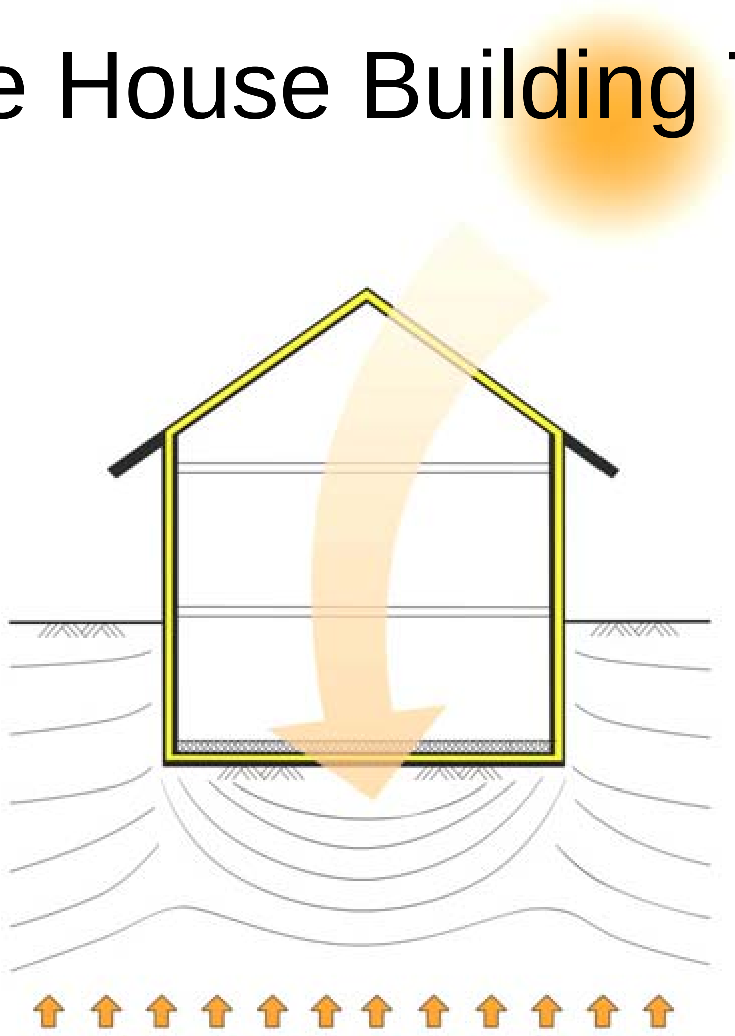
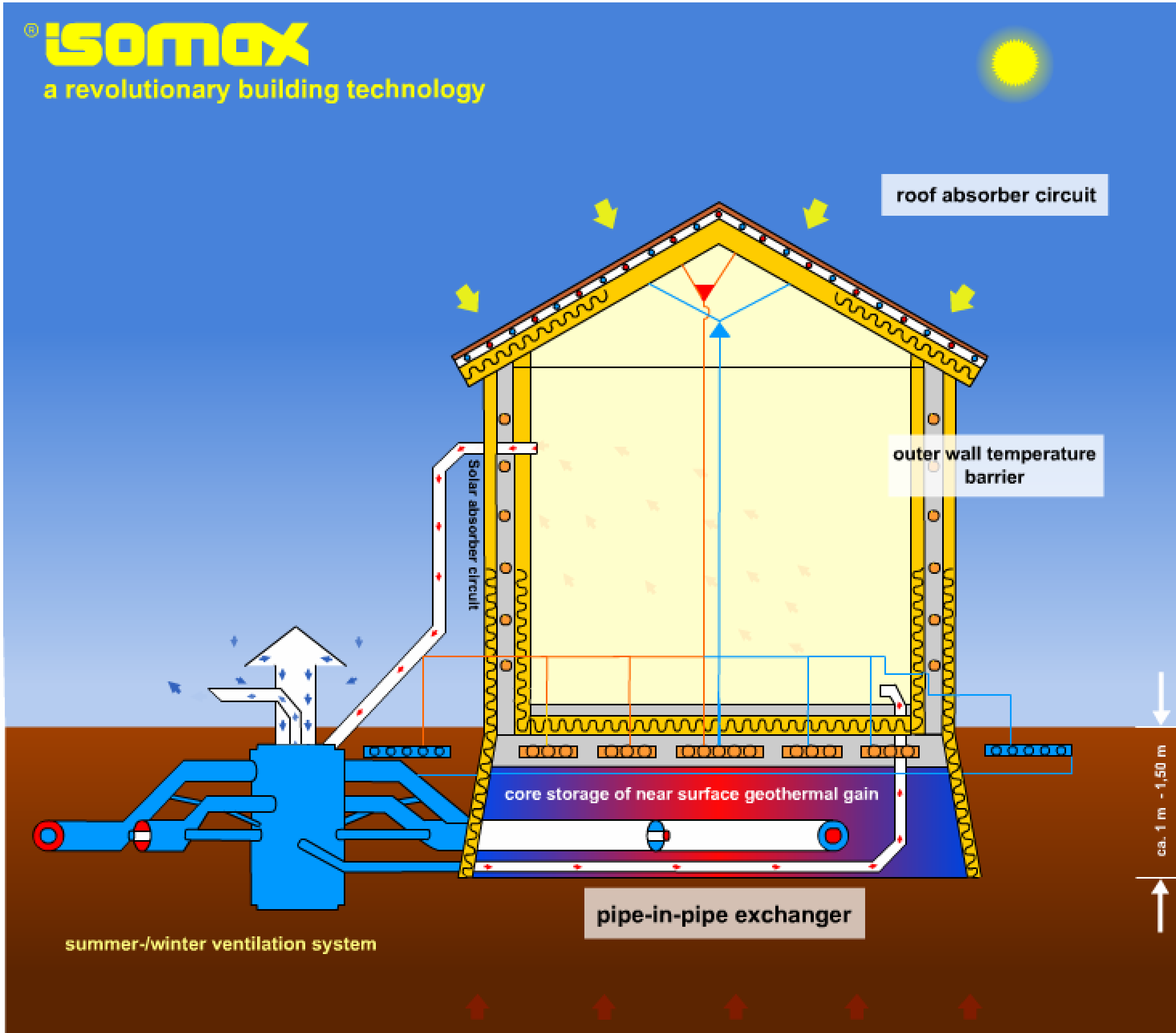
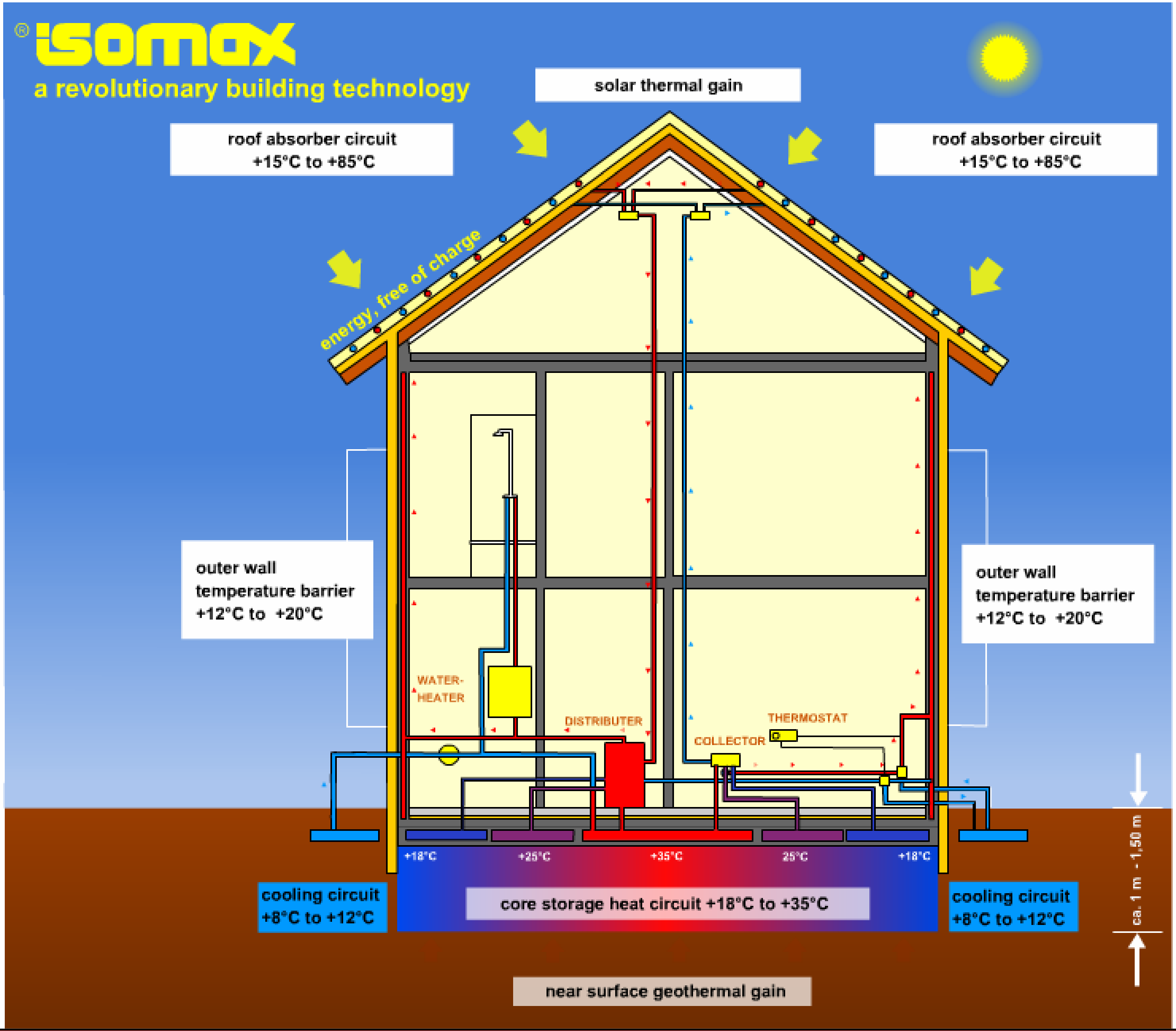
Passive House Building Technology



