

Thermal leakage detection at the construction site Conca d'Oro Metro B1 in Rome, Italy

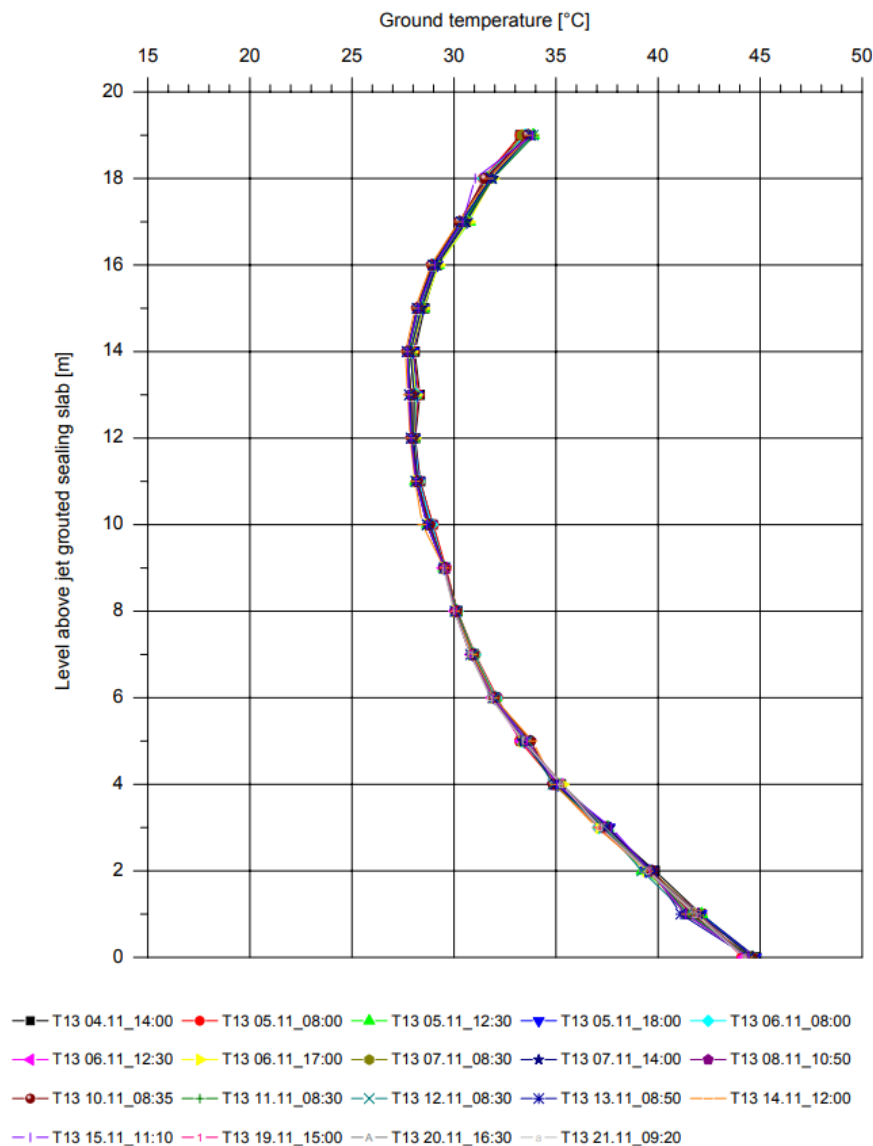
Construction works below the ground water level require a dry excavation. Thus, it is necessary to isolate pits hydraulically from their surroundings. Therefore, an artificial vertical seal (e.g. slurry wall) and often horizontal elements by jet grouting are produced. During this process, the hydration heat of the used cement warms up the surrounding cement. However, if water flows during a pumping test from the outside of the building pit through a leak into the excavation, the temperature profile in the ground around the affected area will change. Temperature measurements in sealed excavation pits therefore enable the exact localisation of leaks in the sealing system.



