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Geothermal Geotechnics development program as a commonly used solution in D-wall.

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The project relates to an idea consisting in the use of diaphragm walls constituting a substructure system most often used during the foundation of a large volume building structure in tight urban fabric. Additionally, it offers the possibility of using this substructure as near-surface geothermal geotechnics and in conjunction with adjacent soil as an interseason heat storage in the form of enclosed box. The effect of the following development program is expected to provide a product in the form of concrete elements, that are already required for structural reasons, as diaphragm walls and barrettes with an integrated geothermal installation that allows obtaining part of the heat energy necessary for the operation of a renewable energy building. The accumulated energy, in the form of a lower energy source will be used to heat the building in winter. In summer, the reduced temperature of diaphragm walls in relation to weather conditions will allow the building to cool down, and thus will power air conditioning systems. This will feature not only concerns about environment aspects but also provides a long-term cost-saving solution that will limit building maintenance.

Presented, currently running, two years program is an effect of cooperation between experienced deep foundation contractor and The Institute of Heat Engineering, scientific unit. The development program, presented below, is based on the industrial research phase in which the lower heat source systems are modelled in Ansys Fluent and then the calculation results are reproduced under laboratory conditions on small physical 3x2x0.7m models. The results from measurements with temperature sensors and IR cameras are used to calibrate the FEM models and to determine the most optimal distribution of the pipes with the fluid carrier. Stage 2 will allow the analysis of the impact of thermal stress generated by the geothermal installation on the construction of the diaphragm walls and the entire building using deformation sensors. Development works in stage 3 will allow verification of the above assumptions using real commercial construction in the interseasonal cycle.

The most significant effect of the development programme, stage 4, will be the creation of a simple tool, on the basis of empirical data collected during model works and prototype tests, to commonly determine the thermal balance for building structures under given ground conditions for commercial buildings. The aim of the tool, being acquired by a deep foundation contractor, is a popularization of the thermo-active ground structures solutions and promotion of geothermal energy utilization.