Photo credit: www.luechingermeyer.ch

Project report

GEROtherm® FLUX geothermal probes, geostructures and manholes

---

Tilia® Tower, Chem. du Viaduc 10, 1008 Prilly/Malley

Tilia© Tower

Photo credit: www.ittenbrechbuehl.ch

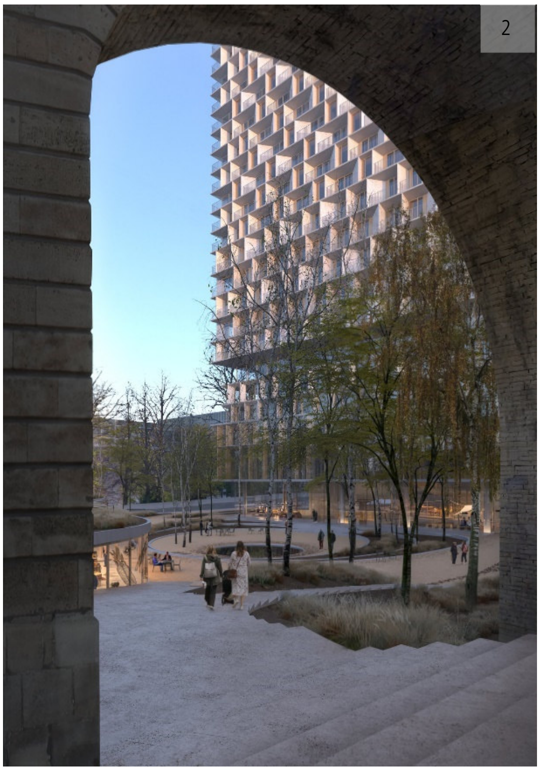


Photo credit: www.ittenbrechbuehl.ch

The Tilia® project comprises an 85-metre-high tower and the renovation of existing buildings. The mixed-use scheme includes 221 residential units, a co-living complex of 160 units and spaces for work, leisure, music and sport, as well as a large landscaped park.

The project is an ambitious initiative in terms of energy, social integration and architecture. By building on the site's existing resources, its sustainable potential is maximised.

The Tilia® Tower stands as a clean-lined architectural marker in a thriving district. Its integration into the neighbourhood is based on a subtle interplay of both volumes with the existing buildings and visual transparency with regard to the viaduct. Particular care was taken to make sure that the tower is optimally integrated into its surroundings and the landscaping in Place du Galicien.

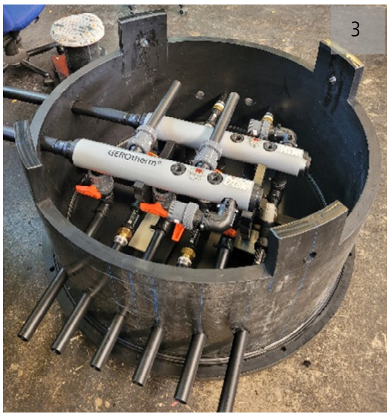
The tower's wide range of amenities – including shops, leisure facilities such as restaurants and gyms, and residential units – are revealed through its differentiated façades. Indeed, façades are a key element in the project. Their low-tech envelopes regulate sunlight, airflow and lighting, while providing varying levels of privacy that enhance user well-being.

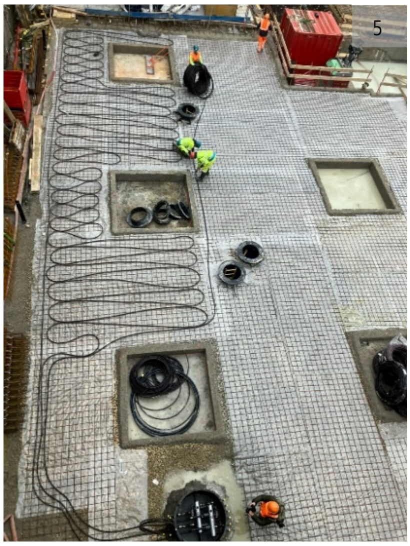
The building is an extension of a cluster of existing structures earmarked for full renovation and preservation. Retaining the Baloise and badminton club buildings – both well-maintained and in active use – is a pragmatic decision. As a result, the project is anchored into the existing urban fabric while lowering the CO_2 emissions that the new construction would generate.

In line with this commitment to reusing resources, there are plans to harness surplus heat from the district heating system in order to heat domestic water. In this way, the building's energy consumption is reduced.

Using timber for the structure and finish lowers the carbon footprint while providing a warm, natural aesthetic.

