# VGH Regionaldirektion Lüneburg

Konrad-Zuse-Allee 4
21337 Lüneburg
Germany


## General Description

Owner:
VGH Versicherungen Hannover, Landschaftliche Brandkasse Hannover, Germany

Architect:
Leonard Schirmer Meyer (LSM), Hannover, Germany

| | |
|---|---|
| Building type: | office building |
| Year of construction: | 2002 |
| Net floor area (NFA): | 3.957 $m^2$ |
| Conditioned floor area: | 3.165 $m^2$ |
| Geothermal system: | foundation piles (101 piles, length 17,5 m - 21,5 m) used for heating and cooling purposes |
| Complementary heating system: | district heating |
| Complementary cooling system: | - |
| Distribution system (all system together): | TABS, radiator, ventilation |
| Ventilation: | natural ventilation; mechanical ventilation (foyer and training rooms) |
| Average building occupancy: | 100 % |

## Energy concept

### Design values geothermal system

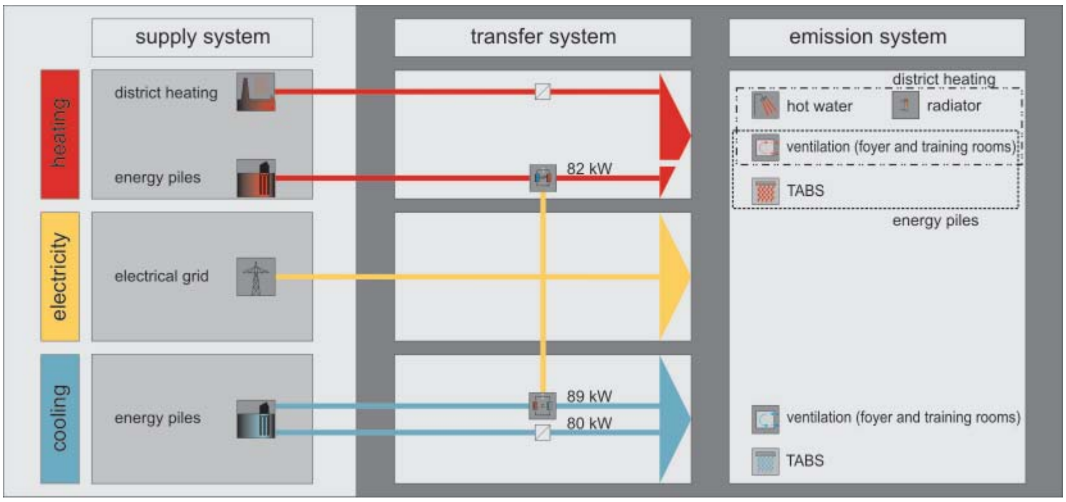
| | |
|---|---|
| heating capacity: | 82 kW |
| cooling capacity | |
| - free cooling: | 80 kW |
| -rev. heatpump: | 89 kW |
| annual heat extraction: | 75 MWh/a |
| annual heat injection: | 25 MWh/a |

| | |
|---|---|
| fraction of total demand | |
| - heating: | 30 % |
| - cooling: | 100 % |

### Design values building

| | |
|---|---|
| total heating capacity: | N/A kW |
| total cooling capacity: | N/A kW |
| spec. heating demand: | 85 kWh/$m^2_{NFA}$a |
| spec. cooling demand: | 5 kWh/$m^2_{NFA}$a |

The four and a half storey building, with a net floor area of about 4.000 $m^2$ was completed in 2002. The shape of the building is rectangular, rounded on the south-eastern side. The entrance and the foyer are located in the front area. The staircases situated in the atrium, divide the entire building into two areas. Training rooms are situated on the south-western façade of the ground floor; whereas on the north-eastern side the cafeteria is placed. The two upper floors and the south-western side of the third floor are allotted for offices. In the basement technical and storage rooms as well as an underground parking are located. The key aspects of the energy concept are optimized ventilation, an optimal daylight usage and a sufficient shading system. Moreover 100 foundation piles, with a length of 17 to 22 meters, are thermally activated for heating and cooling purposes in the building. In the wintertime a ground coupled heat pump (82 kW) extracts heat from the ground and supplies it into the building. During the day it is used to preheat the incoming air to the entrance hall and the training rooms; whereas in the night time it supplies heat to the thermally activated building systems (approximately 1.500 $m^2$) in the offices and training rooms. The geothermal energy is covering the base load of the building. In the case of the increased heat demand during the day, the additional heat from district heating is supplied to conventional radiators in the offices and floor heating in the entrance area. Moreover the district heating can be used for preheating the air supplied to the ventilation systems. In the summertime, two cooling modes are predicted. As long as the conditions in the ground are sufficient the free cooling mode (80 kW) is in use. When the temperatures in the ground rise notably, the reversible heat pump is used as a cooling machine (89 kW). Analogous to the wintertime the soil is used to pre-cool the air supplied to the ventilation system during the day and to cool down the thermally activated systems in the office and training rooms during the night. The heat is being removed from the building and stored in the soil for heating period. In the addition the building is being cooled with the free night ventilation. The warm air from offices is being removed outside through the flaps in the atrium and cool air flows through the tilt windows into the building.




