
Hot-water supply	: electric boiler	
Air-Exchange	: open window	

Planning Aspects of the energy efficient Construction of residential buildings

The building construction in the year 1950

The primary energy consumption is 558 kilowatt-hour per squarmeter and year



From our present view is the primary energy consumption very high with an bad enviromental effect.

Planning Aspects of the energy efficient Construction of residential buildings



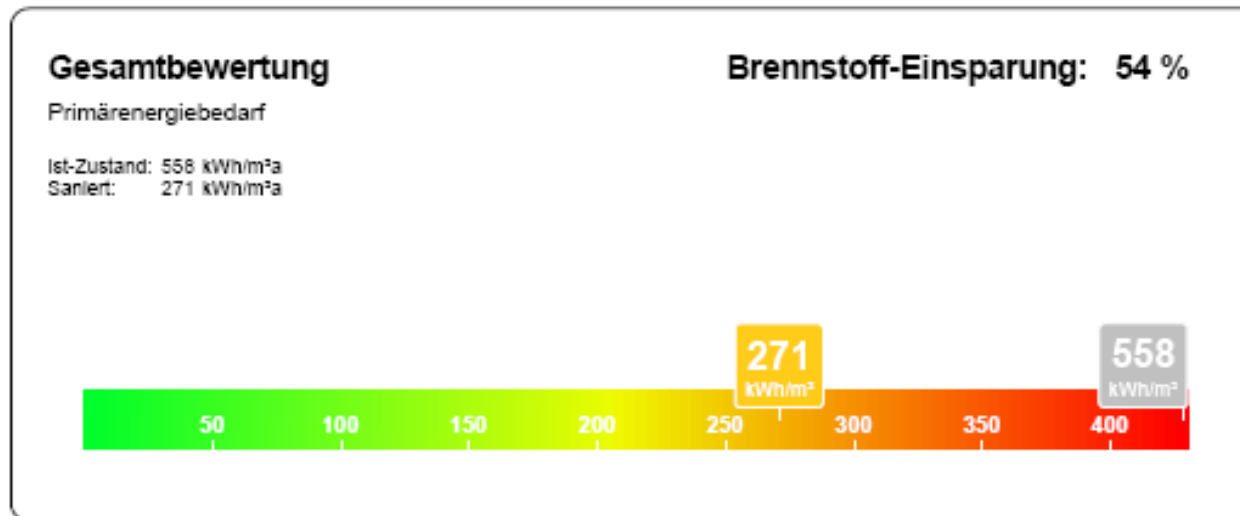
The building construction in the year 1980
 In 1977 the first heat shield prescription became effective

Component	Details	Energy-number	Energy-number 1950
Outside wall	: brick, isolation, airspace, brick	0,80 W/m ² K	1,50 W/m ² K
Windows	: woodframe, double glass	2,70 W/m ² K	5,20 W/m ² K
Flatroof	: massive concrete, isolation	0,50 W/m ² K	2,10 W/m ² K
Groundfloor	: massive concrete, isolation, concrete floor	1,00 W/m ² K	2,20 W/m ² K
Heating systems	: boiler with oil burner, radiators, pipes without isolation		
Hot-water supply	: electric boiler		
Air-Exchange	: open window		

Planning Aspects of the energy efficient Construction of residential buildings

The building construction in the year 1980

The primary energy consumption is 271 kilowatt-hour per squarmeter and year



The energy-consumption compared to the building from 1950 is 54% lower.

From our present view is the primary energy consumption high with an negative enviromental effect.