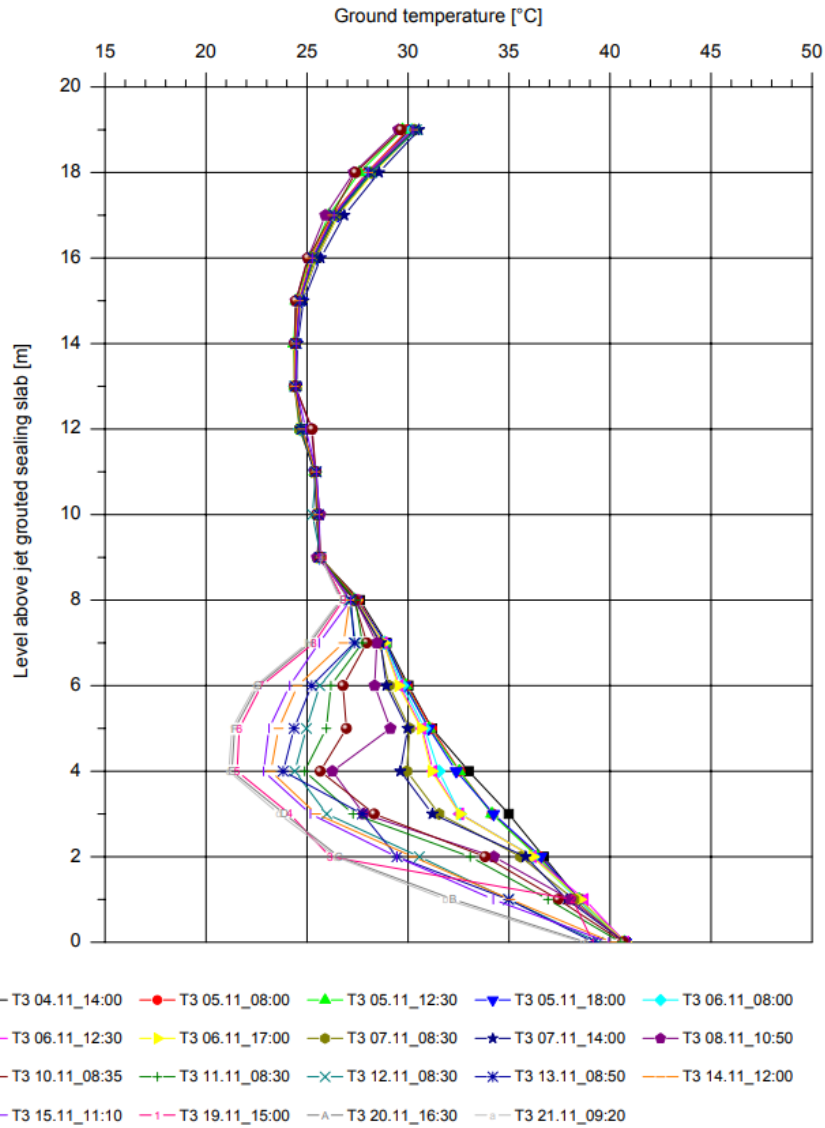
Construction site Conca d'Oro Metro B1 in Rome, Italy

For the construction of the underground station Conca d'Oro of the metro line B1 in Rome, a hydraulically sealed excavation pit was built. Slurry walls and a jet grouted bottom slab were built in order to seal the building pit. Thermal leakage detection was performed by a pumping test in order to detect leaks. For the scope of the investigation, 17 temperature soundings and a reference sounding outside the building pit were introduced into the ground. To insert the temperature sensors, hollow pipes with a nominal external diameter of 22 mm were driven into the ground towards the top edge of the jet grouted bottom slab. Thereafter, sensor chains with temperature sensors at 1 m intervals were inserted into the pipes. During the dewatering, some measuring points registered strong temperature reductions. Thus, ground water infiltrations in the upstream flow of these measuring points into the construction pit were located precisely and sealed efficiently.

The following diagram is an example of the temporal development of the temperature profiles for the sounding T13 during the pumping test. The depth of 0 m refers to the top of the jet-grouted bottom slab. The temperature depth profiles of T13 do not show any significant temperature anomalies that indicate substantial leaks in the near field of the sounding. In case of a leakage, the affected area would experience a strong cooling of several degrees Celsius. This case is illustrated below with the figure of the sounding T3.



Depth profiles of the ground temperature at the sounding T13



Depth profiles of the ground temperature at the sounding T3 before the rehabilitation. After this measurement the area of the wall was rehabilitated successfully.