



# CASE STUDY TECHNICAL SHEET

## Case study 3 – Residential single-family home, Kelowna, British Columbia

(This case study should be read with Case study 2 – Residential single-family home, Kelowna, British Columbia, North side system (Cat. No. M91-19/2-2021E-PDF, ISBN 978-0-660-40848-4).

### SOUTH SIDE SYSTEM

The existing house (105 m<sup>2</sup>) was refurbished and extended by 35 m<sup>2</sup> in 2011. The earth tube system was provided to serve 48 m<sup>2</sup> of the overall house – primarily the master suite and the living room.

### System description

The system is a single pass supply of outdoor air for passive cooling, provided by four 23-m lengths of 100-mm diameter pipe. The four pipes run parallel in a common trench, each with two 90-degree bends.

The ventilation system is an in-line fan that is connected directly to the bedroom and the living room. The outside air (OA) inlet is located on the southeast side of building, mostly in shade. See Figure 1.

The pipes are covered with 1.6 m of soil in a gently sloped hillside, facing south-southeast. See figures 3 and 4.

The system was monitored in 2014 to collect earth tube air temperature (ETAT) and outdoor air temperature (OAT) data. See Figure 2.

### Earth tube technical data

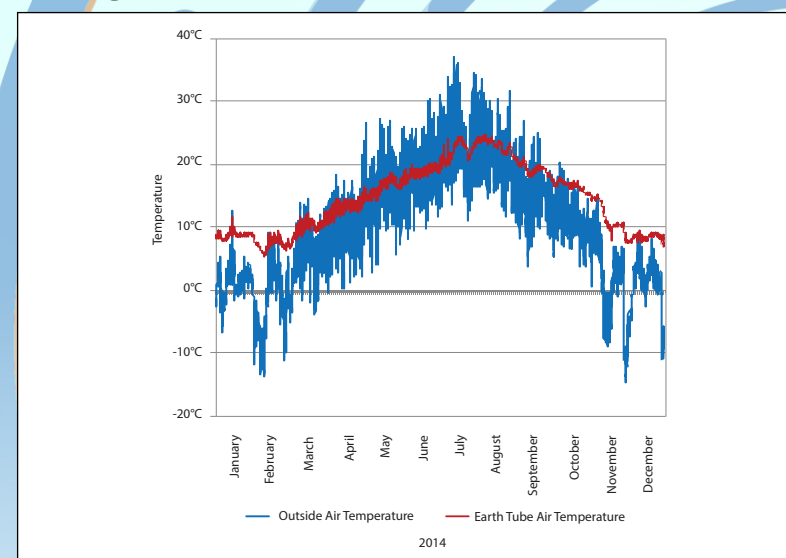
Pipes	4
Pipe depth	1.8 m
Pipe length	29.5 m average, each
Pipe internal diameter	100 mm
Material	HDPE
Airflow rate (L/s)	70 L/s, total (approx. 18 L/s per pipe)
Building type	Single Family Residence
Geographical location	Kelowna, Canada
Maximum heating delta T <sup>1</sup>	13,2°C
Maximum cooling delta T	-8,2°C
Distance between pipes	0.2 m



**Figure 1. Layout of tubes connected to a supply fan and ducting**

Photo courtesy of Trevor Butler.

### Energy performance



**Figure 2. Energy performance of the system**

<sup>1</sup> Delta T is the temperature difference between the pipe inlet and pipe outlet.

## Lessons learned

The earth tube system was monitored for more than a year, starting in 2014. The results indicate a well-performing system.

The internal environmental quality of the house improved after the project was completed. This change is likely due to several factors, including an improved envelope, modernized kitchen and living spaces, and the improved air quality and cooling provided by the earth tubes.

The owners are very happy with the system and are willing to share the monitoring data to further the understanding and application of earth tubes in the Canadian market.

## Acknowledgements

Thank you to Trevor Butler, P.Eng. (Archineers Consulting Ltd.) for contributing to this case study.

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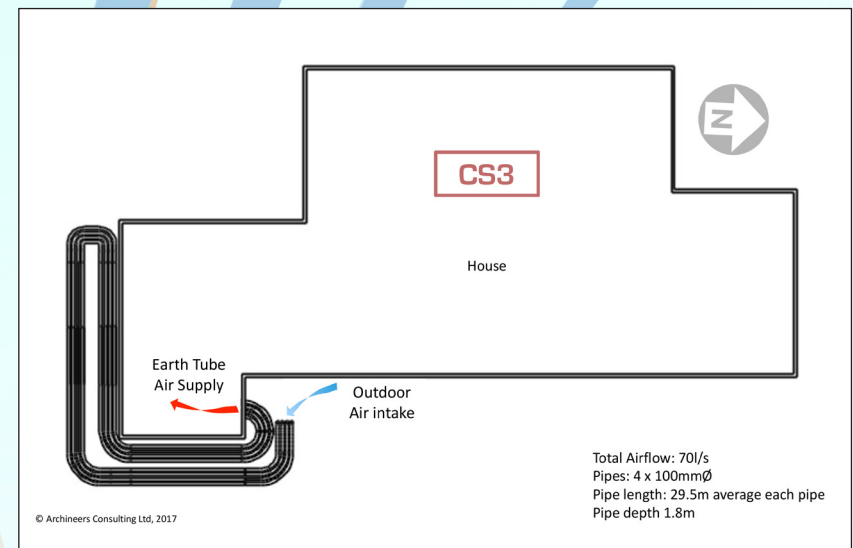
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**Figure 3. Pipes in a trench before it is backfilled**

*Photo courtesy of Trevor Butler.*



**Figure 4. Pipe layout.**

*Figure courtesy of Trevor Butler.*