

# NULLPLUS+ House

The First Active Passive Wooden House Featuring ISOMAX® Technology



Informational Brochure

## CONTENTS

1. Prologue
2. The Idea: Das **NullPlus** House
3. The Energy Concept
  - 3.1. The Energy System
  - 3.2. The Temperature Barrier:  
Exterior Wall Climatisation and Compensation System
  - 3.3. The Fresh Air Underground Duct Ground System:  
"Pipe-in-Pipe Counter Flow System"
4. Summary
5. References

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## SUPPLEMENTS

Photo Documentation

A4 Poster "**NullPlus** House System Diagram"

## 1. PROLOGUE

As stated by BUND (the German branch of "Friends of the Earth") in an informational pamphlet on renewable energy dated August 2005<sup>1</sup>: "The path to a regenerative energy supply is long, but not impossible. By 2050, industrial nations should reduce their climate-altering carbon dioxide emissions by 80%. According to UN calculations, this would reduce climate change to a temperature increase of only 0.1 degree per decade."

Increased energy efficiency is a step along this path. It is no longer an acceptable luxury that approximately 40% of all energy-sources, such as crude oil, petroleum, natural gas and coal, are used for climatization, i.e. to heat and cool buildings. Financially feasible, but still environmentally-friendly alternatives that can reduce consumption of ever-dwindling resources are possible. However, cost-efficient Solutions for end consumers have to be developed, since "despite wide-ranging efforts to utilize renewable energies, the primary energy costs for producing such Systems and installations as well as the procurement costs for photovoltaic technology, solar collectors and heat pumps are still decidedly too high in comparison with the energy savings achieved," according to Krecke and Kunkel in their article published in the Jahrbuch Bautechnik des VDI 2005 (Construction Engineering Almanac) of the VDI (Association of German Engineers)<sup>2</sup>.

## 2. THE IDEA: **NULLPLUS** House

In times of increasingly scarcer resources and rising energy costs, Manz Fertigbau GmbH, a traditional timber and wood construction Company, aims to build more energy-optimised houses through the application of intelligent Solutions.

- Houses that utilize regenerative energies and thereby reduce day-to-day energy costs to a minimum.
- Houses that are of high quality yet remain affordable.
- Houses with active and passive use of environmental energies that are optimised in regards to environmental and economical aspects.

For several years now, the market has been flooded with Systems and products for energy-optimized construction. However, the Investment and maintenance costs of these Systems are not acceptable. **The price of a building and its Systems in terms of primary energy costs and day-to-day energy costs are still decisive.**

Manz Fertigbau GmbH believes that the Key strategy here should be one that eliminates additional costs for the building Shell and Systems while reducing investment and maintenance costs in conjunction with maximum energy savings through the use of environmental energies and optimally insulated building Shells. For years, Manz Fertigbau has been focusing its efforts on planning, building and innovating inexpensive homes that are affordable for everyone, have a simple, comfortable aesthetic and actively utilize environmental energies.

As a material, wood is the ideal complement to the ISOMAX® building technology developed and patented by E. D. Krecke, Dipl.-Ing. (Degreed Engineer). Building a house of wood is environmentally sound, operating it usually is not. The primary energy consumption for the construction of a wood house is extremely low, but heating generally takes place with fossil fuels and is neither environmentally nor economically practical. For this reason, Manz Fertigbau has acquired an ISOMAX® license in order to utilize and adapt this unique technology. Solar energy and geothermal heat have been successfully integrated into the energy concept of a wood house. Under the label **NULLPLUS** House, the world has now been introduced to "the first active passive wooden house for heating and cooling buildings with environmental energy". The **NullPlus House** featuring ISOMAX® technology is exclusively from Manz Fertigbau GmbH.

### 3. THE ENERGY CONCEPT

The innovative technology of the **NullPlus House** is an impressive new concept in the use of energy and is distinguished by the following components:

#### 3.1. The Energy System

Solar energy is captured via the outer shell of the house (via the walls and roofs) in contact with the outside air. This thermal energy is stored in the ground under the building in a solid accumulator, supplemented by the warmth of the earth. Plastic pipes filled with water, which are buried in the ground and embedded in the building structures (i.e. not visible from the outside), transport the energy and feed it into the core reservoir. The solid earth under the foundation is "insulated" on the sides, thus acting as an effective storage medium for the input heat. The storage capacity of various soil qualities is currently being researched to determine the best conditions for optimal solid storage of thermal energy.

This can be subdivided into various temperature ranges by means of corresponding adjustments and settings: the core reservoir at temperatures above 35 °C serves to preheat the service water. The middle and border storage zones, with a temperature range of 15 - 24 °C, provide energy storage for the temperature barrier in the Shell of the house. For cooling the exterior walls during the summer, an optional additional cooling circuit outside the building utilizes the relatively constant ground temperature of 7 to 14 °C.

As a result, the heating requirements of the house can be met exclusively by the ground storage in conjunction with the additionally captured solar energy. The energy demand is significantly below 15 kWh/m<sup>2</sup> of living space per year, which is even lower than the defined passive house standard.

