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PASSIVE HOUSE REPORT

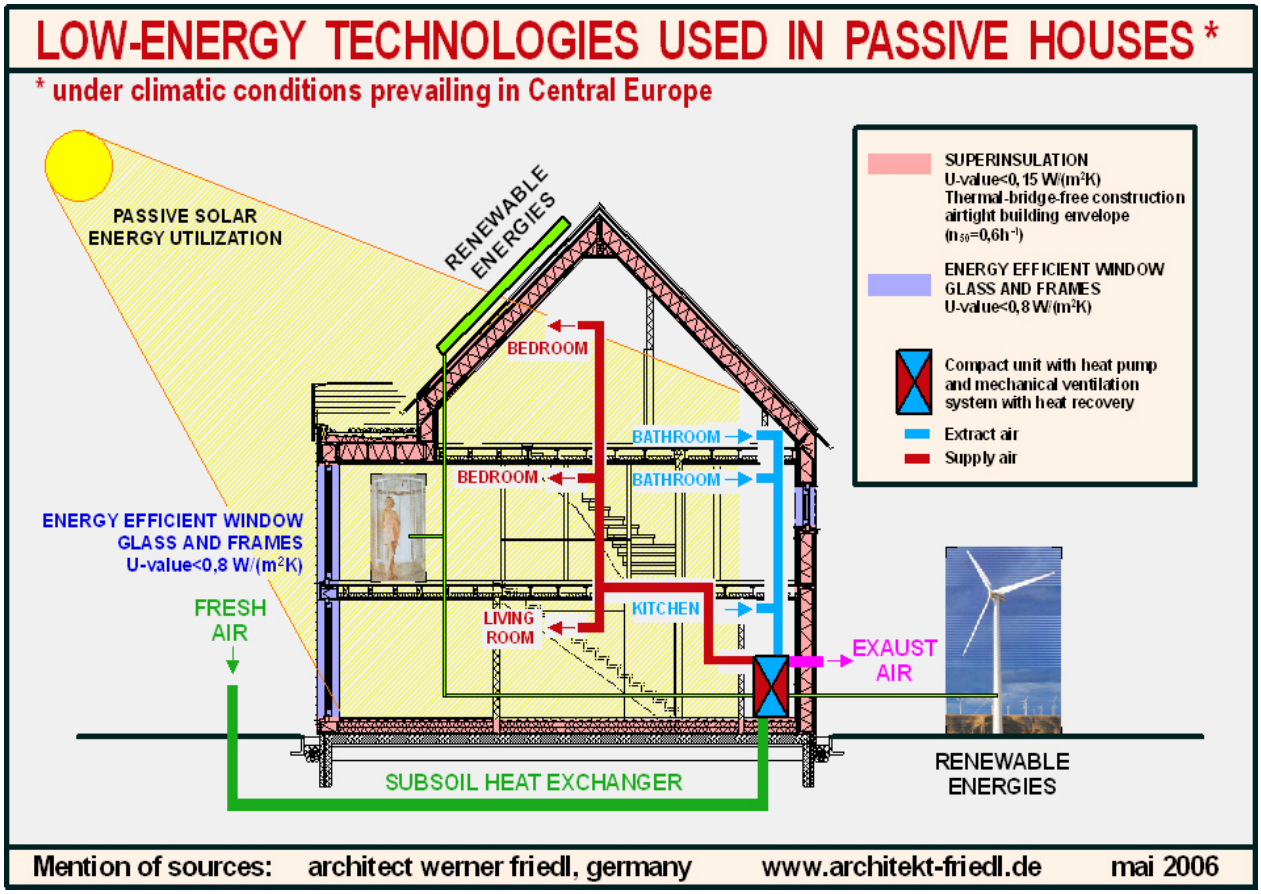
2

PASSIVE HOUSES AND PASSIVE HOUSES IN THE MEDITERRANEAN CLIMATE

- EU-Project "CLAY" -

OVERVIEW

What makes a building a Passive House? No further elements are required in addition to a conventional building: it is only necessary to construct the components that are used in any case (floors, outer walls, windows, roofs and ventilation) to high quality standards.



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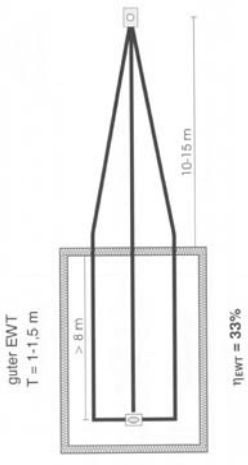
A Passive House, however, requires substantially better thermal insulation as a low-energy house standard. The remaining heat requirement of the Passive House is not zero, but so low that a conventional separate heating system is not necessary. The mechanical ventilation system with heat recovery can heat the supply air.

BASIC ELEMENTS	MISSION	FACTS	For example pictures architect friedl
- 1 - Complete good thermal building envelope	**Superinsulation**	Insulation thickness of 30 – 40 cm (ground, roof, outer walls) **U-value < 0,15 W/(m²K)** All constructions possible: Timber-work, stone house, ……	
- 2 - Building Element junctions	**Preventing thermal bridging**	All building element connections specially optimized **Ψ-value ≤ 0,01 W/(mK)** (Thermal Bridge Free)	
- 3 - Air Tightness	**Airtight building envelope** 	Pressurization test **N_{50}-value < 0,60 h^{-1}** (see picture) German new standard houses have N_{50}-value 1,5-3 h^{-1} older houses to 10 h^{-1}	
- 4 - Subsoil heat exchanger	**Fresh air** in wintertime: **preheating** in summertime: **precooling**	In wintertime: Fresh air is subsoil preheated to 8° C befor the air flows into the mechanical ventilation system In summertime: Fresh air is precooled from the subsoil, …. Length of the subsoil heat exchanger 40-60 m, about 1,5 m deep in the subsoil.	

