



CASE STUDY TECHNICAL SHEET

Case study 5 – Commercial office, Kelowna, British Columbia

The new construction commercial office offers 601 m² to municipal staff for such uses as changing rooms, kitchen or canteen conference facilities, and office space. The earth tube system provides tempered make-up air (MUA) to the entire building.

System description

The earth tube system provides 100% tempered outside air to a single MUA unit serving the building. The system comprises a single 750-mm diameter precast concrete pipe that runs around the outside of the foundation walls, beneath 3.3 to 3.6 m of backfill. See figures 1, 3 and 4.

The MUA provides tempered air to displacement outlets around the building and balances the exhaust air taken by the composting toilet system – one of several deep green initiatives in the building.

The system was monitored, and earth tube air temperature (ETAT) and outdoor air temperature (OAT) data were recorded in 2015.

Earth tube technical data

Pipes	1
Pipe depth	3.3 to 3.6 m
Pipe length	49.0 m
Pipe internal diameter	750 mm
Material	Precast concrete
Airflow rate (L/s)	1,130 L/s total
Building type	commercial office
Geographical location	Kelowna, Canada
Maximum heating delta T ¹	10°C
Maximum cooling delta T	-7°C
Distance between pipes	5.0 m



Figure 1. A 750-mm diameter precast pipe
Photo courtesy of Trevor Butler.

Energy performance

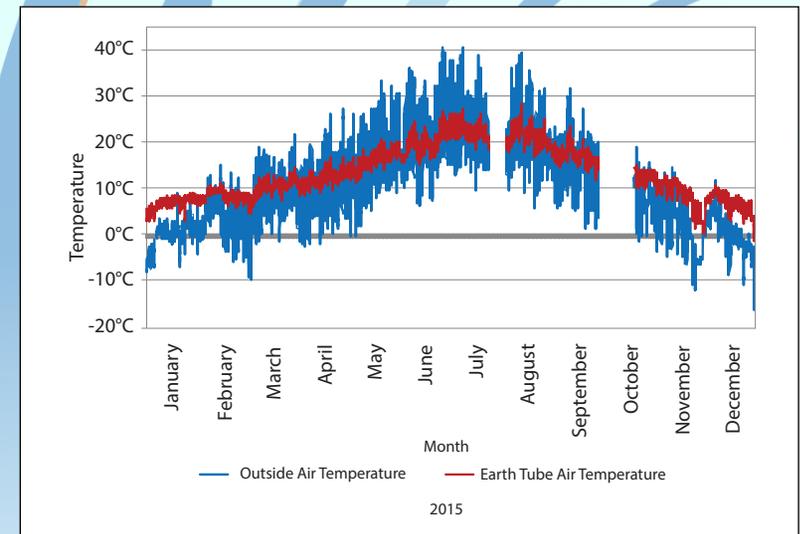


Figure 2. Energy performance of the system, 2015

¹ 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, in 2015. The results indicate a well-performing system. The average delta T for heating and cooling temperatures were 11°C and -12°C, respectively.

This is the deepest covered system under review, and the cooling effects were among the most impressive for passive cooling. The system can save up to 100% of the outdoor air-cooling load during certain times of year. In peak summer, this number is lower, but still more than 70%.

The heating requirements of the outdoor air supplied to the MUA unit can be reduced by more than half during certain times of year.

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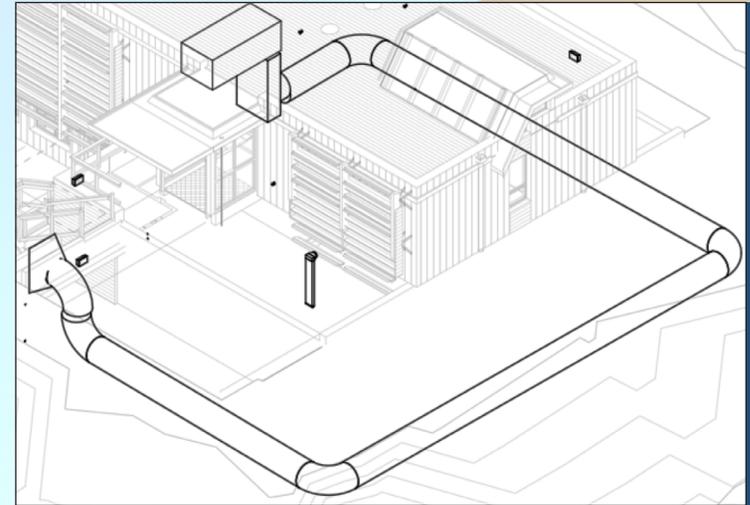


Figure 3. Model of the earth tube system

Figure courtesy of Trevor Butler

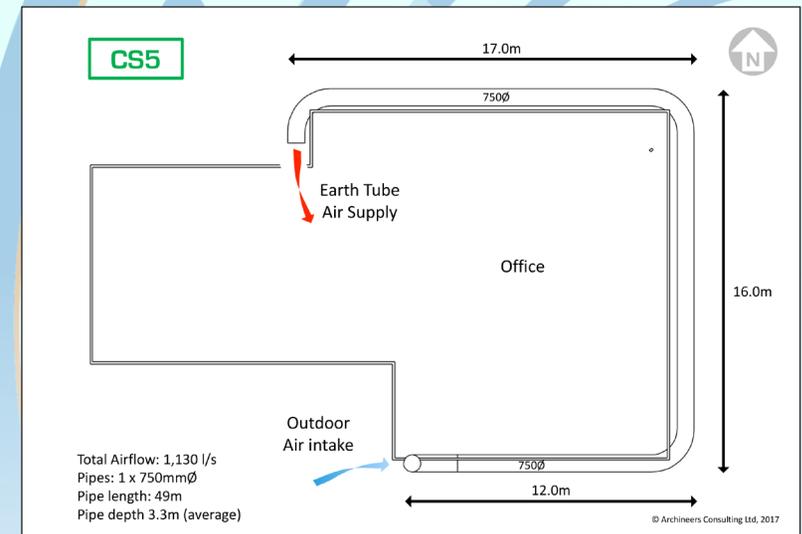


Figure 4. Pipe layout.

Figure courtesy of Trevor Butler