Planning Aspects of the energy efficient Construction of residential buildings



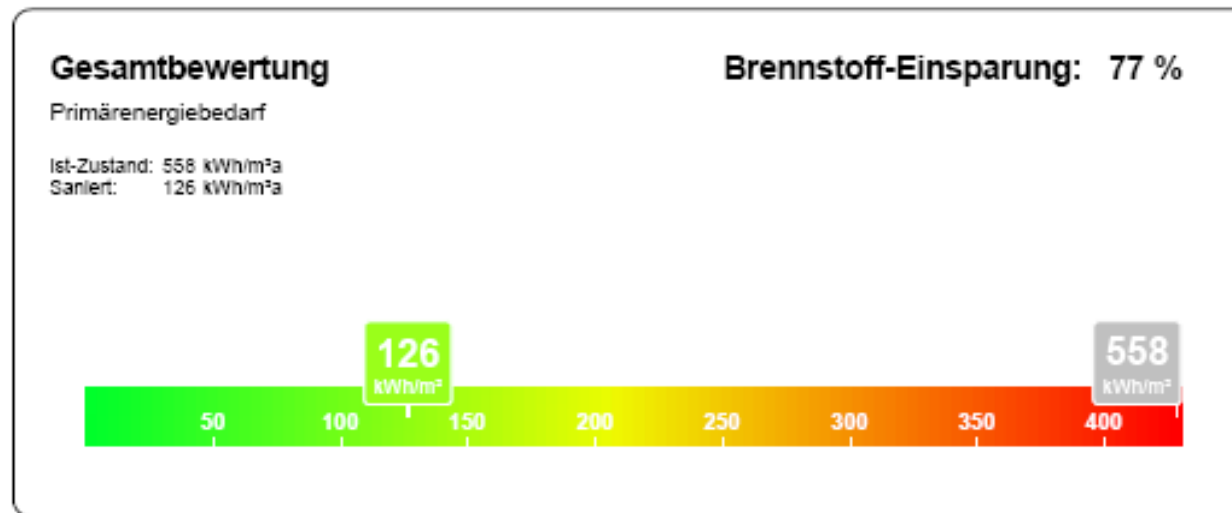
The building construction in the year 1999
 In 1995 the 3. heat shield prescription became effective

Component	Details	Energy-number	Energy-number 1980	Energy-number 1950
Outside wall	: brick, more isolation, airspace, brick	0,30 W/m ² K	0,80 W/m ² K	1,50 W/m ² K
Windows	: woodframe, double glass	1,80 W/m ² K	2,70 W/m ² K	5,20 W/m ² K
Flatroof	: massive concrete, more isolation	0,30 W/m ² K	0,50 W/m ² K	2,10 W/m ² K
Groundfloor	: massive concrete, more isolation, concrete floor	0,45 W/m ² K	1,00 W/m ² K	2,20 W/m ² K
Heating systems	: low temperatur boiler with gas burner, radiators, pipes with isolation			
Hot-water supply	: central boiler heatet over heating system			
Air-Exchange	: open window			

Planning Aspects of the energy efficient Construction of residential buildings

The building construction in the year 1999

The primary energy consumption is 126 kilowatt-hour per squarmeter and year



The energy-consumption compared to the building from 1950 is 77% lower.

From our present view is the primary energy consumption and enviromental effect is fair.