Over approximately 30 years of research and development, solar heat, combined with *near-surface ground temperature*, has been used successfully to air-condition thousands of buildings in different climate zones across the world in an economical and environmentally friendly way.

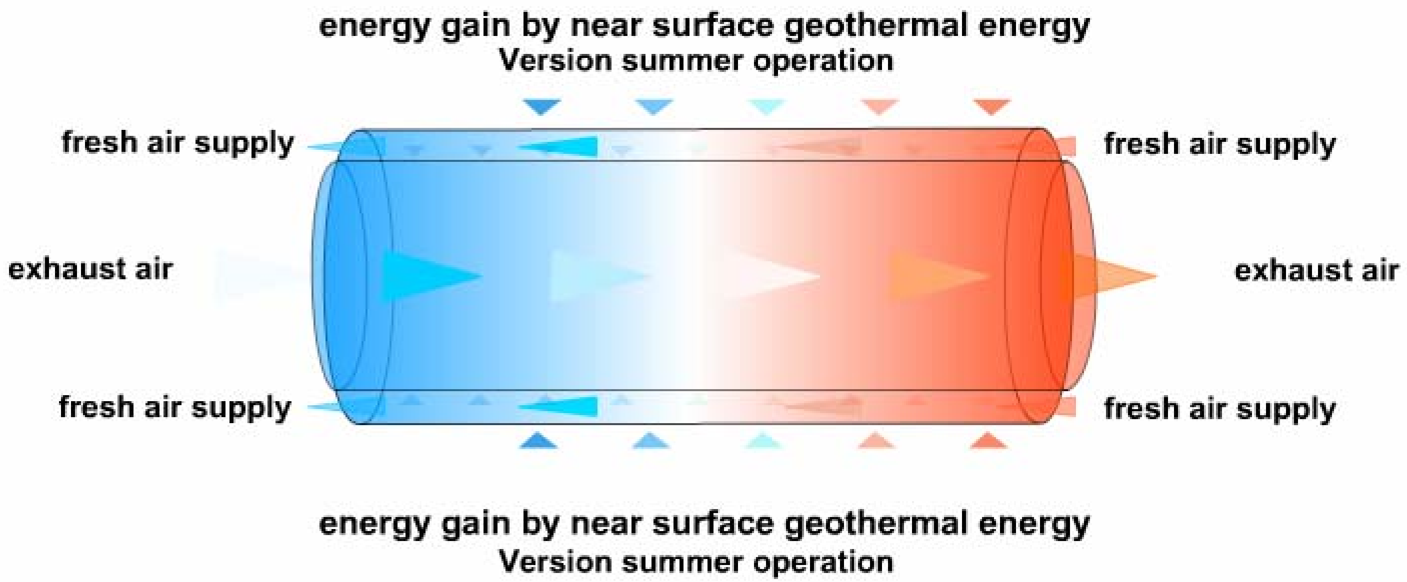

a revolutionary building technology
roof absorber circuit
outer wall temperature barrier
Solar absorber circuit
core storage of near surface geothermal gain
ca. 1 m - 1,50 m
pipe-in-pipe exchanger
summer-/winter ventilation system

Stainless steel pipes are coiled at the construction site and laid beneath the HOT / COLD CIRCUITS as a pipe-in-pipe counterflow ventilation system for intake and extraction of air. These pipes have a heat exchange function with a performance of around 98%. An additional multiple energy gain enables heating or cooling from the earth around the outer pipe of the incoming air. After flowing through the COLD / HOT CIRCUITS, the incoming air, now brought to room temperature in the outer pipe, reaches the rooms in the house.
The return air is expelled from the building by means of an exhauster through the inner pipe, in accordance with its heat exchange function.


