# Exhibition Place Press Building

## CASE STUDY

Geoexchange Series




## SITE PROFILE

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| Building owner | Exhibition Place |
| Building location | Toronto, ON |
| Building type and use | Two-storey early 20th century heritage building housing the staff of the Canadian National Exhibition (CNE) |
| Net floor area ($ft^2$) | 14,430 (including basement) |
| Ground loop | 12 boreholes |
| Number of GSHPs | 8 |
| Distribution system | The ground loop connects 8 water-to-water heat pumps in parallel, creating an 8 zone distribution system |
| Backup system | Existing electric baseboard heaters were kept in place and locked out |
| Dominant use of system | Balanced |
| Year installed | 2008 |

## ABOUT THE SITE

The City of Toronto's Exhibition Place is Canada's largest entertainment venue and is visited by over 5.3 million people each year. Located on 192 acres of waterfront parkland, Exhibition Place contains convention, exhibition, and conference venues, as well as sporting facilities, restaurants, and nightclubs. Through its GREENSmart Program, the organization has implemented an array of sustainability initiatives related to energy production and waste management.

## RATIONALE AND PLANNING

The geoexchange project was initiated at Exhibition Place in an attempt to make it a Net Zero Energy facility. The project was in part a trial to assess the performance of geoexchange in municipal buildings. The Press Building was chosen to house the geoexchange system as its existing air handling unit was due for replacement.

The existing forced-air distribution system, based on natural gas for heating and a direct exchange (DX) chiller for cooling, had only a single zone for each floor. This made it especially prone to hot and cold-spotting, degrading the thermal comfort of the building occupants. The problem had been mitigated somewhat by adding electric baseboard heaters but management saw that an appropriately zoned distributed geoexchange would rectify this issue entirely.

## GEOEXCHANGE SYSTEM DESIGN

The Press Building is a 14,430 square foot administrative facility built in the early twentieth century. The geoexchange system is a closed loop vertical system consisting of 12 boreholes and 8 ground-source heat pumps (GSHPs). The project was originally slated to be a horizontal system but was changed to a vertical design when space was found to be limited due to an extensive network of underground service lines. The eight GSHPs are divided evenly between the two floors and share a common ground loop, creating an 8 zone system. Internal duct work was modified to support the new zones and, to increase the energy efficiency of the building, the windows and the insulation of the roof were upgraded as well. The façade was left intact in order to conform to regulations that apply to heritage buildings.

## PROJECT IMPLEMENTATION

When procuring a design-build contract, Exhibition Place used weighted selection criteria which evaluated not only pricing but also the proponent's technical skills and experience. Pricing had a lower weighting than experience in order to account for the complex technical nature of the project. The contract was awarded to a leading designer of geoexchange systems in North America. Management was pleased with the performance of the project team.

## OPERATION AND MAINTENANCE

The temperature in the building is maintained between 19 and 24°C depending on the season, which decreases both the heating and cooling load of the building. The building operator conducts preventative maintenance on the system, on a scale comparable to a conventional HVAC system, and then relies on the building automation system (BAS) trends or occupant calls to identify any issues. The only issues that have come up are relatively minor, for example, the control boards on some of the heat pumps malfunctioned and were replaced under warranty.

## COSTS

The vertical loop geoexchange system retrofit was installed at a cost of $700,000. This was higher than anticipated because they were unable to use a horizontal loop. Although the organization does not typically implement projects with an expected payback of longer than 8 years, this project was feasible because the geoexchange system was installed when the conventional HVAC system was due for replacement. Funding support was provided by the City of Toronto's Better Buildings Partnership, Enbridge and the Federation of Canadian Municipalities.

## SUCCESSES

Employees are satisfied with the performance of the geoexchange system and management will strongly consider geoexchange installations in other buildings. Post-retrofit, supplementary electric baseboard heating was no longer required in the building.

The project has brought notoriety to Exhibition Place and has attracted additional investment due to the organization's willingness to implement trial projects and monitor the outcomes. Its portfolio of clean energy and waste management initiatives have set it apart from similar facilities and has received numerous awards for its environmental leadership.

## LESSONS LEARNED

Horizontal loops are typically more cost-effective than vertical loops, but it is advisable to carry out a feasibility assessment for the land at the onset of the process to ensure that there are no obstructions.

The heating and cooling load of a building can be lowered by allowing the temperature to fluctuate within an acceptable range rather than setting it at a specific temperature year-round.

Distributed geoexchange systems are well-suited to zoning. This increases efficiency and occupant thermal comfort.


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