LONDON BRIDGE BEST PRACTICE

LONDON BRIDGE STATION

Geothermal Piling

Overview

The London Bridge Redevelopment Project has an aspiration to provide CO_2 savings of 77 tonnes per year. Heating and cooling the newly designed station would be highly carbon intensive if regular temperature control methods were used. Such methods would create a barrier to the reduction target specified. Therefore, London Bridge collaborated with GI Energy to implement an innovative technology into the project. Working together, the companies identified installing geothermal loops into 145 of the planned piles, with routing arrangements to the proposed plant room in order to achieve the specified CO_2 saving.

The Solution: Geothermal Piles

The geothermal piles installed consist of pile foundations combined with 2 closed-loop ground source heat pump systems which span the length of the pile. Their purpose is to deliver support to the building at the same time as acting as a heat source in winter and a heat sink in the summer. They are able to do this by using the earth's natural heat which is collected through the loops which is carried by a heat transfer fluid to a unit in the station building.

When constructing the piles, the soil is bored out of the ground and a rigid, welded reinforcement cage is inserted into the hole. Two close-ended loops made of high density polyethylene plastic with an external diameter of 32mm are then fixed evenly around the inside of the reinforcement cage, spanning the full depth of the pile.

Geothermal energy can be considered a clean and environmentally friendly energy source. It produces minimal greenhouse gas emissions because the conversion and utilisation processes do not involve any chemical reactions, such as combustion. It is also classified as both renewable and sustainable. Geothermal piles are becoming increasingly attractive to city developers as larger developments already tend to require pile foundations. These offer the lowest total cost and the highest renewable contribution combined with low spatial requirements.

The geothermal pile system at London Bridge is designed to provide a peak heat rejection load of 200kWt and heat extraction of 100kWt using 145 geothermal piles. This will produce a maximum temperature of 44°C from piles with a depth of 25 metres. The current calculations for the geothermal pile system suggest that the aspiration of a CO_2 saving of 77 tonnes per year will be exceeded.

	Delivered kWh	Consumed kWh(pumps)	C02 savings (tons)
Heating	100,000	11,122	18
Cooling	440,000	27,878	61
Total	540,000	39,000	79

Geothermal piles provide long term benefits despite higher initial investment costs. The project have carried out whole life cost exercises on the piles which indicate that this form of heating and cooling has lower running and life cycle costs and over time will reap cost saving advantages. It has been estimated that the lifecycle financial operating benefit will be around £41,000.

Benefits:

- Provides a continuous, reliable, sustainable and clean energy source
- Reduces dependence on fossil fuels
- Reduced whole life cost due to low operating and maintenance charges
- The cost of geothermal energy is not prone to the fluctuations often experienced when reliant on gas or electricity
- Allows the London Bridge development scheme to meet the aspiration of a CO_2 saving of 77 tonnes

Objectives and Targets:

- London Bridge Sustainability Delivery Statement – minimise the levels of carbon generated over the whole life of TLP; understand the whole life cost implications of project and purchasing decisions; identify opportunities to proof the rail network against climate change; reduce the cost of delivery of TLP
- CEEQUAL – energy and carbon