isomax
a revolutionary building technology
solar thermal gain
roof absorber circuit
+15°C to +85°C
roof absorber circuit
+15°C to +85°C
energy, free of charge
outer wall
temperature barrier
+12°C to +20°C
outer wall
temperature barrier
+12°C to +20°C
WATER-
HEATER
DISTRIBUTER
THERMOSTAT
COLLECTOR
+18°C
+25°C
+35°C
25°C
+18°C
cooling circuit
+8°C to +12°C
core storage heat circuit +18°C to +35°C
cooling circuit
+8°C to +12°C
ca. 1 m - 1,50 m
near surface geothermal gain

PP 20/2 Ø circuits are also laid in a meandering form in the centre of all the roofs and exterior walls, which are insulated on both sides. These then form what are called the *TEMPERATURE BARRIERS*.
Likewise, PP 20/2 Ø circuits are laid in all the exterior walls and roofs on the outer or upper side, respectively, outside the insulation, in a meandering form.
These then form, in summer operation, the SOLAR ABSORBERS and in winter operation a *SECOND TEMPERATURE BARRIER.*

stainless steel pipe-in-pipe counter flow extraction/ventilation by additional near surface geothermal energy



The stainless steel pipes used as a pipe-in-pipe counterflow ventilation system have a heat exchange function with a performance of around 98%.
An additional multiple **energy gain** enables **heating** or **cooling** from the earth around the outer pipe of the incoming air after this has flowed through the COLD / HOT CIRCUITS.

PP 20/2 Ø circuits are also laid in a meandering form in the centre of all the roofs and exterior walls, which are thin and insulated on both sides. These then form what are called the *TEMPERATURE BARRIERS*.

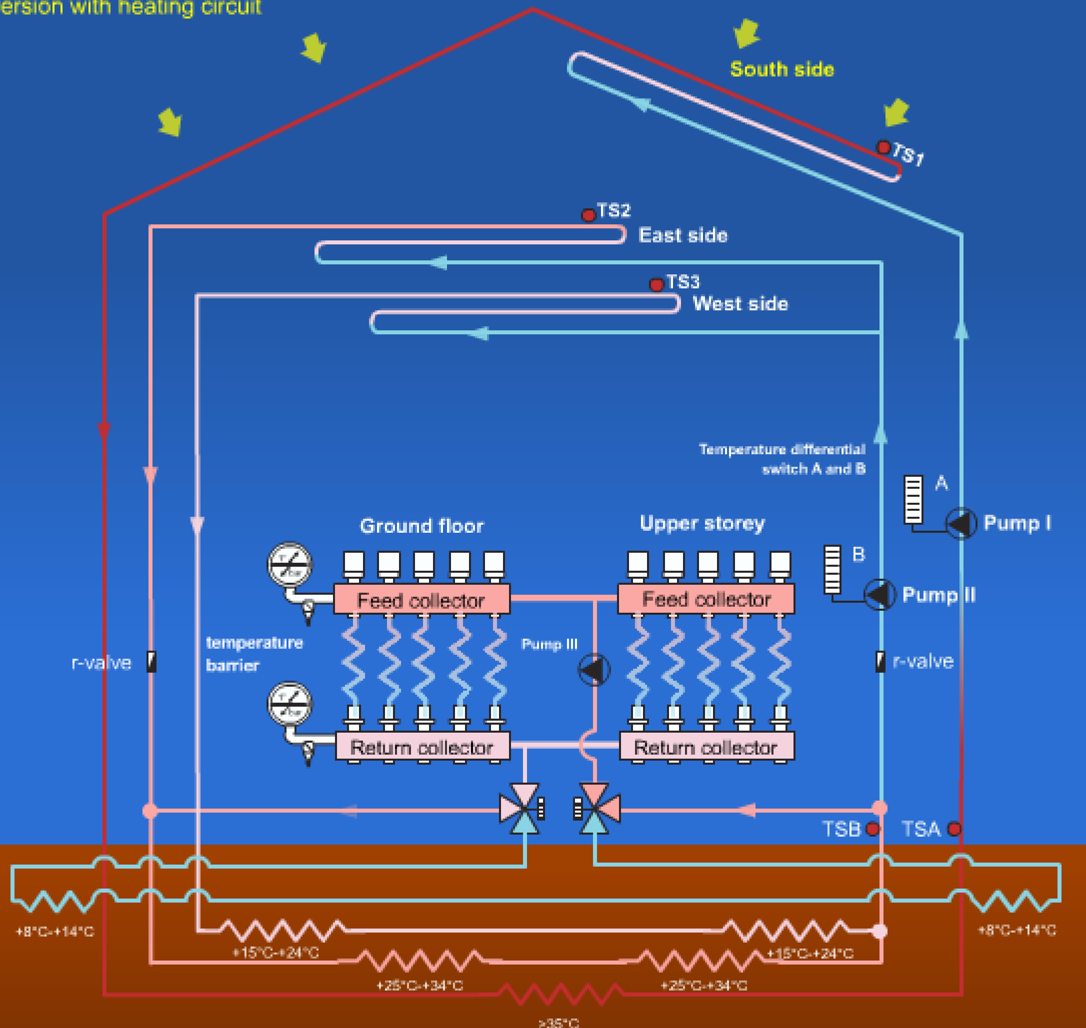
Likewise, PP 20/2 Ø circuits are laid in all the exterior walls and thin roofs on the outer or upper side, respectively, outside the insulation, in a meandering form.
These then form, in summer operation, the SOLAR ABSORBERS, and in winter operation a *SECOND TEMPERATURE BARRIER.*

