



CASE STUDY TECHNICAL SHEET

Case study 4 – Commercial office, Salmon Arm, British Columbia

The new construction commercial office offers 1,933 m² for anchor tenant and subtenant areas. The earth tube system provides tempered make-up air to the whole building.

System description

The system provides 100% tempered outside air (OA) to a series of heat recovery ventilation (HRV) units that serve each tenant area.

The earth tubes comprise three 35-m lengths of 750-mm diameter precast concrete pipes that run in a straight line underneath the ground floor of the slab on grade part of the building. See Figure 1. The three pipes connect to a single, common 1,000-mm diameter header (collector) pipe, from which the air is drawn by separate HRV units that serve separate spaces. See figures 3 and 4.

The HRV units further temper the air with heating or cooling recovery. The primary air (double-tempered OA) is then supplied to the office space, mixed with room air, and heated or cooled by fan coil units, as required.

The system was monitored, and earth tube air temperature (ETAT) and outdoor air temperature (OAT) data were recorded, in 2015. See Figure 2.

Earth tube technical data

Pipes	3
Pipe depth	1.2 m
Pipe length	35.0 m average, each
Pipe internal diameter	750 mm
Material	Precast concrete
Airflow rate (L/s)	2,265 L/s, total (approx. 755 L/s per pipe)
Building type	Commercial office
Geographical location	Salmon Arm, 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 (1 of 3 in the system)

Photo courtesy of Trevor Butler.

Energy performance

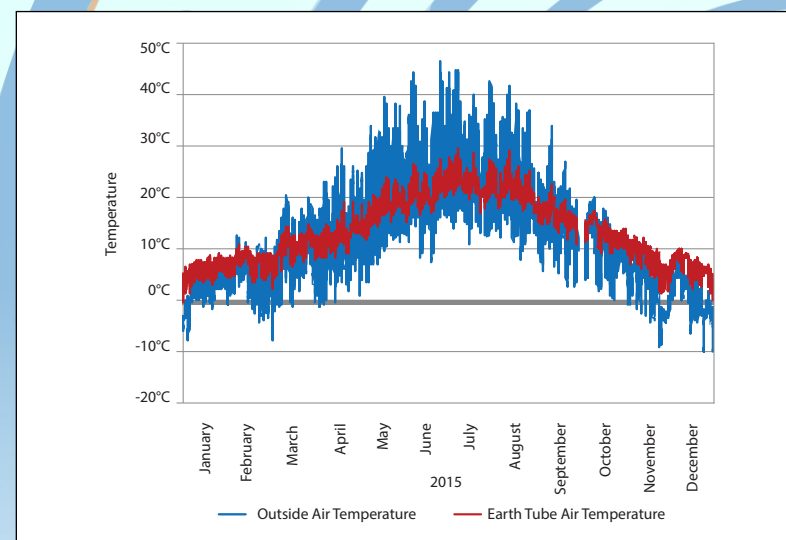


Figure 2. Energy performance of the system, 2015.

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, starting in 2015. See Figure 2. The results indicate a well-performing system.

This case study is the first time a system has been run underneath the slab on grade, and it was interesting to note that the performance was still effective. It is common knowledge that it is best for pipes to run in exposed areas to prevent the risk of thermal saturation under the structure. However, this case study demonstrated that, because urban sites have limited space to run the pipes, running them under the building is an effective option.

Acknowledgements

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

Disclaimer

Neither Natural Resources Canada nor any of its employees makes any warranty express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of its contents. Reference in the case study to any specific commercial product, process, service or organization does not necessarily constitute or imply endorsement, recommendation or favouring by Natural Resources Canada. The views and opinions of authors expressed in this case study do not necessarily state or reflect those of Natural Resources Canada.

Aussi disponible en français sous le titre :
Étude de cas 4 – Bureau commercial, Salmon Arm, Colombie-Britannique

Cat. No. M91-19/4-2021E-PDF
ISBN 978-0-660-40852-1

For information regarding reproduction rights, contact Natural Resources Canada at nrcan.copyrightdroitdauteur.nrcan@Canada.ca.

© Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources, 2021



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

Photo courtesy of Trevor Butler.

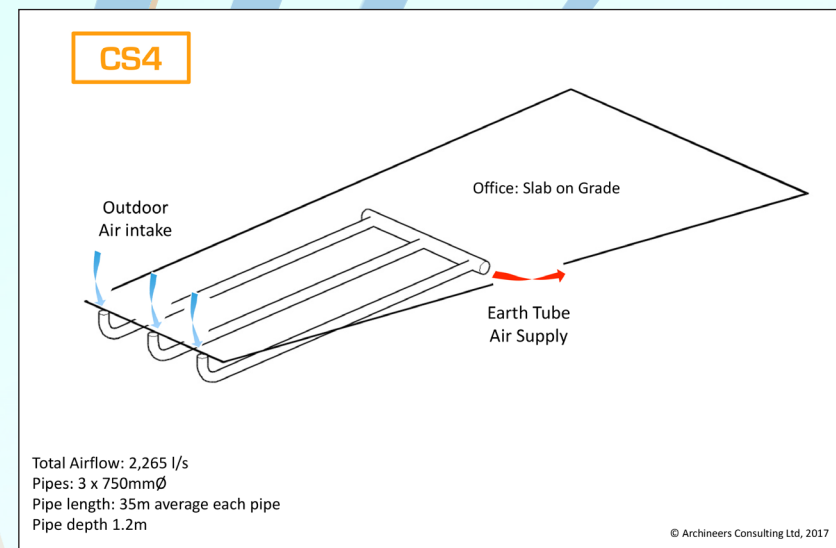


Figure 4. Pipe layout.

Figure courtesy of Trevor Butler.