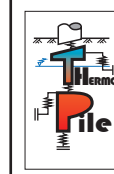
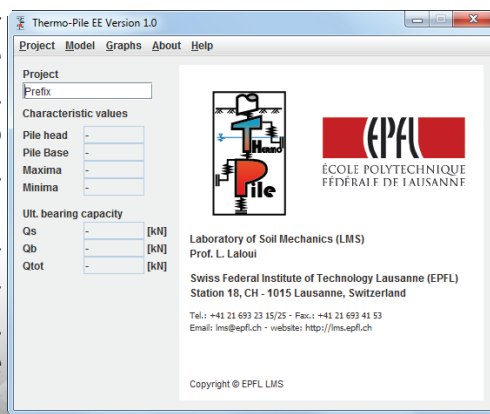
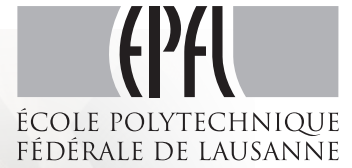


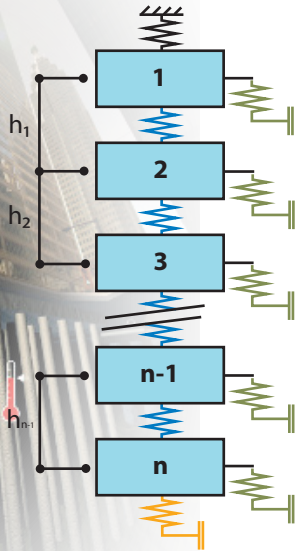
**Thermo-Pile** user interface is easy-to-use and intuitive. Projects can be exported to be used or modified later. Physical parameters are listed in logical menus: soil properties, pile properties, interactions properties and loading. The Graphics menu allows the user to visualize the results.



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**Thermo-Pile** uses a new geotechnical analysis method based on the load transfer approach. It proposes a design method integrating the complex interactions between thermal storage and mechanical behaviour.



**Easy-to-use & Quick**

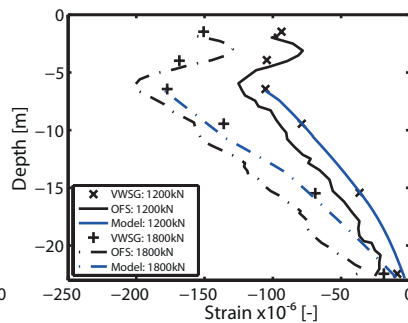
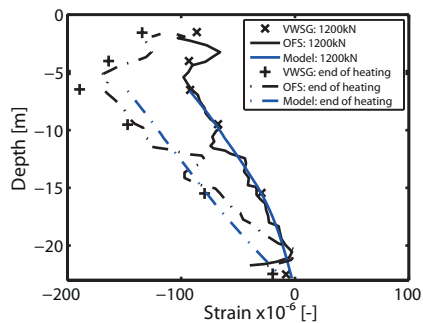
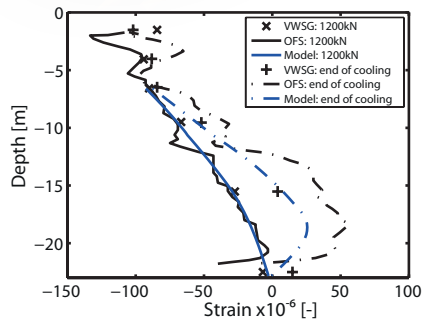
# THERMO-PILE

A Software for Geotechnical Design of Energy Piles

**Innovative**

**Trustworthy**

**Thermo-Pile** was validated against analytical solutions as well as results of two comprehensive full scale in situ experiments (Knellwolf et al. 2011): one carried out at the EPFL in Lausanne, Switzerland (Laloui et al. 2003, 2006) and another one undertaken at the Lambeth College in London, United-Kingdom (Bourne-Webb et al. 2009).

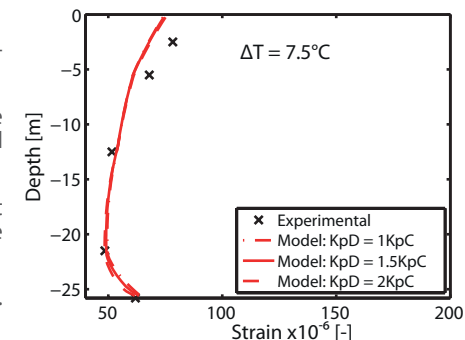
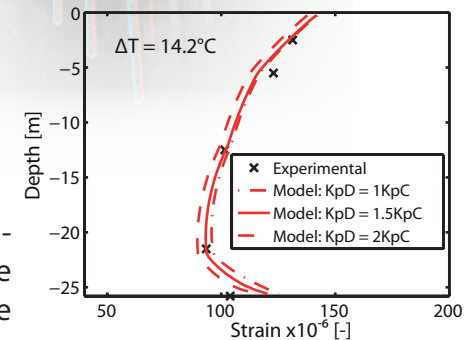


Laloui L., Moreni M. and Vulliet L. (2003). "Comportement d'un pieu bi-fonction, fondation et échangeur de chaleur". Canadian Geotechnical Journal, Vol. 40, 388-402.