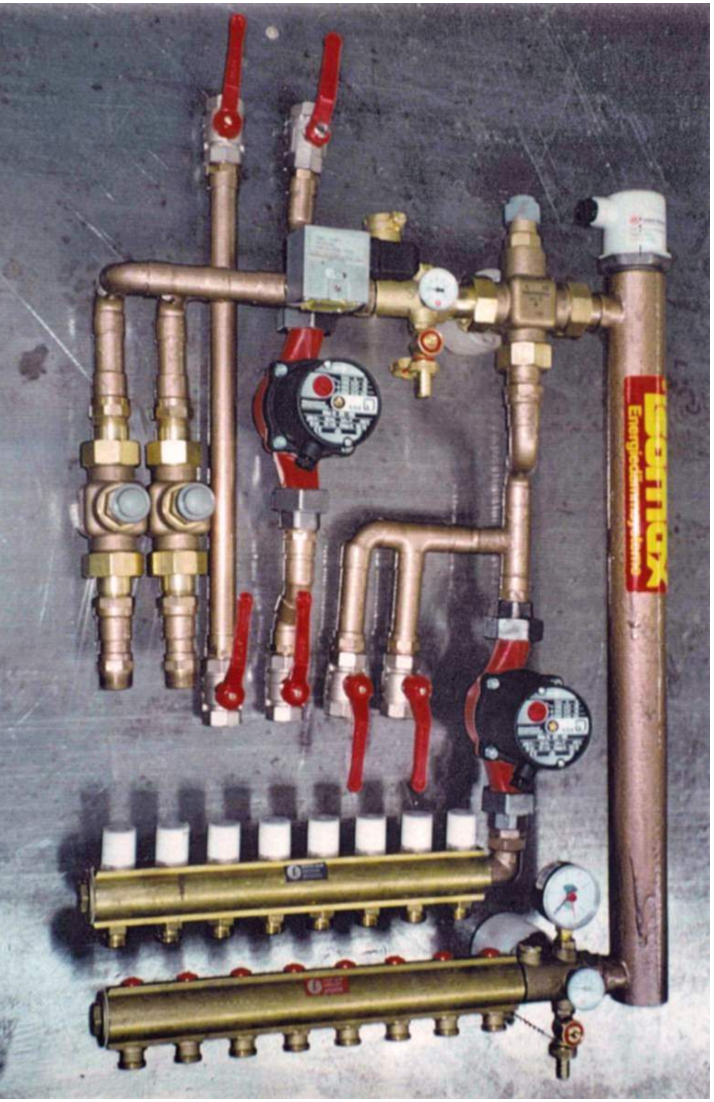
® isomax

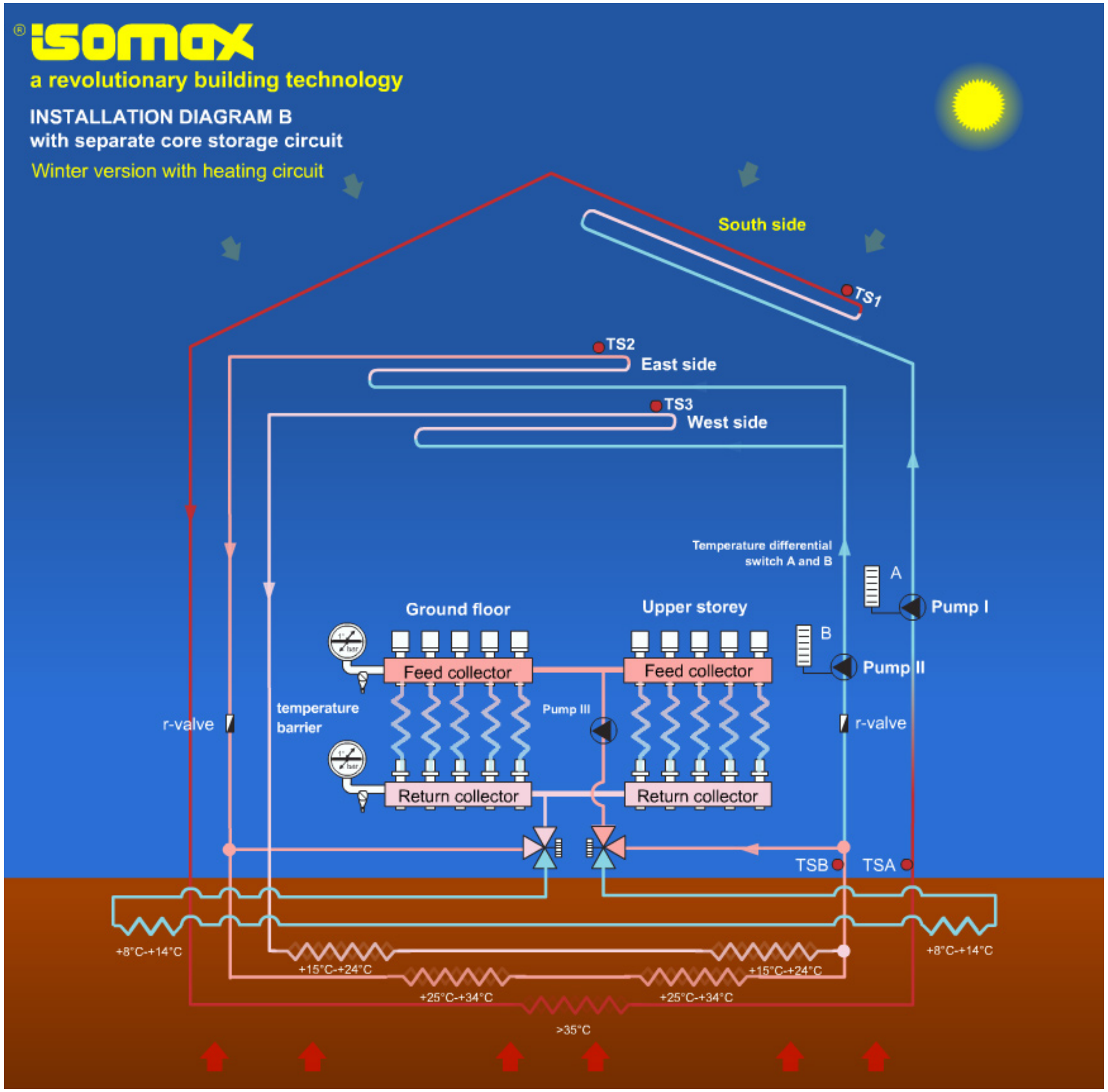
a revolutionary building technology

INSTALLATION DIAGRAM B
with separate core storage circuit

Winter version with heating circuit






isomax
a revolutionary building technology
INSTALLATION DIAGRAM B
with separate core storage circuit
Winter version with heating circuit
South side
TS1
TS2
East side
TS3
West side
Temperature differential
switch A and B
A
Pump I
B
Pump II
Ground floor
Upper storey
Feed collector
Feed collector
temperature
barrier
Pump III
r-valve
r-valve
Return collector
Return collector
TSB
TSA
+8°C-+14°C
+8°C-+14°C
+15°C-+24°C
+15°C-+24°C
+25°C-+34°C
+25°C-+34°C
>35°C

Installations for ISOMAX passive building technology can be fabricated and installed with just minimum technical skill by plumbing firms and laymen respectively.

For the first year of operation – where it has not been possible to receive the first summer solar feed in – it is recommended that a small additional heating apparatus, such as a heat exchanger or an immersion heater, is included as a precautionary measure. This would also be an additional precaution for possible extremely cold polar nights.

Pipe-in-Pipe Ventilation System

Stainless steel pipes are coiled at the construction site and laid beneath the HOT / COLD CIRCUITS as a pipe-in-pipe counterflow ventilation system for intake and extraction of air. This has a heat exchange function with a performance of around 98%.

Transport of Pipe-in-Pipe Ventilation System

On site fabrication of the pipe-in-pipe system and the transport and laying of the system in the excavation do not require any specialized knowledge.

Cool Circuit - Air

Cool Circuit - Air

The pipe-in-pipe ventilation system, made from high grade stainless steel for the hot circuit, is laid underneath the building. The cool circuit outside the building is brought in directly.

