

CASE STUDY



Animal Hospital is Wild for Concrete

Earth Rangers Wildlife Center combines creative and traditional concrete applications for energy efficiency

An organization dedicated to wildlife, conservation and education, Earth Rangers of Kortright, Ontario in Canada set out to build a new Wildlife Center that would exemplify its environmental leadership. To satisfy an organizational mandate to use innovative building applications for sustainable development, Earth Rangers chose concrete solutions to establish a world-class, high performance wild animal treatment facility and education center that was designed to achieve LEED silver certification from the United States Green Building Council (USGBC). Completed in 2004, the Earth Rangers Wildlife Center incorporates a mix of proven and bold, new concrete applications, such as:

- Exposed surfaces to take advantage of concrete's high thermal mass
- Radiant slab systems for efficient space heating
- An underground ventilation system of concrete tunnels to leverage the limited temperature fluctuation of the ground to reduce energy consumption

The variety of concrete solutions used on this structure underscores its versatility as a sustainable development material. Concrete can be formed into virtually any shape, offering architects limitless options for sustainable building solutions. As a direct result of creative and traditional concrete applications, energy use at the Earth Rangers Wildlife Center will be an estimated 63 percent less than required by the Canadian energy code.

All structures built with concrete benefit from its high thermal mass. Thermal mass refers to an objects ability to store heat depending on its density. Concrete has the highest thermal mass of any traditional building material, therefore, structures built with concrete experience limited temperature fluctuations resulting in reduced energy consumption, cost savings, and limited environmental impact. The Earth Rangers Wildlife Center was designed with double foundation concrete walls, which provide optimal insulation for the building. Additionally, the walls and

floors in the structure were left exposed where possible to trap heat during the winter months and improve cooling conditions during the summer.

Floors and roofs in the Earth Rangers Wildlife Center were constructed with radiant concrete slabs, a proven innovation that provides space heating and cooling throughout the structure at a minimal cost. In a radiant slab system, polyethylene tubes are embedded in an exposed concrete surface and depending on the season, the tubes are pumped full of warm or cold water to regulate temperature throughout the structure. Radiant slabs provide 100 percent of the space heating and cooling for the Wildlife Center, limiting the environmental impact and utilization costs of the building. Radiant slabs also eliminate the need for costly air heating and cooling equipment. The innovation is effective because the surface temperature in a building affects comfort as do air temperature, humidity and air movement. For example, warmer air temperatures during the summer months can be comfortable if the surrounding surfaces, such as exposed concrete floors, walls and ceilings, are cool. During the cold Ontario winter months, radiant slab floors provide excellent heat distribution throughout the structure. Heat naturally rises; therefore radiant slab floors create a consistency at the bottom of the room that is naturally distributed, ensuring thermal comfort.

Earth Rangers also used creative concrete solutions to manage the temperature of air *outside* the building. The Wildlife Center was designed with underground concrete ventilation tunnels, which temper outside air before it is circulated throughout the structure. In what is the largest ground heat exchange system of its type in a North American building, outdoor air is circulated into a cast concrete inlet structure, which feeds a grid of nine concrete pipes buried 1.5 meters below the surface. The pipes empty into a space inside the concrete foundation wall created by a second wall of insulated masonry block. At that depth, air temperature varies only +4 °C and +17 °C, whereas outside air varies from -30 to +35 °C. After the outside air is moderated underground, it is then circulated throughout the building. With its unprecedented system of concrete ventilation tunnels, air filtered into the Earth Rangers Wildlife Center is much closer to a comfortable indoor temperature than outside air for much of the year. This impressive innovation helps Earth Rangers operate the wildlife Center using far less energy.

Additional concrete solutions contributing to the building's sustainable design include pervious concrete that allows runoff water to be returned to the aquifer and the use of concrete in the design of the building's green roof landscape,

The Earth Rangers Wildlife Center will stand for years to come as a testament to an organization that emphasizes environmental consciousness. The pragmatism and creativity that Earth Rangers used to devise the concrete solutions in the building also serve as an inspiration to green builders. The building's optimal energy performance and minimal impact on the environment will stand as a living example of Earth Rangers' dedication to protecting the environment.

Building Snapshot

Project description: 5800 m2 wild animal treatment and rehabilitation, education center

Owner: Earth Rangers

Location: Kortright Centre for Conservation, Woodbridge, Ontario

Completed: October 2004

Project Team:

Architect: M. Architecture Inc.

Structural Engineer: Internorth Engineering Inc.

Mechanical Engineer: Enermodal Engineering

Construction Manager: Internorth Construction Inc.

Concrete Supplier: Duffern Custom Concrete Group