



# CASE STUDY TECHNICAL SHEET

## Case study 5 – Commercial office, Kelowna, British Columbia

The new construction commercial office offers 601 m<sup>2</sup> 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

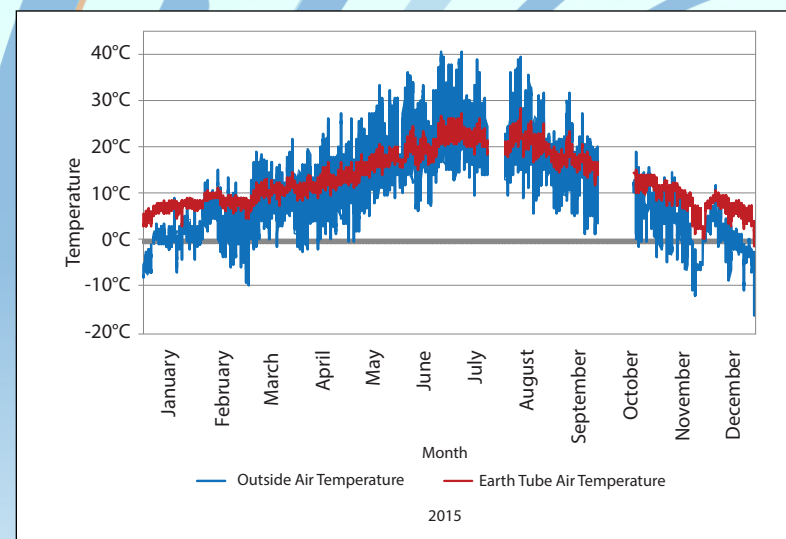
Pipes	1
Pipe depth	3.3 to 3.6 m
Pipe length	49.0 m
Pipe internal diameter	750 mm
Material	Precast concrete
Airflow rate (L/s)	1,130 L/s total
Building type	commercial office
Geographical location	Kelowna, Canada
Maximum heating delta T <sup>1</sup>	10°C
Maximum cooling delta T	-7°C
Distance between pipes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

<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, 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.

## Acknowledgements

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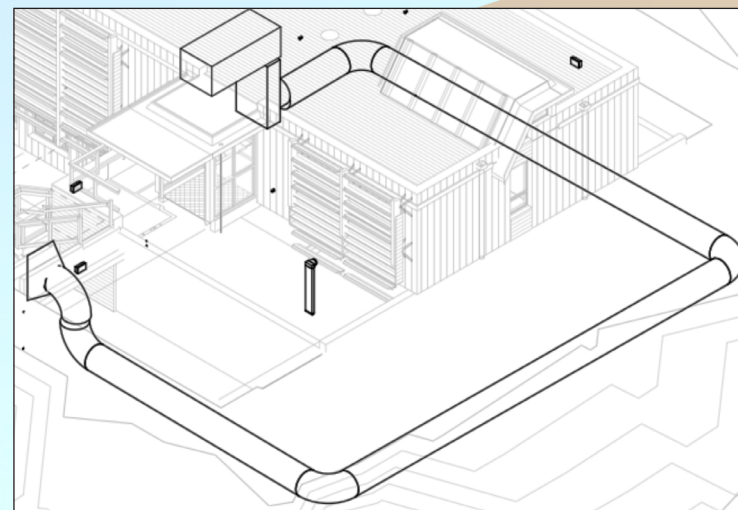
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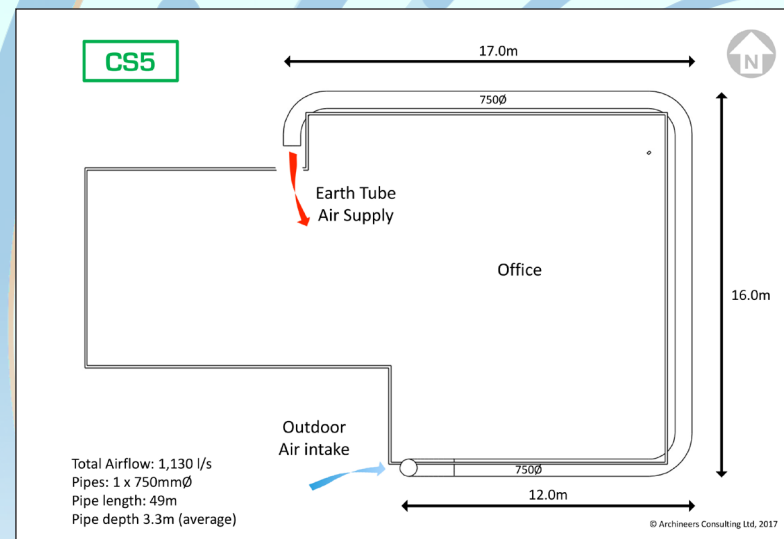
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**Figure 3. Model of the earth tube system**

Figure courtesy of Trevor Butler



**Figure 4. Pipe layout.**

Figure courtesy of Trevor Butler