Hot Circuit - Air

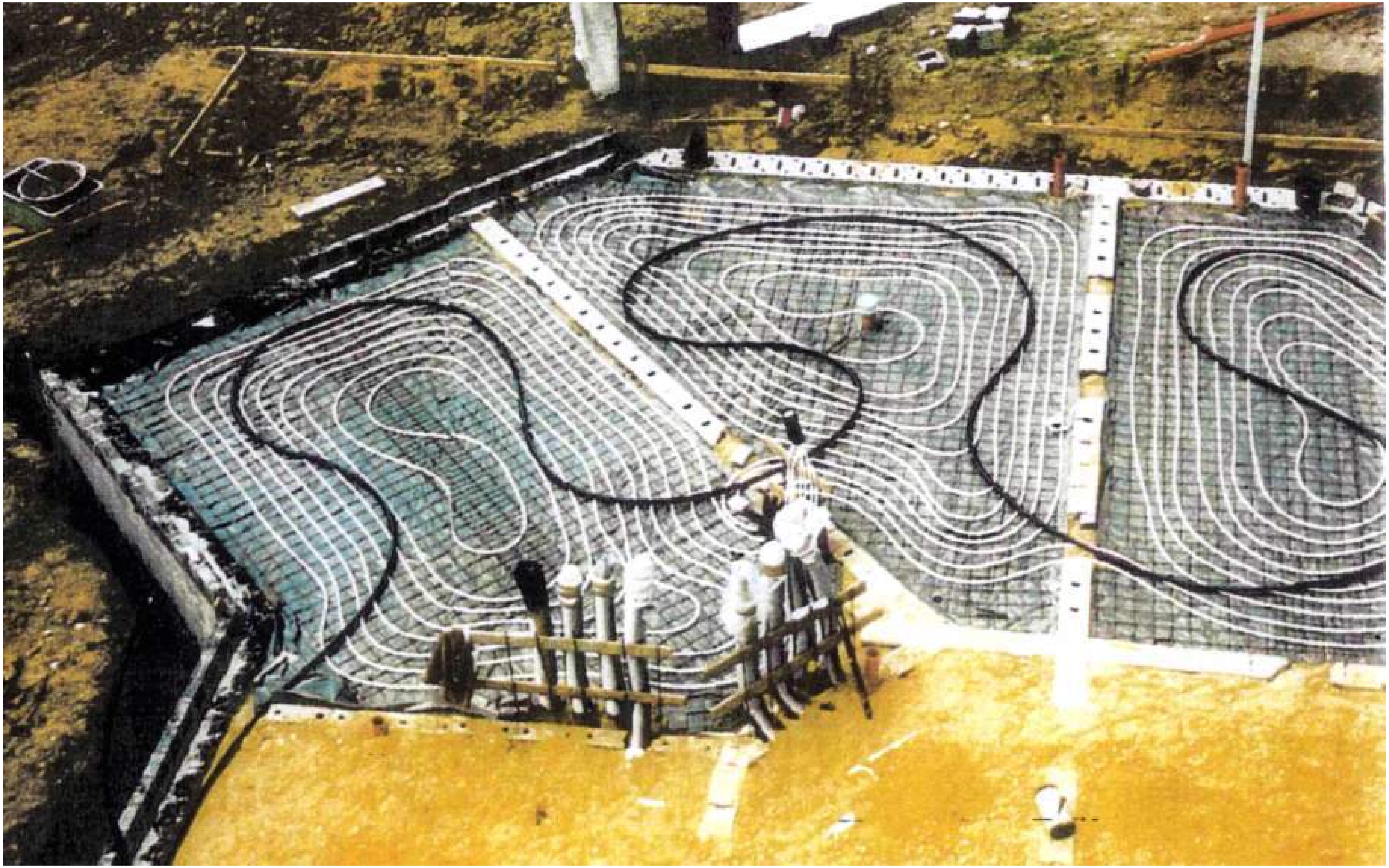
An additional multiple **energy gain** enables **heating** or **cooling** from the earth around the outer pipe of the incoming air. After flowing through the COLD / HOT CIRCUITS the incoming air, now brought to room temperature in the outer pipe, reaches the rooms in the house.

The return air is expelled from the building by means of an exhauster through the inner pipe, in accordance with its heat exchange function.

Cool Circuits - Water

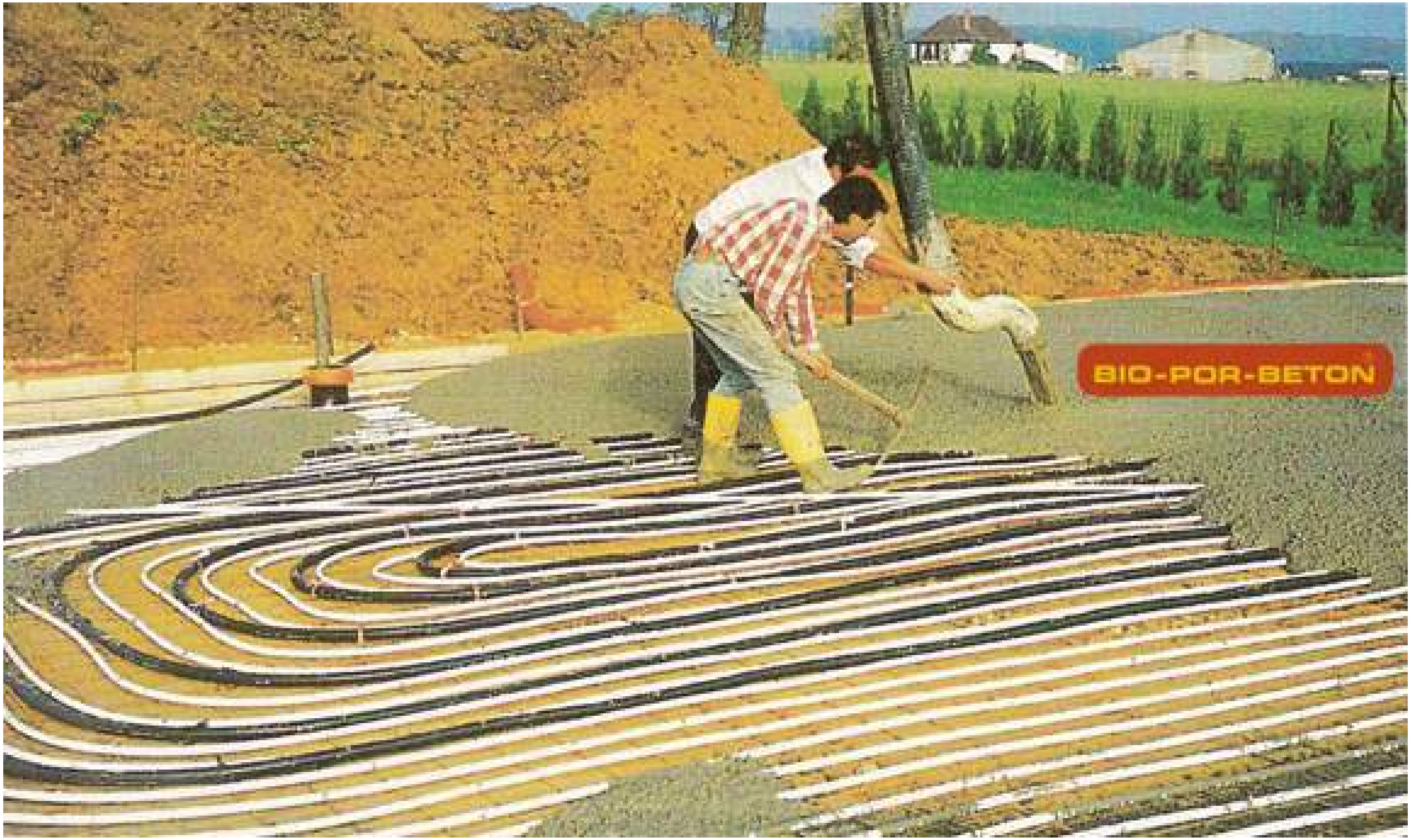
Numerous PP 20/2 Ø circuits are laid outside the foundation slab. These then form what are called the COLD CIRCUITS up to a maximum of +16°C.