Planning Aspects of the energy efficient Construction of residential buildings

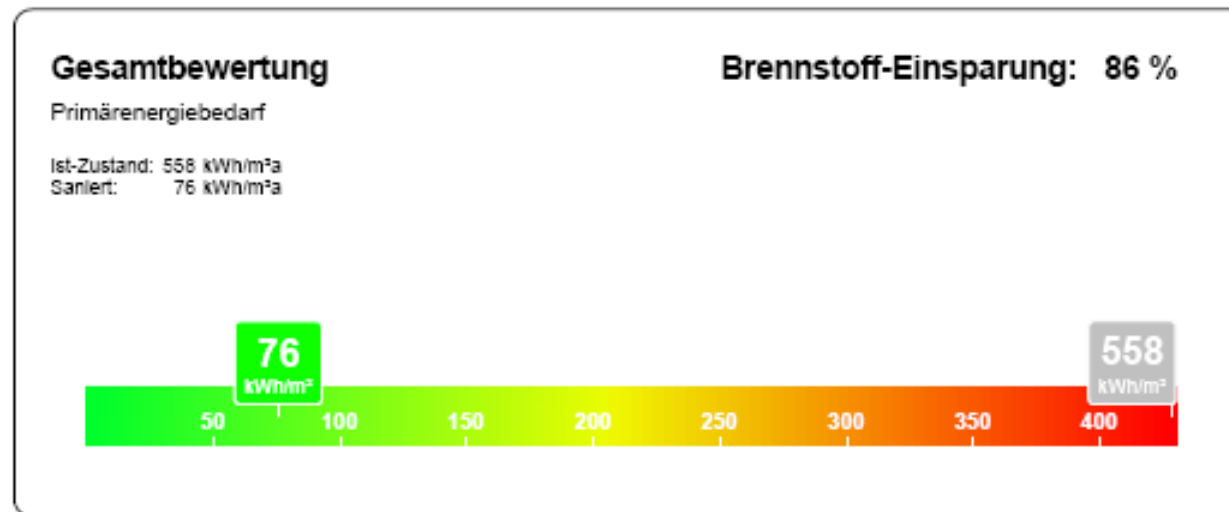
The building construction in the year 2006
 In 2004 the 2.energy saving prescription became effective

Component	Details	Energy-number	Energy-number 1999	Energy-number 1950
Outside wall	: brick, 14cm isolation, airspace, brick	0,30 W/m ² K	0,30 W/m ² K	1,50 W/m ² K
Windows	: woodframe, double glass	1,80 W/m ² K	1,80 W/m ² K	5,20 W/m ² K
Flatroof	: woodframe-construction 20cm isolation	0,20 W/m ² K	0,30 W/m ² K	2,10 W/m ² K
Groundfloor	: massive concrete, 14cm isolation, concrete floor	0,25 W/m ² K	0,45 W/m ² K	2,20 W/m ² K
Heating systems	: low temperatur boiler with gas burner and exhaust heat exchanger, low temperature radiators, pipes with high isolation			
Hot-water supply	: central boiler heatet over heating system			
Air-Exchange	: open window			

Planning Aspects of the energy efficient Construction of residential buildings

The building construction in the year 2006

The primary energy consumption is 76 kilowatt-hour per squarmeter and year



The energy-consumption compared to the building from 1950 is 86% lower.

From our present view is the primary energy consumption and enviromental effect is good.

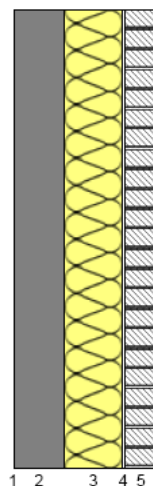
Planning Aspects of the energy efficient Construction of residential buildings

The building construction in the year 2010
In 2009 the 4. energy saving prescription became effective

The result of the energy saving prescription is to see the connection of the building cover (outside wall, windows, roof and ground floor) with the heating-, hot-water and ventilation engineering and to improve them a unity.

The wall construction for an Passiv-House looks like this detail:

1. Plaster 0,5cm
2. Energysaving brick 17,5cm
3. Isolation 20cm
4. Airspace 1cm
5. Brick 11,5cm



In the relation of energysaving and the cost of the construction, we reached the line.
We get more static problems if we want to build in more isolation.