Laloui L., Nuth M. and Vulliet L. (2006). "Experimental and numerical investigations of the behaviour of a heat exchanger pile". International Journal of Numerical and Analytical Methods in Geomechanics, Vol. 30(8), 763-781.

Bourne-Webb P. J., Amatya K., Amis T., Davidson C. and Payne P. (2009). "Energy pile test at Lambeth College, London: geotechnical and thermodynamic aspects of pile response to heat cycles". Géotechnique 59, No.3, 237-248.

Knellwolf C., Péron H., Laloui L. (2011). Geotechnical analysis of heat exchanger piles. Journal of Geotechnical and Geoenvironmental Engineering.



# Near-Surface Geothermal Energy

It uses the fact that the temperature is stable and relatively high (10-12°C under the European latitudes) a few meters below the soil surface. This energy can be used for heating during cold spells or for cooling during hot spells. The heat from the ground is extracted with absorber pipes wherein a heat-carrying fluid circulates. Heat pumps are used to raise the temperature level of the heat, forming the so-called Ground Source Heat Pumps.

## Examples of realized projects:

**Midfield dock at Zürich airport (Switzerland, 2003):** About 300 of the 350 piles (1.2 m of diameter) were converted into geothermal piles with 5 U loops attached to the reinforcing cages of the piles. The collected energy is used for heating with heat pumps and direct cooling.

**One New Change building (London, 2010):** This innovative building, regrouping several renewable energy sources, is equipped with 219 energy piles contributing to the heating and cooling of the 52'000 square meters of office or retail space.

**Nanjing new industrial zone (China, ongoing):** The University of Nanjing is involved in the construction of new industrial zone using energy geostructures. As a part of the project, a building will be entirely equipped in order to monitor the fluid temperature in the piles.

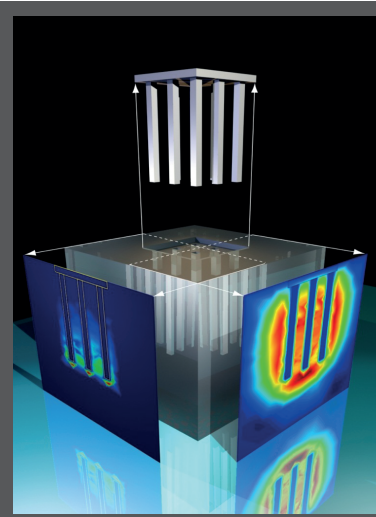


## PHOTO GALLERY

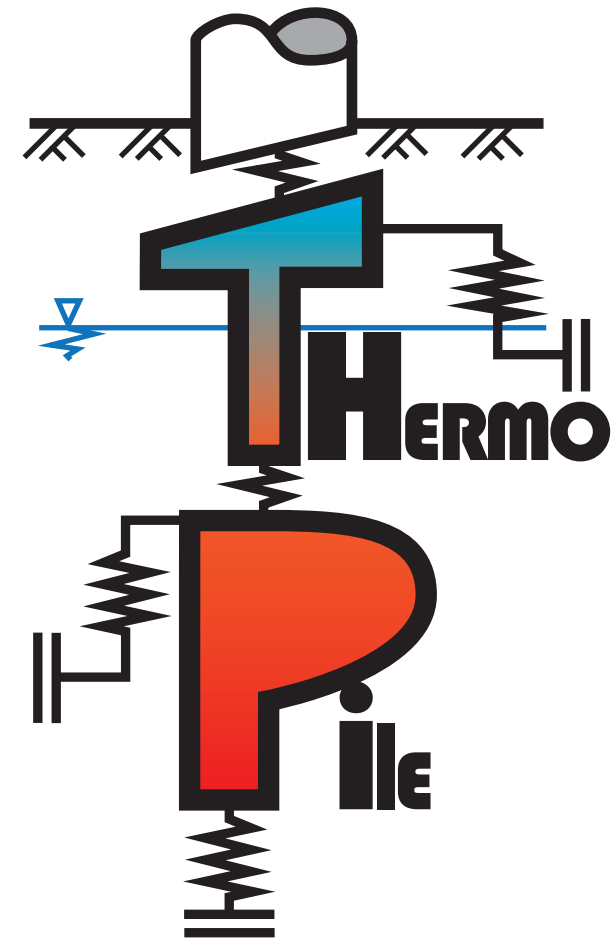
One New Change, London ▲

Main tower of Frankfurt ▼

Results from 3D simulation ◀



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### THERMO-PILE

A software for Geotechnical Design of Energy Piles

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