

Energy concept:

The aim is to provide excellent thermal comfort and indoor air quality for the inhabitants, by reducing energy costs and technical machinery in an ecological sense. By using ecological energy sources and systems, not only operating costs and expenditure on devices are reduced, but also sojourn quality is enhanced and physical as well as psychical illness are reduced (sick building syndrome). Thus the buildings are designed to the requirements of passive building codes.

Compact building

A compact building with an optimum relationship between the footprint area and the volume provides the best conditions for minimizing energy losses. The aim is to achieve a radical saving of energy while maintaining an even higher level of comfort.

Efficient thermal insulation and heat mirror glazing

Optimised thermal and energy features of the envelope are a prerequisite for low heating energy consumption. Non transparent components are insulated with a U-value of 0.25 W/(m²*K). Transparent components are double glazed with heat mirror glazing and are individually optimized in order to save energy and optimize transparency.

The U value of the glazing is 0.3 to 0.7 W/(m²*K) and the light transmission factor of 0.45 to 0.65, according to the orientation of the windows.

The usual cold radiation from the windows and the impairment of thermal comfort in winter are thus eliminated. Since cold radiation surfaces are avoided, traditional radiator layouts below the windows can be avoided, too, because the pre-heated fresh air of the source air system is sufficient.

Simultaneously, natural light incidence is maximised to minimise the relative amount of artificial light (in order to reduce operating costs and prevent that rooms are heated during summer).

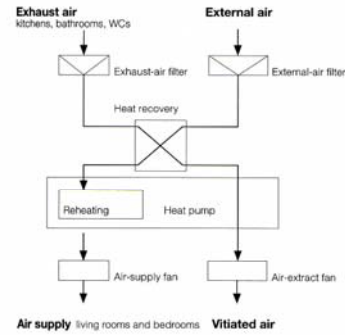
Ecological energy sources

Temperature differences from the soil and groundwater are used as ecological energy sources with the help of energy slabs or pillars.

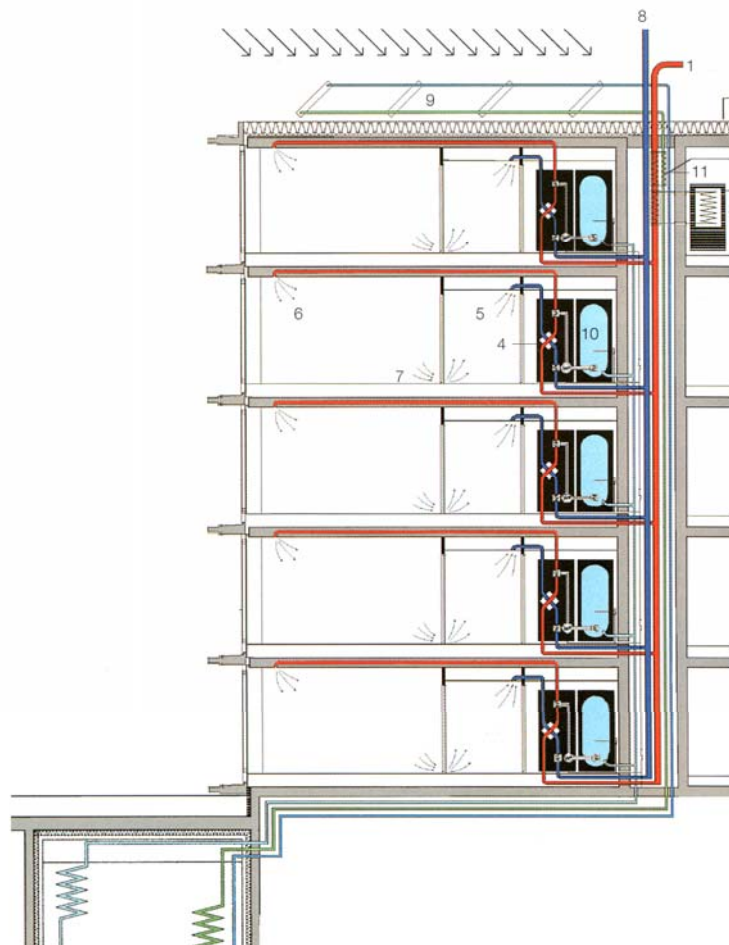
The concrete structures of the ceilings provide the necessary thermal storage volume in terms of building physics.

Indoor air-quality will be maximized with the help of a **Controlled Ventilation System** for hygienic air exchange. It delivers sufficient fresh air maintaining comfort conditions considering temperature and air- flow speed for occupants.