GEROtherm® geostructures





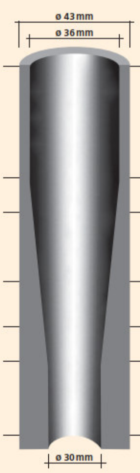
GEOEG and Orllati have chosen geothermal energy for this pioneering project in the Lausanne West urban area. By integrating geostructures into the foundations and installing geothermal probe fields, the Tilia® Tower aims to draw heat from the ground. Located in Prilly-Malley, the Tilia® Tower will house residential units, hotels, co-working and co-making spaces, retail areas, restaurants and sports facilities. The 85-metre structure is built with timber and emits just 2.36 kg of CO_2/m^2/year. For this flagship development, GEOEG designed a low-carbon cooling system that incorporates energy-efficient geostructures. From the initial planning stage to construction, the Lausanne-based engineering and innovation office worked on thermally activating the basement walls and building foundations. These energy geostructures contribute significantly to the tower's overall energy needs and make the building a benchmark in terms of de-carbonisation. At the same time, Orllati installed a 380-metre-deep geothermal probe field to meet a large portion of the tower's heating requirements.

GEOEG was founded in Lausanne by former EPFL students and staff. The Tilia® Tower provides a platform to measure thermal energy recovery from the ground using embedded structures in the foundations of a building or concrete structure. The results of this will be used in developing what is a key concept in the energy transition. This concrete-and-timber tower does not fall short when it comes to its foundations. The concept's simplicity has generated a lot of enthusiasm. Synthetic pipes were embedded while the foundations – which measure more than ten metres deep – were poured. In total, over five kilometres of piping were laid into the concrete foundations. Once installed, they will come into contact with the ground to collect heat. By circulating water through the pipes, heat is extracted from the ground to warm up the building. In summer, the same system can also be used to cool it. This thermal system should enable 30% of the tower's energy needs to be covered. The energy geostructures are also connected to geothermal heat pumps, in a boost to energy sustainability. Solar collectors on the façades provide additional energy. The Tilia® Tower is also connected to a district heating system. The geostructures were laid in foundation walls and slabs, rather than just in piles – the first time that this system has been applied on such a large scale in Switzerland. This required complex but well-managed planning. Investment is required to cover the cost of this approach as well as the development of energy geostructures. Due to the scale of the project, engineering for the geostructures took one to two years before securing the construction permit. As a consequence, this technique comes at a cost, one that makes the work more expensive. It is all nonetheless worth it, because it reduces operating costs. The Tilia® Tower project is expected to pay for itself in around fifteen years. The tower sets an example for promoting energy geostructures and contributes valuable insights regarding this concept.

Thanks to its excellent thermal conductivity, over 9,000 metres of our 25 mm GEROtherm® PE100-RC piping were installed in the project. For the walls, around 2,000 metres of 25 mm HAKAthen PE-Xc-O□ pipe was used.

GEROtherm® FLUX geothermal probes

The client entrusted drilling to Orllati Géothermie SA, confident in HakaGerodur AG's FLUX conical probe technology. In total, 24 GEROtherm® FLUX geothermal probes each measuring 380 metres in length were used for the probe field. These pressure-optimised, conical GEROtherm® FLUX geothermal probes significantly reduce pressure loss compared to conventional PN20 probes, thereby reducing the energy requirements of the circulation pump. The probes were assembled using GEROtherm® connection pipes.



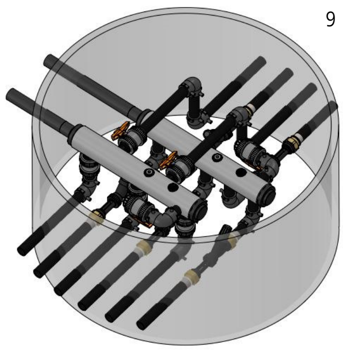
Épaisseur des parois	Résistance à la pression interne	Résistance à l'écrasement[1]
3,5 mm	0 m: 14 bars	0 m: 6,3 bars
3,5 mm	-140 m: 14 bars	-140 m: 6,3 bars
3,8 mm	-160 m: 16 bars	-160 m: 7,8 bars
4,4 mm	-200 m: 20 bars	-200 m: 10,7 bars
5,4 mm	-260 m: 26 bars	-260 m: 15,9 bars
6,5 mm	-320 m: 32 bars	-320 m: 22,6 bars
6,5 mm	-410 m: 32 bars	-410 m: 22,6 bars