Planning Aspects of the energy efficient Construction of residential buildings

The building construction in the year 2010
 In 2009 the 4.energy saving prescription became effective

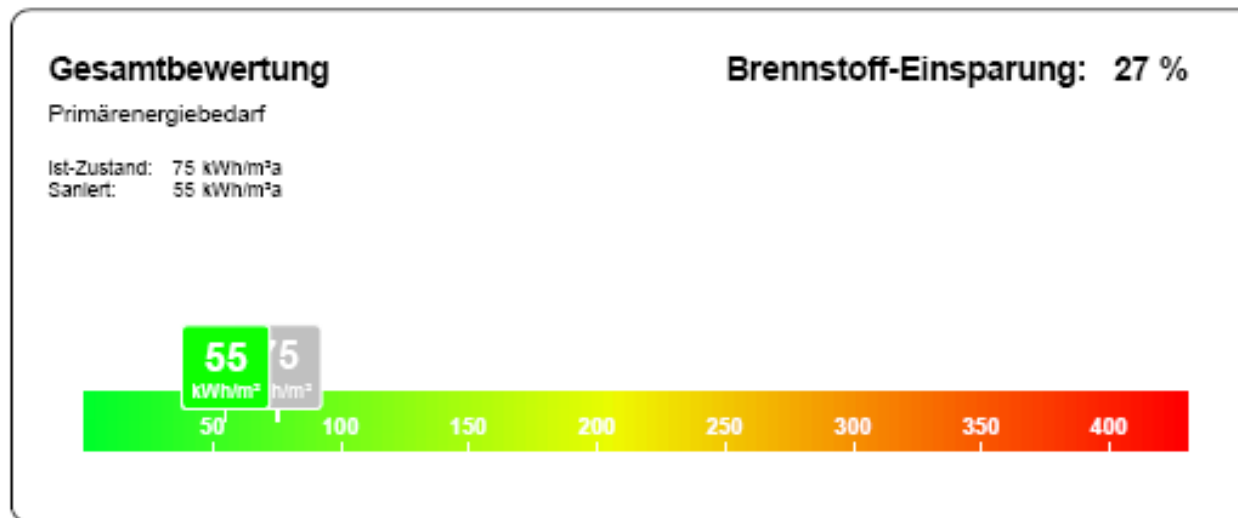
Building cover of an Passivhouse

Component	Details	Energy-number	Energy-number 1999	Energy-number 1950
Outside wall	: brick, 20cm isolation, airspace, brick	0,13 W/m ² K	0,30 W/m ² K	1,50 W/m ² K
Windows	: woodframe, double glass	0,90 W/m ² K	1,80 W/m ² K	5,20 W/m ² K
Flatroof	: woodframe-construction 24cm isolation	0,13 W/m ² K	0,30 W/m ² K	2,10 W/m ² K
Groundfloor	: massive concrete, 26cm isolation, concrete floor	0,13 W/m ² K	0,45 W/m ² K	2,20 W/m ² K
Heating systems	: low temperatur boiler with gas burner and exhaust heat exchanger, low temperature radiators, pipes with high isolation			
Hot-water supply	: central boiler heatet over heating system			
Air-Exchange	: open window			

Planning Aspects of the energy efficient Construction of residential buildings

The building construction in the year 2010

The primary energy consumption is 55 kilowatt-hour per squarmeter and year

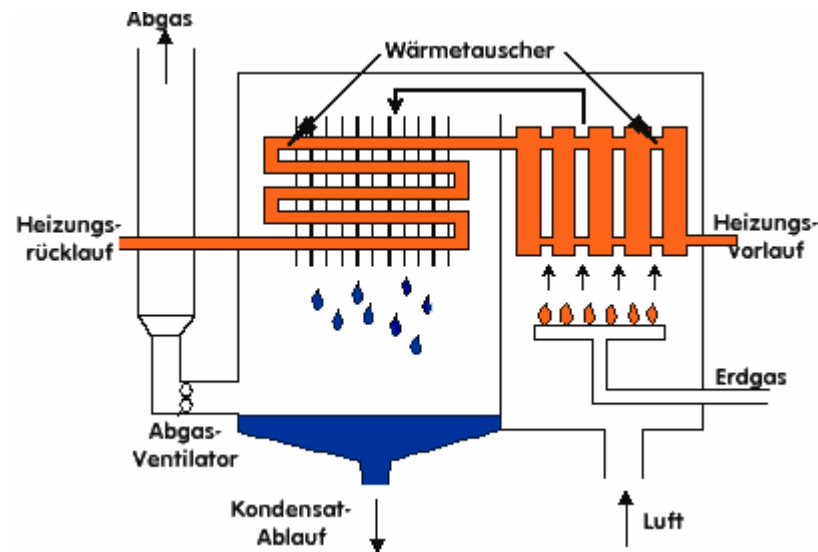


The energy-consumption compared to the building from 2006 is 27% lower.

