Temperature Monitoring of Multiple Borehole Heat Exchangers

Hamburg, Germany

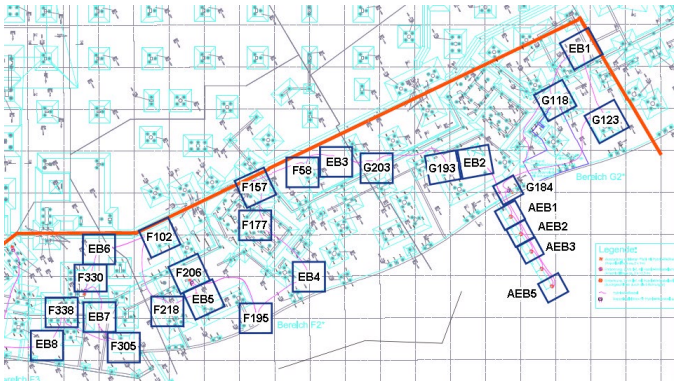
When the Hamburg Ministry of Urban Development and Environment moved into its new buildings, the ministry decided to make use of geothermal heat exchange pipes to heat the buildings in winter and keep them cool in summer.

Over 1600 boreholes and bore piles were drilled and heat exchangers were installed in over 800 bore piles. In 27 boreholes, a fiber optic sensor cable was also installed to enable temperature monitoring with AP Sensing's Distributed Temperature Sensing (DTS) solution. The well-insulated buildings are among the most energy-efficient offices in Germany, requiring only 70 kWh per square meter per year.

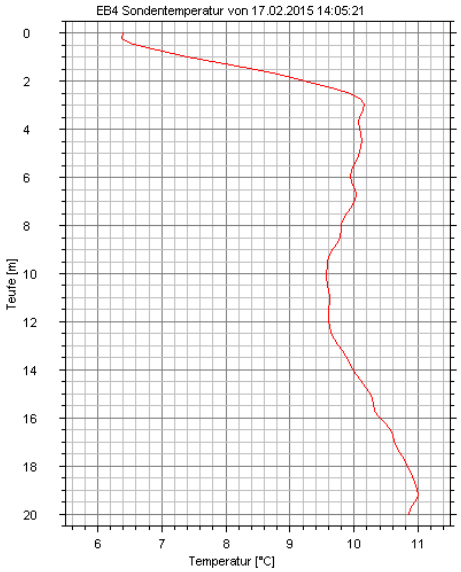
Hamburg Ministry of Urban Development and Environment

Joint box used to connect cables during installation

19" AP Sensing DTS device mounted in a flat wall cabinet



Map of the 27 borehole locations



Temperature monitoring from one of the boreholes

The AP Sensing solution consists of a distributed fiber optic-based DTS instrument with two channels and a two km measurement range. The device itself is installed in a wall cabinet in a control room.

Thermal monitoring of the boreholes is important, because there is a heat limit set by the Ministry that should not be exceeded (e.g., during the warmer summer months, when the system acts to keep the buildings cooler). In addition, the temperature data is used to measure and optimize the system's efficiency. This data is also utilized for a research project by the University of Hamburg.

GTC Kappelmeyer, our local partner, was responsible for the planning, commissioning, and installation. It developed a project-specific program that provides real-time temperature profiles of the monitored boreholes, as well as the temperature histories for each since the system went live in September 2014. In the internal network of the Ministry, live temperature data and graphs can be viewed online.