[1] à 20°C/60 h selon SIA 384/6

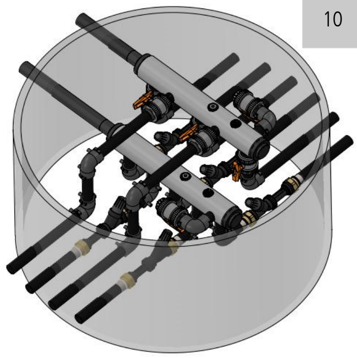
Thickness distribution of the walls and resistance to the pressure of a GEROtherm® FLUX 43 mm geothermal probe

8

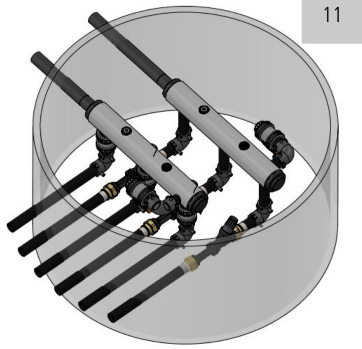
GEROtherm® manholes



9



10



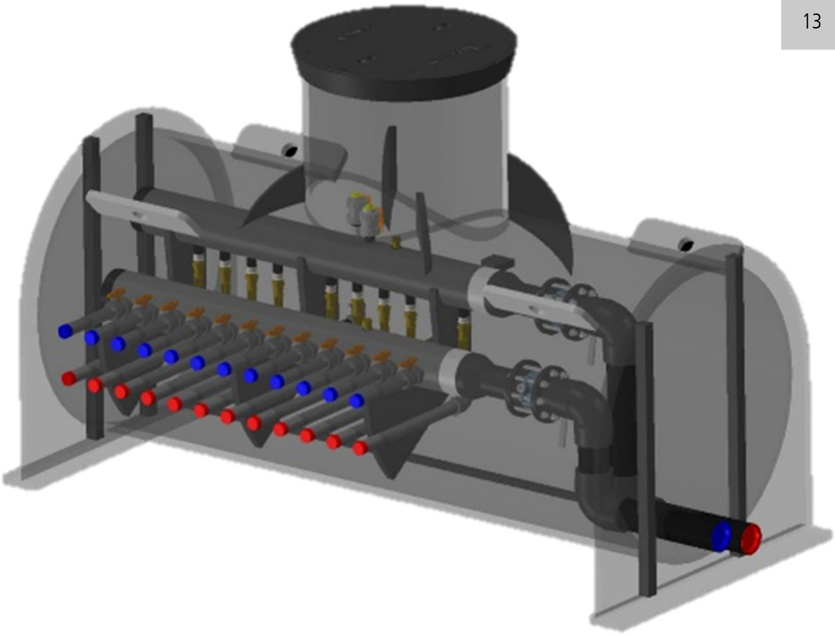
11

In order to group together the geostructures in the basement of the building, special manholes were developed to bring together the collectors and distributors of the various circuits while keeping the construction height of the manholes as low as possible. The pressure-optimised, conical GEROtherm® FLUX geothermal probes are grouped into three type 1 and type 3 GEROtherm® manholes.

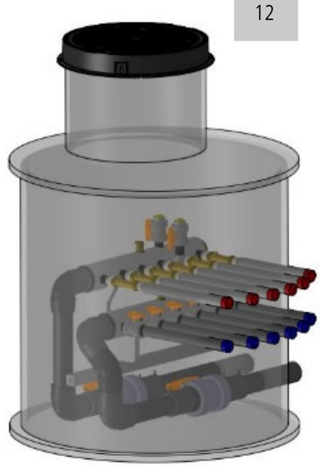
GEROtherm® manholes

The probe field was spread over three manholes: the type 1 manhole with six connections and two type 4 manholes with 19 connections. The probe field was linked to the underground synthetic manholes using connecting pipes. PE100-RC supply and return collectors were integrated into the manholes. The manholes are fitted with SAVE collectors/distributors with 50 mm connections, synthetic ball shut-off valves and fill and drain taps. This allows every geothermal probe to be optimally integrated and adjusted for peak efficiency.