Compact ventilation appliances with heat exchangers and minimum-sized heat pumps are installed decentralised in each dwelling for ventilation. The skin of the building is insulated such that, allowing for other internal heat sources (people, appliances and lighting), temperatures do not fall below 15°C, even when the heating system would be out of action. Every flat also has one conventional radiator that provides the occupants with an additional heating and a place to hang wet clothes.



Heating and ventilation (see ills. A, C)



- The air intake is via the roof (1). In winter, cold external air is heated to a temperature of 0–10 °C by means of the solar storage unit (2). When there is no solar heating of the air intake, a gas heater (3) performs this function.

- In the ventilating appliance for the dwellings (4), the fresh-air intake is heated to 16–20 °C by heat extracted from the exhaust air (5). In this process, 80 per cent of the thermal energy from the exhaust air (20–22 °C) is recovered to heat the fresh air, without any contamination with vitiated air.

- In the event of no heating being necessary as a result of heat gains from people, lighting or insolation, the fresh-air intake is fed into living rooms and bedrooms without being preheated. When heating is required, the fresh-air intake is heated to roughly 30–40 °C by a minimal-sized ventilation heat pump (4).

- The fresh air is conveyed to the ventilation outlets (6) in the living and sleeping areas via thermally insulated ducts in the concrete floor slabs.

- Vitiated air is removed from the kitchens, bathrooms and WCs by suction. The air from the living rooms and other spaces flows through the slits beneath the doors (7). The extraction of cooking fumes occurs separately via activated carbon filters.

- As part of the ventilation system, exhaust air passes through a heat-recovery plant and is released at roof level (8).

Solar heating of hot water and preheating of air supply

Solar heating of the hot-water supply is by means of solar collectors (9) and central solar storage elements (2).

- When insolation occurs, the solar collectors, with an area of 140–190 m² per building, yield their heat to the central solar storage elements (80–105 m³ per building) situated in the corners of the basement garages.

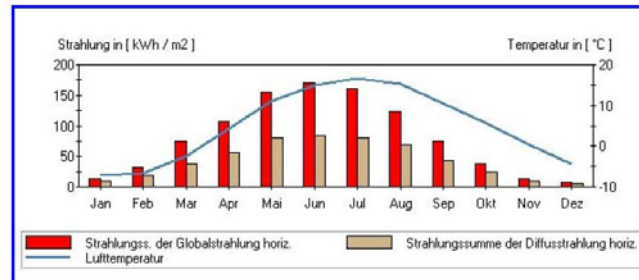
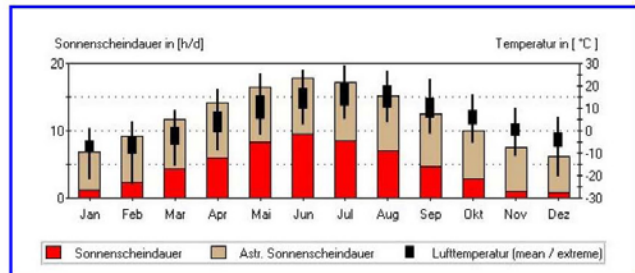
- In summer, the requisite hot water is heated in the storage elements (with a temperature of 40–60 °C) and then fed into hot-water tanks in the individual dwellings (10), where the water can be reheated by means of the heat pump (roughly 65 per cent more efficient than an electric water heater).

Energy Savings

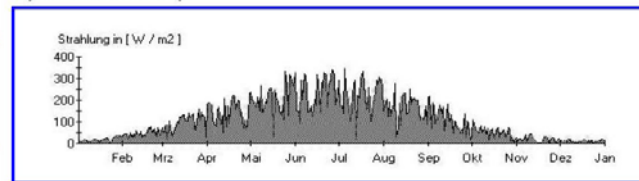
Given the appropriate form of construction and mechanical services, a high degree of comfort can be achieved with extremely low energy consumption for heating (approx. 20 kWh/m²a). In comparison to conventional housing construction (60-80 kWh/m²a), savings in heating energy of roughly 1280 megawatt-hours per annum could be achieved for the 444 dwellings. That is equivalent to the thermal heating needs of about 170 low-energy single-family houses; i.e. roughly 128.000 litres of oil, or 128.000m³ of gas plus 350 tonnes of CO₂ emissions.

Tartu

Tartu



Tagesmittel der Globalstrahlung



Tageswerte der Temperatur (Mittel, Min. und Max.)