Hot Circuits - Water



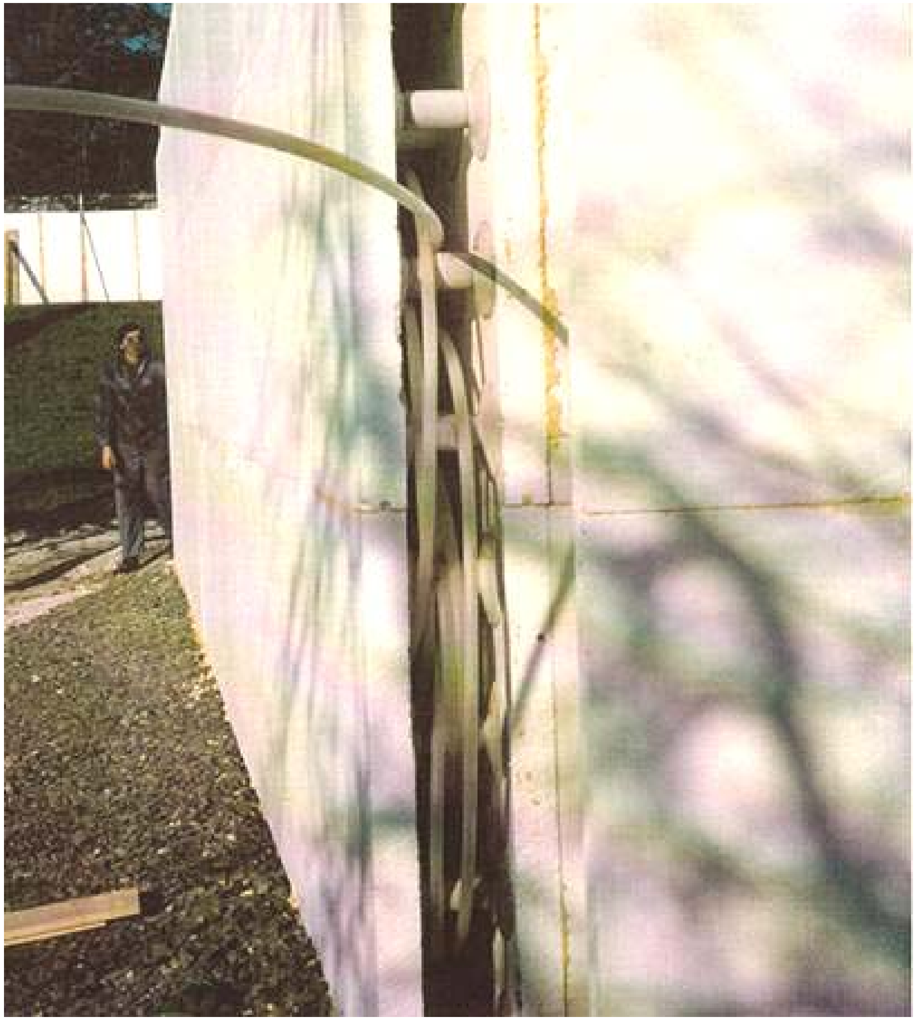
In the early stages of the new construction, several PP 20/2 Ø circuits are laid within the concrete foundation slab (not strip foundations). These then form what are called the HOT CIRCUITS up to a maximum of +22°C.

Hot Circuits - Water and Hot Water Preheating



A ground-level development – without a basement – is also possible. 32/4 Ø PE piping for hot water preheating is integrated into the core of the foundation slab. For preference, Bio-Por-Concrete (highly porous concrete) is used.

Temperature Barrier - Water



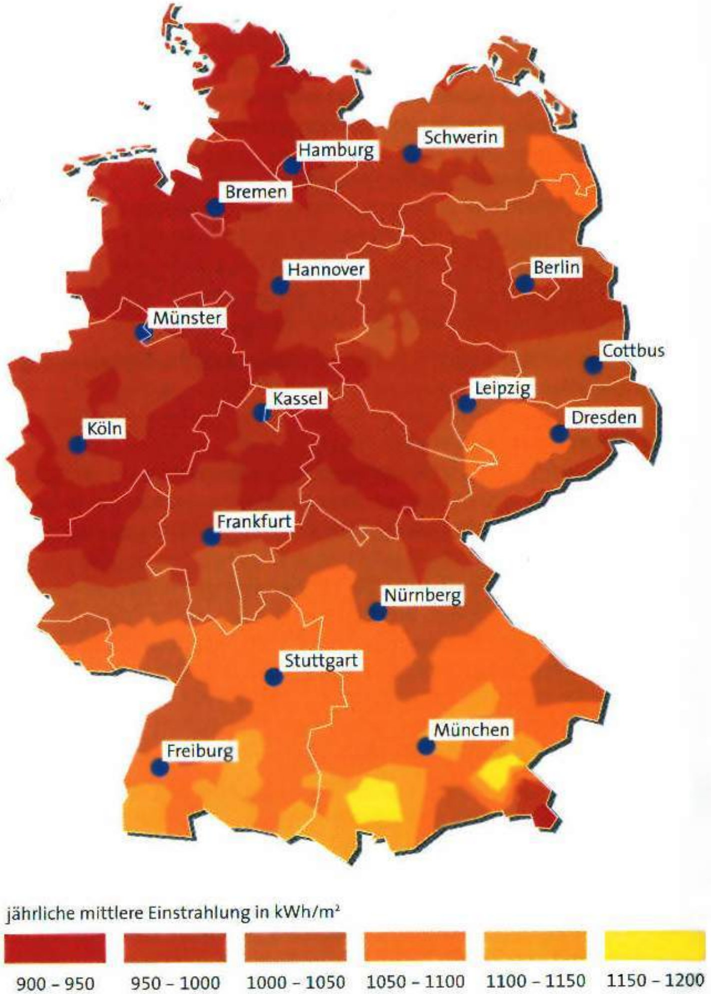


Bild 1.54 Sonneneinstrahlung in Deutschland – mittlere Jahressummen in kWh/m², Quelle: DWD

Extremely thin exterior wall with PP piping for the temperature barrier in maximum space of 15cm, “in situ” for load-bearing Bio-Por-Concrete core to be poured in.

Solar Absorber Roof

In all the roofs, PP 20/2 Ø circuits are also laid in the centre or on the upper side, outside the insulation, in a meandering form. These then form, in summer operation, the TEMPERATURE BARRIER and SOLAR ABSORBERS, and in winter operation, where necessary, a SECOND TEMPERATURE BARRIER.