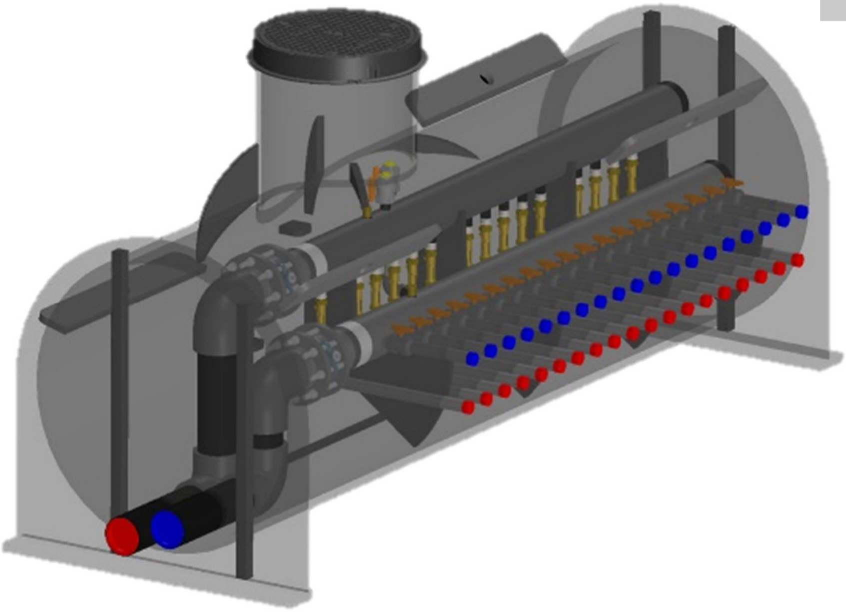
13



12



14



1. Tilia® Tower
   Photo credit: www.ittenbrechbuehl.ch
2. Tilia® Tower
   Photo credit: www.ittenbrechbuehl.ch
3. Special GEROtherm® manhole for connecting geostructures (photo credit: HakaGerodur AG)
4. Special GEROtherm® manhole integrated into the floor slab (photo credit: HakaGerodur AG)
5. Laying the geostructure pipes
   (photo credit: HakaGerodur AG)
6. Concreting the geostructure pipes
   (photo credit: HakaGerodur AG)
7. Geostructures installed
   (photo credit: HakaGerodur AG)
8. Drills in action; view of part of the site
   (photo credit: HakaGerodur AG)
9. Special GEROtherm® manhole, type 3R 2L 40
   (photo credit: HakaGerodur AG)
10. Special GEROtherm® manhole, type 3R 3L 40
    (photo credit: HakaGerodur AG)
11. Special GEROtherm® manhole, type 3R 40
    (photo credit: HakaGerodur AG)
12. GEROtherm® manhole, type 1 6×50
    (photo credit: HakaGerodur AG)
13. Special GEROtherm® manhole, type 3 12×50
    (photo credit: HakaGerodur AG)
14. Special GEROtherm® manhole, type 3 19×50
    (photo credit: HakaGerodur AG)
15. GEROtherm® FLUX on the way to the site
    (photo credit: HakaGerodur AG)
16. GEROtherm® FLUX on the reel, ready for installation
    (photo credit: HakaGerodur AG)

Project details

Site

Tilia® Tower
Chem. du Viaduc 10
1008 Prilly/Malley

Project owner

HRS Real Estate SA
Rue du Centre 172
1025 St-Sulpice
www.hrs.ch

Drilling company responsible for the work

Orllati Géothermie SA
Route de Bettens 13
1042 Bioley-Orjulaz
www.orllati.ch/competences/geothermie/

Planning

Weinamnn-Energies SA
Chem. du Grésaley 4,
1040 Echallens
www.weinmann-energies.ch

Products used

- 37 GEROtherm® FLUX geothermal probes, 43 mm diameter, 390 metres long
- 37 GEROtherm® injection pipes, 32 mm diameter, 392 metres long
- 37 GEROtherm®, initial weight 19 kg
- GEROtherm® connection pipes, PE 100-RC, 50 mm, PN16
- GEROtherm® geostructure pipes, PE 100-RC 25 mm diameter, 9,000 metres long
- HAKATHEN, geostructure pipes, PE-Xc-02 25 mm diameter, 2,000 metres long
- Two special GEROtherm® manholes for geostructures, type 3R×40
- Two special GEROtherm® manholes for geostructures, type 3R 2L×40
- One special GEROtherm® manhole for geostructures, type 3R 2L×40
- One large GEROtherm® manhole for geothermal probes, type 1 with 6 connections
- One large GEROtherm® manhole for geothermal probes, type 3 with 12 connections
- One large GEROtherm® manhole for geothermal probes, type 3 with 19 connections

HakaGerodur

HakaGerodur AG
Giessenstrasse 3
CH-8717 Benken
Tel.: +41 55 293 25 25
verkauf_ews@hakagerodur.ch
www.hakagerodur.ch