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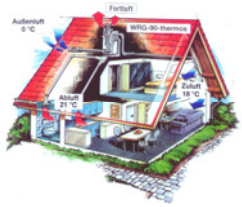
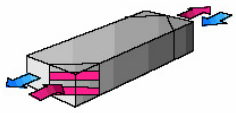
BASIC ELEMENTS	MISSION	FACTS	For example pictures architect friedl
5.1 (+5.2) mechanical ventilation with heat recovery for a better indoor air quality (always in a Passive House)	**Mechanical ventilation system with efficient heat recovery** This system can`t manage these services: heating and domestic hot water (see 1.2)	Polluted air is removed by the ventilation system (kitchen, bathrooms, …). Fresh air has to be supplied to the living rooms and bedrooms. Heat recovery of over 90% is available. This appliance can also flow the preheated supply air in the rooms.	 picture: paul-lueftung.de  counterflow heat exchanger
5.2 (+5.1) heating and domestic hot water with a small combustion unit for biomass fuel	**The pellet compact unit** 	The biomass oven will run automatically. Only a few kilograms per day, This main heating system can also heat the supply air for the rooms (for Nr. 1.1)	 picture: www.wodtke.com
- 6 - Heating with the remnant energy of the exhaust air (all services)	**Compact unit with heat pump**	Instead of No.5.1 + 5.2 Combines all the services; heating – ventilation – domestic hot water; in one handy appliance. heat pump: annual COP > 3 (2-4 kW heating energy possible)	 picture: www.aerex.de
- 7 - Passive utilization of solar energy (only for Central Europe, not for the Mediterranean climate)	**Optimal glassed area and minimized shading**	Glazed areas must be oriented to the South (+- 30° possible). > 33% coverage of space heat requirement	

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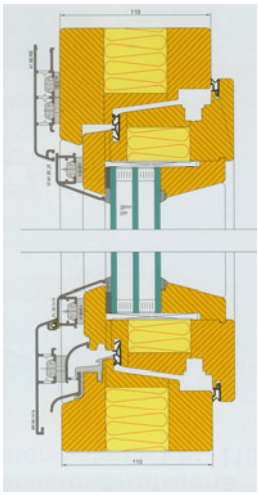
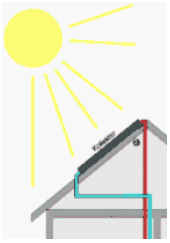
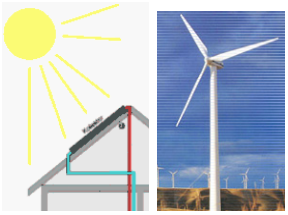
BASIC ELEMENTS	MISSION	FACTS	For example pictures architect friedl
- 8 - Windows and outside doors too	**3-pane low emissivity glazing** **Superinsulated window frame** 	windows **U-value < 0,8 W((m²K)** (Frame + 3-pane-glass combined) Orientation should be south (+- 30°) Solar transmittance g-value > 50% Correct airtight installation is necessary. Outside doors: **U-value < 0,8 W((m²K)**	 picture: www.variotec.de
- 9 - Active utilization of solar energy	**Solar flat plate collectors**	Cost-efficient flat plate collectors integrated in the façade or on the roof. > 50% coverage of water heating <u>For the Mediterraneans:</u> Newly developed solar flat plates can use the solar energy in combination with heat pumps to cool the passive house with less energy.	 
- 10 - Electric Efficiency	**High-efficiency low-energy household appliances**	More than 50% savings compared to standard appliances. Dishwashers, refrigerators, lamps, …	
- 11 – Remaining energy with renewable energies	**Biomass** **Wind-energy** **Sun-energy** **Subsoil-energy**	The low remaining energy demand moreover makes possible that which would otherwise be unaffordable.	

a.s.o / etc.

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Aim of the "BASIC ELEMENTS" is to reduce the building`s annual demand for space heating to 15 kWh/(m^2a).

The supply air of the ventilation system can only transport limited heat. Just 10 W/m^2 can be delivered to the supply air rooms. That will not be sufficient at all in conventional houses. But in a Passive House, the peak heat load requirement is extraordinarily low. The reason is the good thermal building envelope with maximum heating demand of 15 kWh/(m^2a).

Further on, the target of the Passive Houses is to keep the total primary energy requirement for space heating, domestic hot water and household appliances below 120 kWh/(m^2a). This is lower by a factor of 2 to 4 than new standard houses across Europe.

In the next Passive House reports you can read many more details about the basic elements. Particularly for Passive Houses in the Mediterranean Climate, to show how summer temperatures can be kept in a comfortable range without using regular air conditioning.

END PASSIVE HOUSE REPORT 2

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Mention of sources used:

- Website: Deutsches Passivhausinstitut, Darmstadt (www.passiv.de)
- Cepheus Proposal Summary, Deutsches Passivhausinstitut, Darmstadt
- Cepheus ECEEE, Jürgen Schnieders, Deutsches Passivhausinstitut, Darmstadt
- Cepheus-Projektinformationen Nr. 38, Abschlussbericht Juli 2001, Deutsches Passivhausinstitut, Darmstadt (Thermie-Program of EU BU/0127/97)

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