Contact

TU Braunschweig
Institut für Gebäude- und Solartechnik
Mühlenpfordtstraße 23
38106 Braunschweig
Germany
Franziska Bockelmann
bockelmann@igs.bau.tu-bs.de
http://www.igs.bau.tu-bs.de

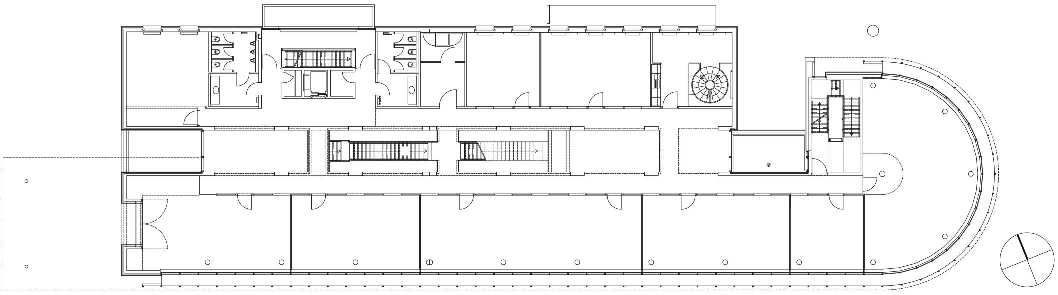
Supported by:

Federal Ministry of Economics and Technology

## Floor plan

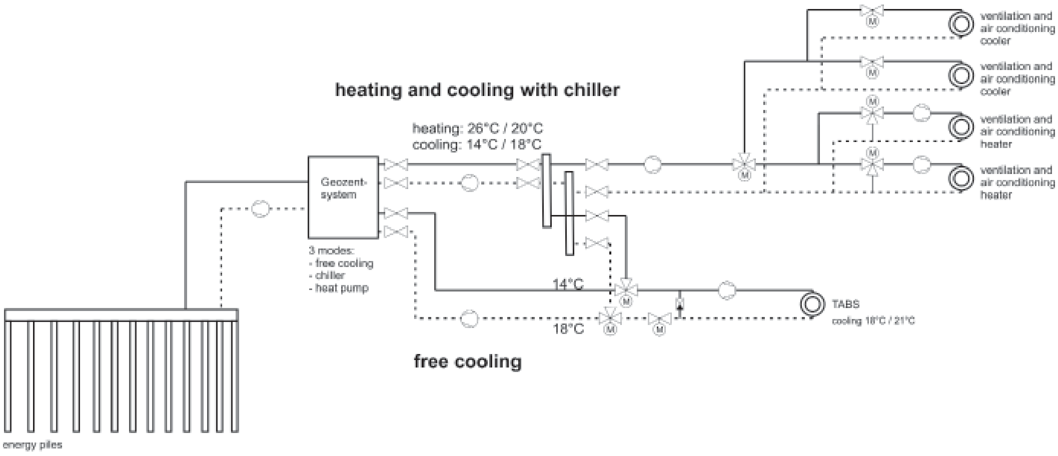
Floorplan

Ground floor



## Hydraulic scheme

Hydraulic scheme with generation-, storage-, distribution-, control- and emission-system (main focus is on geothermal supply)




## Control strategies

TABS with geothermal energy (Mo – Fri 10 pm – 6 am):

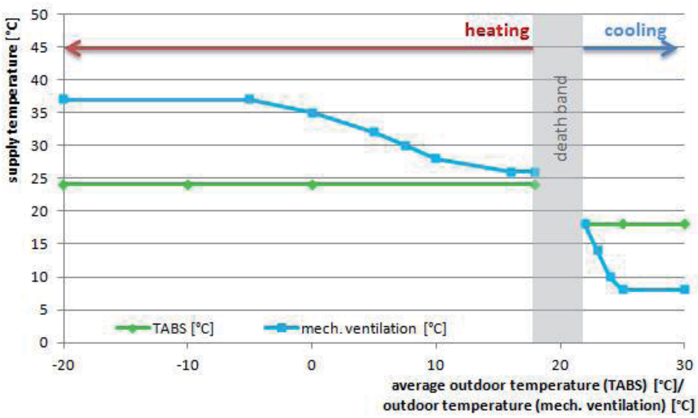
- heating mode, when average outdoor temperatures measured between 6 am and 6.00 pm is lower than 17,5 °C and current indoor temperature is lower than 18,5°C
- cooling mode, when average outdoor temperatures measured between 6 am and 6.00 pm is higher than 22 °C and current indoor temperature is higher than 20 °C

Ventilation with geothermal energy and district heating (Mo – Fri 6 am – 10 pm):

- heating mode, when outdoor temperatures is lower than 18 °C
- cooling, when outdoor temperatures is higher than 22 °C

Radiators with district heating:

- heating mode in the daytime, when the outdoor temperature is lower than 18 °C
- heating mode in the night-time, when the outdoor temperature is lower than 5 °C




Supply temperature for TABS and mechanical ventilation according to the average and outdoor temperature.

## Monitoring data

| energy consumption | | planning | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|
| **total heating consumption** | [kWh/$m^2_{NFA}$a] | | 85,8 | 95,8 | 103,8 | 84,4 |
| **total cooling consumption** | [kWh/$m^2_{NFA}$a] | | 1,7 | 4,9 | 4,3 | 3,4 |
| **geothermal heating supply** | [kWh/$m^2_{NFA}$a] | | 24,6 | 22,9 | 15,2 | 19,4 |
| **geothermal cooling supply** | [kWh/$m^2_{NFA}$a] | | 1,7 | 4,9 | 4,3 | 3,4 |
| **fraction of geothermal energy for heating** | [%] | | 28,7 | 23,9 | 14,7 | 23,0 |
| **fraction of geothermal energy for cooling** | [%] | | 100 | 100 | 100 | 100 |

## Operation experiences

The innovative concept for heating, cooling and ventilation in the building, based on the combination of seasonal energy storage in the ground and summer night ventilation, is profitable from users comfort and economical point of view.
It has to be highlighted, that operation of the ground coupled chiller causes higher temperature on the return, which influences the temperature of the ground. High temperature of the soil makes the free cooling mode not possible to be used, what excludes alternate usage of the modes.