The building construction in the year 2010

Optimization of the heating-, hot-water and ventilation engineering

Heating systems : low temperatur boiler with gas burner and exhaust heat exchanger



The building construction in the year 2010

Optimization of the heating-, hot-water and ventilation engineering

Heating systems :low temperature radiators



The building construction in the year 2010

Optimization of the heating-, hot-water and ventilation engineering

Heating systems : pipes with high isolation,



The building construction in the year 2010

Optimization of the heating-, hot-water and ventilation engineering

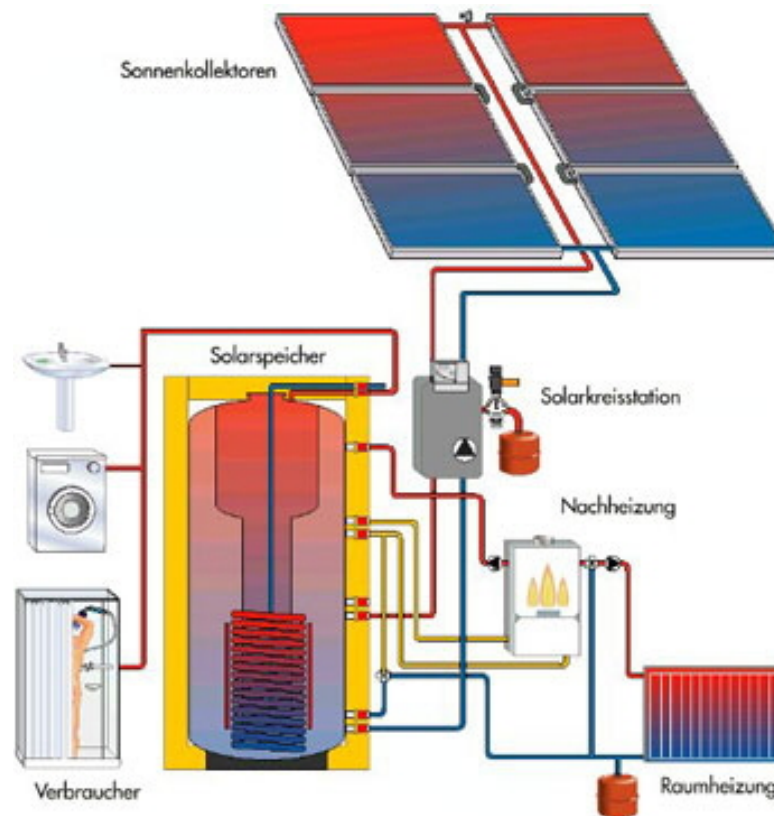
Heating systems : high efficient pumps



The building construction in the year 2010

Optimization of the heating-, hot-water and ventilation engineering

