

®TERRASOL – THE PRINCIPLES

Ground source energy is an inexhaustible source of energy, and when combined with the enormous potential inherent in solar energy, is the most economic, sustainable and environmentally friendly alternative source of energy available for controlling the climate in new buildings and upgrading the heating systems in existing buildings worldwide.

The main alternative forms of energy production, such as wind turbines and photovoltaics, are merely temporary, expensive solutions, which are highly reliant on subsidies and require large amounts of primary energy expenditure.

®ISOMAX /®TERRASOL technologies, which are based on ground-source and solar heat, are capable of meeting all of the heating and cooling requirements of a building, along with its ventilation.

Heating system upgrades for existing buildings globally as well as new build directly employ ground-source heat to keep the temperature of a building's outer skin at the same level as that of the ground (temperature barrier). In doing so, the difference (Delta T) between the outdoor and requisite indoor temperature can be reduced to just a few degrees thanks to the inexhaustible and freely accessible heat available near the surface of the ground. The marginal, residual heat thus required to increase indoor temperatures can therefore be substantially reduced and subsequently provided easily through the ®ISOMAX Pipe-in-Pipe Counterflow Ventilation System.

The seasonal solar energy storage system employed by the ®ISOMAX technologies is based on a very sophisticated and yet amazingly simple concept for storing energy at different temperature levels.

The core ground heat storage unit located centrally underneath the building's foundation is fully insulated on all sides and is charged with the highest solar temperatures available. This heat is subsequently made available to heat the building through the Pipe-in-Pipe Counterflow Ventilation System and to preheat water.

When upgrading heating systems in existing buildings, these core heat storage units can also be installed right next to a building.

The ground cooling storage system installed around the building is designed to cool the building's outer skin (temperature barrier) while simultaneously accumulating thermal energy for the core ground heat storage unit, while the building's roof and, in some cases, external walls, are furthermore fitted with water-filled PP pipes for absorbing solar heat.

Together, the internationally patented Pipe-in-Pipe Counterflow Ventilation System and the ®ISOMAX temperature barrier for the building's outer skin comprise a PASSIVE climate control system that recovers up to 98% of the building's energy, while the extra energy acquired through the ground by means of the heating and cooling circuits provides an abundance of additional free energy.

Overall, these factors make this climate control system extremely RESPONSIVE and ensure an ideal indoor climate!

SIMPLIFIED DESCRIPTION OF ENERGY REQUIREMENTS

Objective:

This example illustrates the impact of a solar-heat supported, free, ground heat-fed climate control system installed in a building's outer skin (temperature barrier) on a building's heat energy requirements, and compares these effects with those achieved by conventional energy efficient building construction methods.

Energy requirement calculations:

The amount of energy lost through the wall climate control system during transition will be calculated separately.

- **Calculation of the U-value from the inside up to the temperature barrier.**
- **Calculation of the monthly energy lost during transition (kWh) at a given outdoor temperature and for outer skin (with temperature barrier (TB)) temperatures of +16°C and +18°C.**

Energy lost during ventilation, and the heat derived from the inside of the building and from solar energy, are calculated as usual.

Additional energy gains:

The ®ISOMAX temperature barriers vastly and positively improve the temperature levels inside a building.

Annual heat requirement in kWh/m²

- a) **Conventional calculation method for energy efficient buildings HHR 56.8 kWh/m²**
- b) **Mechanical Pipe-in-Pipe ventilation with ®ISOMAX temperature barriers fitted to outer walls and roof with**

TB at +16°C = 5.4 kWh/m²

TB at +18°C = 3.2 kWh/m²

Extra energy gained through cooling system and near-surface ground heat:

The additional energy gained from the heat lost when the outer walls cool (TB) and from the core ground heat storage and cooling system of the heating and cooling circuits' air inlet pipe, which is approx. 55 m long and takes in air at 1.2 m/s, were not taken into account in this calculation.

U.S.A., July 2009, E. Krecké