Kyoto, College of Medicine/Technology, Foundations

Many hundreds of buildings have had to be constructed across the world to become a proficient leader in the low energy houses, the passive house and what is today known as “Zero Energy Building Technology”.

Kyoto, College of Medicine/Technology

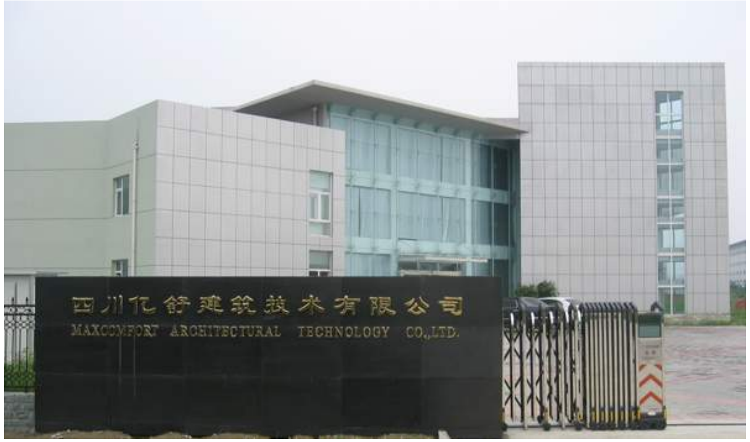
ISOMAX technologies have made large scale environmentally friendly and economical projects possible all over the world.

Large Scale Project Poland, 126 Residential Units

ISOMAX in Poland

Poland – as an extremely energy dependent state – has accepted the ISOMAX passive building technologies scientifically and politically as a building technology giving priority to economical as well as environmental factors.

Large Scale Projects China, Office and Residential Buildings



ISOMAX in China

China, as the most energy-hungry industrial nation in the world, in its search for quick to implement, urgently required solutions to environmental problems, has, like other nations, also opted for ISOMAX passive building technologies in order to conserve energy.

ISOMAX

Energetically the Best Home in Poland

8,5 kWh/m²/a

MEMORANDUM 061108 **Visit by delegation from STUTTGART UNIVERSITY OF APPLIED SCIENCES and OPOLE UNIVERSITY OF TECHNOLOGY to ISOMAX Passive House (8.5kWh/m²/a) in Turawa near Opole, Poland on 08.11.2006**

Opole / Stuttgart 8.11.2006

Participants:
Prof. Dr. Martin Stohrer – Chancellor of Stuttgart University of Applied Sciences (HfT), Stuttgart, Germany
Dr. Ing. Eduard A. Konopka – Civil Engineering Department, HfT, Stuttgart, Germany
Prof. Dr. habil. Tadeusz Chmielewski – Dean of Civil Engineering Department, Opole University of Technology, Opole, Poland
Prof. Dr. habil. Inz Roman Ulbrich – Head of TERRA-SOL Research Centre, Chair of Environmental Technology, Opole University of Technology, Opole, Poland
Mr Jan Szefer – Building owner, Turawa, Poland

1. The ISOMAX passive house in Turawa was built according to a TERRA-SOL / ISOMAX Technology standard project in 2003. Plastic pipes were used in the roof of the building as simple solar absorbers incorporated below the roof surface. This captured heat is transported via the foundation slabs into the ground under the house and is stored there. A separate system of pipes then transports this heat from here into the pipes in the exterior walls, which then forms a temperature barrier. During the winter this temperature barrier brings a clear reduction in heat loss from the inside to the outside (during the summer the temperature barrier prevents heat from entering the building). After three years the temperature of the barrier had already reached +18° C. The return air is fed back into the central heat exchange pipe system (stainless steel pipe-in-pipe counterflow ventilation system for intake and removal of air) where, during the winter, the heat from the used air heats the cold external air.

2. During the visit, the outside temperature was between +3° C and +4° C with an extremely cold, gusty wind. The temperature inside, which is controlled in each individual room, then reached +25 ° C on the ground floor and +21°C on the first floor. The ventilation did not appear to reduce the high level of comfort at all. The visitors were impressed at how warm and comfortable the room felt. All the rooms were considered to be ventilated perfectly. Unpleasant cold draughts could not be detected. The performance of the kitchen extractor will possibly be optimised in the future.

3. The Szefer family stressed that with the ISOMAX technology the desired room temperature can be achieved both in winter and in summer.
The energy requirement for heating, cooling, intake and removal of air for ventilation and water preheating was also confirmed by the building owner to be around 8.5kWh/m²/a. He maintained that the total energy requirement of the building (lighting – television – electric cooking – hot water – heating – cooling – ventilation) came to 75 Euros a month.

4. An additional energy source is not required. The open-fire is used occasionally during the year. It was established that the open-fire was not in accord with the ISOMAX technology and has a negative effect on the whole positive energy balance. The air circulation, in fitting with the principles of a passive house, should soon be improved.

Signature	*Signature*
Prof. Dr. -Ing. habil. R. Ulbrich TSW Terra-Sol International Scientific Board	Dr. -Ing E.A. Konopka Stuttgart University of Applied Sciences Civil Engineering Department

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The most energy efficient and environmentally friendly home in Poland today – leading the way for politics, universities, associations, and homebuilders.

Construction of the “City of Luxembourg“ in Djibouti

COOPERATION LUXEMBOURGEOISE

LUX-DEVELOPMENT
SOCIETE LUXEMBOURGEOISE POUR LA COOPERATION INTERNATIONALE

LA "CITÉ DU LUXEMBOURG"

TECHNOLOGIE LUXEMBOURGEOISE DANS LA CORNE DE L'AFRIQUE

En association étroite avec une entreprise luxembourgeoise Lux-Development a entrepris un projet ambitieux à Djibouti visant à:

- transférer du savoir-faire adapté d'origine luxembourgeoise
- produire sur place tous les éléments pour la construction préfabriquée;
- valoriser les matières premières locales (sable et roche basaltique)

Dans un premier temps, il a été aménagé une usine de production dans laquelle plus de 80 ouvriers sont formés à la nouvelle technologie.

Simultanément le projet construit à Balbala un lotissement de 92 maisons unifamiliales préfabriquées destinées aux couches de la population à faible revenu.

Le chantier de la "Cité de Luxembourg" occupe plus de 200 ouvriers répartis entre une dizaine de firmes locales sous-traitantes.

A l'issue du projet, les équipements sont cédés par Lux-Development à une société créée en joint-venture par une entreprise luxembourgeoise et les entreprises locales les plus dynamiques ayant participé à la réalisation du projet.

Ce projet original est suivi avec beaucoup d'attention par tous les donneurs (Banque Mondiale, FED, etc..) et gouvernements des pays limitrophes (Somalie, Ethiopie, Erythrée et Yemen).