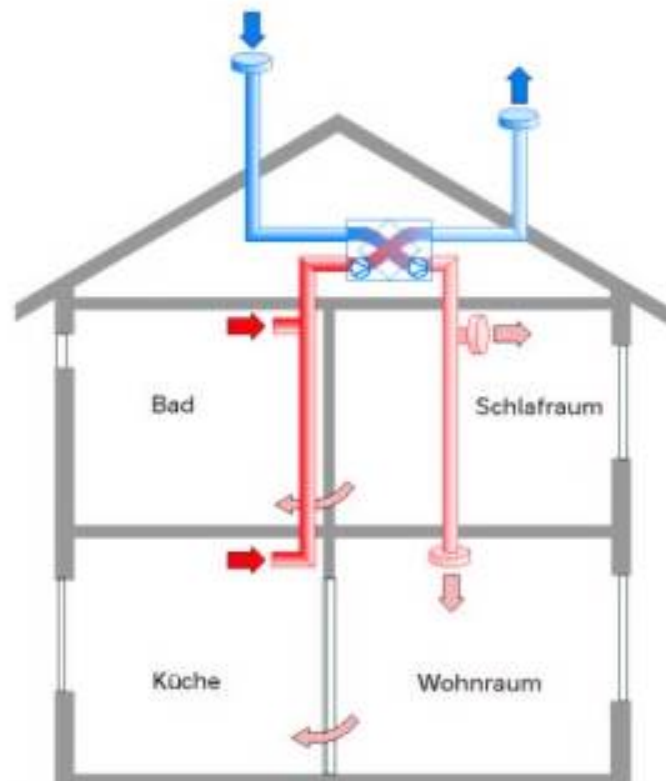
Hot-water supply : central boiler heated over heating system and supported by solarpanel



The building construction in the year 2010

Optimization of the heating-, hot-water and ventilation engineering

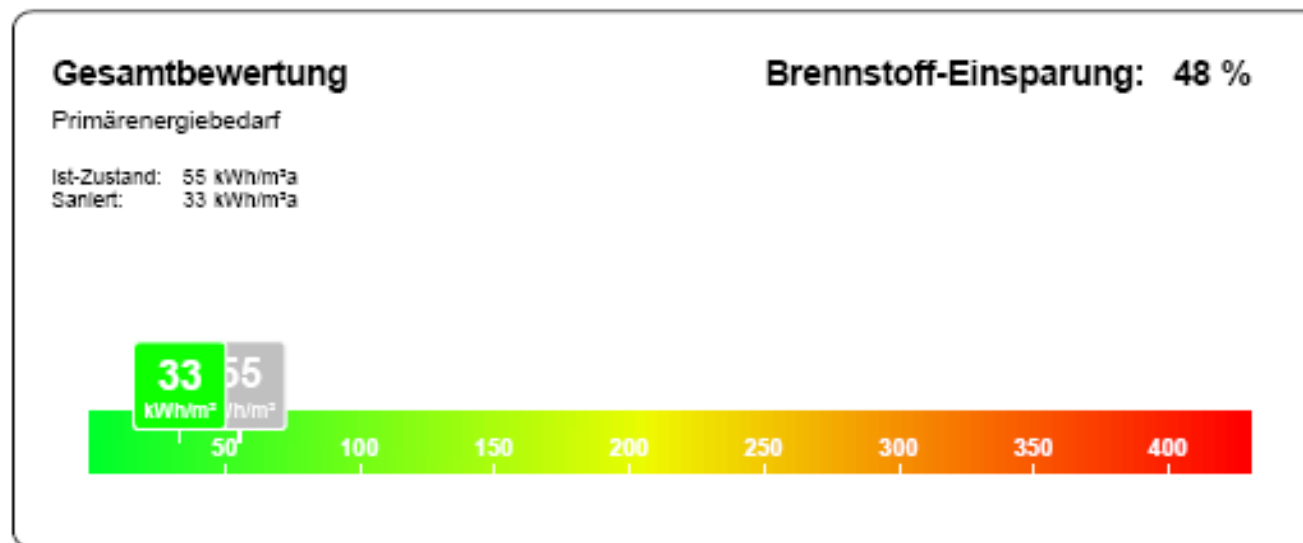
Air-Exchange : ventilationssystem with heat recovery



Planning Aspects of the energy efficient Construction of residential buildings

The building construction in the year 2010

The optimization of the heating-, hot-water and ventilation engineering reduced the primary energy consumption to 33 kilowatt-hour per squarmeter and year



The energy-consumption compared to the same building without the optimization of the heating-, hot-water and ventilation engineering is 48% lower.