### 3.2. The Temperature Barrier:

#### Exterior Wall Climatization and Compensation System

With a conventional wall structure, significant transmission heat loss cannot be avoided during the heating season due to the temperature difference between inside and outside. During the summer months or in other climate zones of the Earth, the reverse problem arises - the building becomes overheated. The **NullPlus House** offers an impressive solution for both of these potential conditions: the "Exterior Wall Climatization and Compensation System" (EWCC) acts as a temperature barrier.

Temperature-controlled water, guided through pipes, flows through a building component with a temperature barrier. These pipes have thermal insulation on the component interior as well as insulation against the exterior air. During the heating season, the wall cross-section is warmed to approx. 14 to 18 °C, depending on the temperature of the Underground storage. The transmission heat loss therefore arises only from the temperature difference between the building interior (interior room temperature in accordance with the German Energy Savings Ordinance (EnEV), e.g. 19° C) and the temperature barrier. The exterior insulation no longer plays any role in transmission heat loss, since the energy escaping there is re-supplied from the Underground storage, which, of course, has to deliver sufficient energy to maintain the wall temperature. During the heating season, the temperature barrier thus enables a significantly reduced and entirely minimal heat loss through the building shell. During the summer, the building is cooled via the temperature barrier. The "cooling circuits" installed outside of the solid storage flow into the temperature barriers at a temperature of approx. 8 - 12 °C and absorb energy there. If it exceeds the temperatures in the border zones of the solid storage, this energy can be guided back to these zones. The end result offers two benefits: cooling of the building Shell and re-supply of the solid storage.

### 3.3. The Fresh Air Underground Duct System: "Pipe-in-Pipe Counter Flow System"

Nowadays, controlled Ventilation of the building is practical in terms of both reducing energy consumption and increasing comfort. A fresh air Underground duct system with heat recovery is used in the **NullPlus House**. With the unique stainless steel "pipe-in-pipe counter flow system" - also patented by E.D. Krecke - the supply and exhaust air are guided in two opposite directions through pipes laid in each other. The extremely thin-walled, coiled stainless steel pipes act as a heat exchanger.

With a properly dimensioned length of the two stainless steel pipes, a more than 95 % degree of efficiency is achieved for the heat exchange process. The fresh air transported within the pipe system is guided through the ground for heating or cooling the air, depending on the outside temperatures.

Thus ISOMAX® technology is just as important for ventilating living spaces in summer as well as winter. In the energy exchange processes described here, the geothermal energy and solid storage are used for consistent conditioning of the air! The required control technology is limited to one exhauster and accessories.

#### 4. Summary

The NullPlus House combines the use of solar energy with near-surface geothermal energy in an amazingly simple way. The advantages of the two proven processes are both realized. Numerous examples of ISOMAX® solid construction in all climate zones of the Earth also substantiate the efficiency of this System.

Both the manufacturing and operating costs are low. The annual heating demand is significantly lower than the passive house Standard. The extremely low amount of electricity it requires makes the technology of the NullPlus House an exceptionally attractive and above all environmentally-friendly alternative to conventional heating and air conditioning Systems.

On the basis of these experiences, which corroborate the environmental friendliness, effectiveness and cost-efficiency of the ISOMAX building technology, the Manz **NullPlus** house, with its wooden construction design, can be assessed as making an innovative contribution to an ecologically compatible and sustainable approach to utilising the resources of the earth.

#### 5. Literaturnachweis

Becker, Thorben; "Erneuerbare Energien";  
Bund für Umwelt und Naturschutz (BUND/German branch of Friends of the Earth)  
August 2005

Krecke, Edmond D.; Dr. Kunkel, Klaus;  
"Klimatisierung von Gebäuden durch oberflächennahe Erdwärme";  
Preprint of the Jahrbuch Bautechnik des VDI 2005  
(2005 Construction Engineering Almanac of the Association of German Engineers)  
Düsseldorf 2005

## SUPPLEMENT

### NullPlus House Photo Documentation



Construction of a NullPlus House in Much  
in the Rhein-Sieg district (North Rhine-Westphalia, Germany)

Photo documentation for:

### 3.1. The Energy System



Roof absorber



Solid accumulator circuit

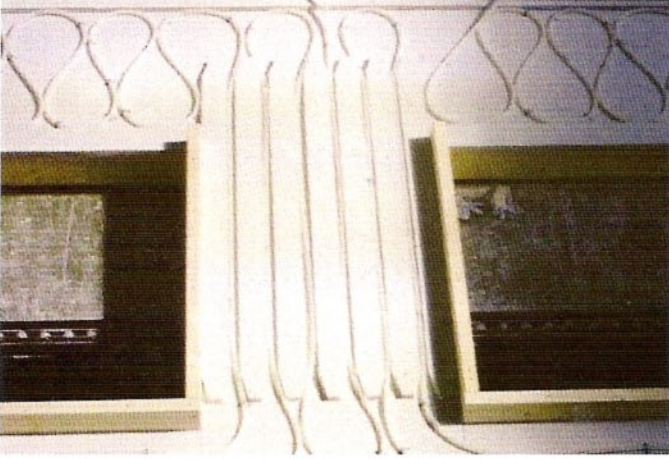


Cooling circuit

Bilddokumentation zu:

### 3.2. The Temperature Barrier:

#### Exterior Wall Climatization and Compensation System



Temperature barrier



Central control and regulation of all building Services



Installation of temperature barrier