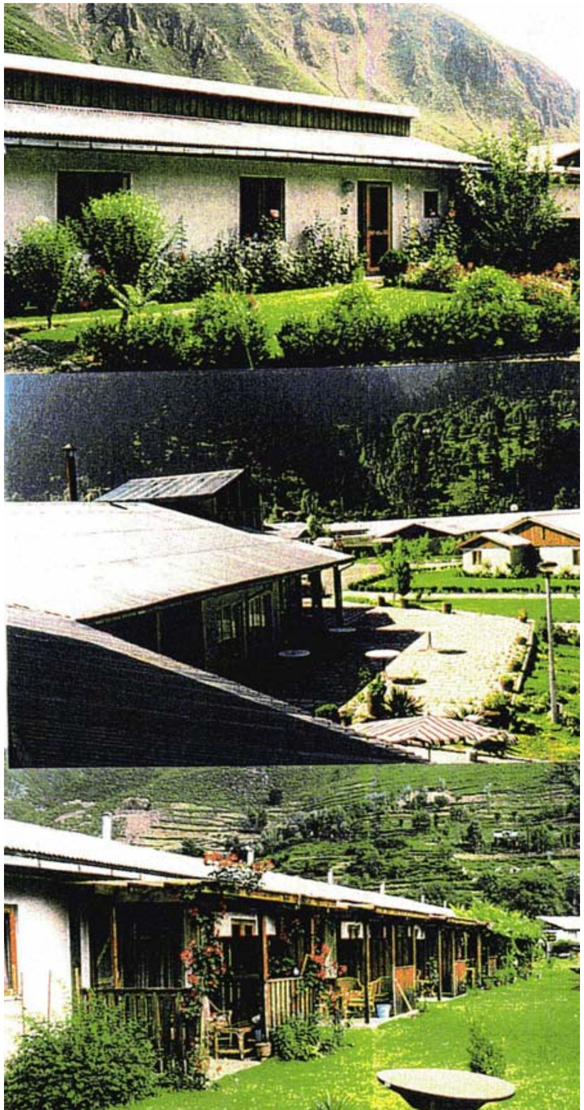
PHOTO DE GAUCHE: Fabrication sur place des écarteurs selon la technologie ISOLUX
PHOTO DE DROITE: Grâce à ce projet, Djibouti redécouvre la beauté de ses pierres basaltiques.

Even for the extremely hot climate of Djibouti, the now proverbial comfort in well insulated ISOMAX buildings was a determining factor in the decision of Luxembourg and Djibouti authorities to build an entire town using ISOMAX technology. African families also have the right to high quality, highly economic housing.

The task of constructing the infrastructures, such as road construction, water supply and a sewage plant, electricity and telecommunications systems, alongside parks and public facilities with integrated shopping facilities, including a new kind of drainage irrigation system for the parks and gardens using innovative technologies, as well as the planning, production and project management, was assigned to Mr. Krecké, Engineer and Physicist. The homes of this large scale project were ready for occupancy in 18 months.

Several earthquakes measuring up to 5.6 on the Richter scale, and the large flood resulting from the dam collapse, have not caused any major harm or damage to people or buildings.

Large Scale Project, Uri Kashmir - Thousands of People Saved



ISOMAX TECHNOLOGY CONFIRMATION

I would like to introduce myself as the responsible Civil Engineer for the construction of ISOMAX residential & commercial project in URI Kashmir. I confirm that under my supervision, with the construction crew, around 400 ISOMAX housing units were constructed during 1990-91 period.

All of these ISOMAX TECHNOLOGY BIO- POR- BETON (Light weight concrete) construction buildings remained undamaged in spite of extremely strong earthquake of minimum magnitude of 7.6 on the moment magnitude scale in October, 8 2005. The ISOMAX buildings are directly located in the area of earthquake in URI KASHMIR.

I would like to thank ISOMAX TECHNOLOGY to have provided earthquake proof building technology. This is to be admired because 80% of surrounding conventional and modern building has been destroyed. The ISOMAX building technology saved thousands of people's life in URI KASHMIR.

Gingal URI
Dated 10th Dec. 2005

ALTAF H FAROOQI
Ex. Responsible Civil Engineer
of ISOMAX Construction Project Uri Kashmir

Large Scale Project, Uri Kashmir - Thousands of People Saved

In Uri, Kashmir, India, a border development of several hundred ISOMAX residential and administration buildings was constructed in a short space of time upon commission of the Indian government.

Immense production plants had to be first shipped from Europe to Uri, assembled on site and put into commission. The work on the infrastructure for the development was also assigned to the ISOMAX licence holder. The project was afflicted by several small and large earthquakes.

In particular, the earthquake on 8 October 2005, measuring 7.8 on the Richter scale, destroyed 80% of the conventional structures in Uri. The 20% that remained intact had been built with ISOMAX technology. Thousands of lives were saved through this earthquake proof construction method.

The entire responsibility and technical management for the project in this area of extreme political tension in the most difficult climate conditions were assumed and undertaken by Mr. Krecké, Engineer and Physicist.

ISOMAX

Research House III

Report on operation and experiences with a residential building constructed with ® ISOMAX building technology, such as foundation heat storage, wall temperature barrier, roof solar absorber, stainless steel pipe-in-pipe counterflow ventilation system:

Building in: Beaufort, Luxemburg
Construction company: Isomax Castellum Investment AG
Year of construction: 1996
Number of residents: 3
Building system: ISOMAX

Basement: 0 m^2 | Ground floor: 154 m^2 | 1st upper floor: 154 m^2
2nd upper floor: 0 m^2 | Open terrace: 40 m^2 | Balcony: 0 m^2
Total useful living area: 308 m^2

Total energy consumption for heating, cooling, ventilation, hot water: 12.2 $kWh/m^2/year$

Current ground storage temperature: + 20 °C

Evaluation	Very Good	Good	Satisfactory	Comment
Overall architectural / aesthetic impression	x			
Creative living / using comfort	x			
Quality of the construction / building material	x			
Quality of the ® ISOMAX technologies				
Temperature and climate comfort: Winter approx. + 22 – 23 °C	x			
Summer	x			
Room air / ventilation quality	x			
Resident comfort	x			
Temperature near the outer walls	x			
Handling of the ® ISOMAX systems		x		
System maintenance	x			
Price / performance ratio	x			
Living comfort	x			
Operating experience with ISOMAX technology	x			
ISOMAX consulting Service and assistance	x			
Evaluation by friends / guests	x			

<u>**Comments and suggestions:**</u> ***"Thanks to the ISOMAX technology: low energy consumption with optimal comfort and a constant temperature year-round of +22 °C / 23 °C."***

The above passive building technology information for our home is approved for publication.

Beaufort, 25.05.2003

Above technical parameters checked by: Didier SCAILLET Mme. RECKINGER

ISOMAX CASTELLUM INVESTMENT AG
Dr. Klaus KUNKEL

® isomax

The solar research houses I, II and III in Luxembourg and the ISOMAX residential house built in 2004 in Turawa, Poland, along with many others, have received full approval from their occupants.

The economical, extremely environmentally friendly technology and the high levels of comfort have now been recognised and acknowledged by numerous competent international institutions.

Thank you for your attention!

Edmond D. Krecké

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