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**REHAU Radiant Heating and Cooling System  
Facilitates Energy Efficiency at Earth Rangers Centre**

*LEESBURG, Va., July 29, 2005* – A REHAU radiant heating and cooling system was recently installed in one of Canada’s most innovative and energy-efficient buildings, the Earth Rangers Centre in Woodbridge, Ontario, Canada. The 60,000 square-foot facility, which officially opened in October 2004, functions as a wildlife refuge and hospital and as an education centre for children. The facility houses a world-class veterinarian research and training hospital, interactive educational displays for the public, and will soon include one of Canada’s only oil spill response units dedicated to wildlife.

The ecologically conscious building was designed with leading-edge environmental technologies. These technologies, in conjunction with forward-thinking design and engineering, will enable the facility to use approximately 63 percent less energy than the Canadian standard dictated by the Model National Energy Code of Canada for Buildings (MNECB).

To qualify for public funding as a “green” building, the centre had a number of criteria to fill, which included: low energy use; water conservation and re-use; enhanced indoor environmental conditions; materials with high recycled content and low embodied energy; and minimal environmental impact on the site.

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Additional unique design elements were necessary to accommodate the building's unusual full-time occupants—beavers, deer, raptors, and songbirds, to name a few. Treatment and rehabilitation rooms for these special residents also demanded durability, water-resistance and as few hiding and escape nooks as possible. As a health care facility, good ventilation and comfortable living conditions for the ailing animals were also a priority.

To meet these demands, the project's engineers specified hydronic radiant heating and cooling. "REHAU was chosen to supply the system based on their innovative technology and their ability to provide comprehensive on-site support throughout the project," said Richard Lay, senior design engineer at Enermodal Engineering Ltd., and engineer of record for the Earth Rangers project.

### **Combined Heating and Cooling**

The Earth Rangers Centre is one of the first buildings in North America with 100-percent reliance on radiant heating and cooling. "This technology offers a number of advantages over traditional forced air systems," said Mark Euteneier, installer and president of Klimatrol Environmental Systems. "A radiant system benefits the environment by using less fuel, plus it is less costly to maintain. The REHAU system benefits the Earth Rangers project in particular, as it eliminates ductwork in which animals can hide, and it utilizes a concrete floor surface that's easy to clean and maintain."

The REHAU system also complements the building's energy-conserving structure—reinforced concrete with load-bearing masonry walls in the animal areas. The interior concrete walls and masonry are able to function as thermal storage, improving the comfort and energy performance of the building.

For the radiant heating and cooling system, 74,000 feet of REHAU's RAUPEX® 02 Barrier pipe—34,000 feet of 5/8-inch and 40,000 feet of ½-inch—was installed in more than 36,000 square feet of exposed concrete slabs at 6-inch and 12-inch spacing. Tubing was suspended midway in the 8-inch to 12-inch thick slabs using chairs and 6-inch by 6-inch wire mesh between two layers of

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reinforcing steel. This placing provided an approximate 3-inch clearance for future fasteners to be drilled in below for pipe and duct hangers. Since slabs with radiant tubing cannot be core-drilled, significant coordination was required for the installation of the electrical conduit and mechanical slab penetrations.

RAUPEX was installed in both the floor and ceiling—as well as in the cast-in-place skylights—in order to collect, distribute and maximize solar gain. A high efficiency Viessmann Vertomat 1 million BTU output hot water boiler was specified as the heat source.

The combined ceiling and floor slab mounting design would enable the system to provide both efficient heating and cooling. The system's cooling function employs concrete slabs that are actively cooled to approximately 64° F overnight using circulating water from a cooling tower. The slabs warm up slightly during the day as they absorb heat from the space. This technique provides much of the building's cooling energy on an average day and significantly cuts electricity use. A low-energy-consuming evaporative cooling tower provides most of the energy, supplemented by a small electric chiller. In all, the cooling load for ventilation and space conditioning is only 64 tons—less than half that of a comparably-sized conventional building.

The heating function provides additional efficiency. “Typically for a low-energy building, if a slab has adequate capacity for cooling, it will have more than enough capacity for heating,” explained Richard Lay. “Fortunately, overhead heating with low-temperature heated slabs does not produce radiant asymmetry—or ‘hot head syndrome’—and is comfortable when combined with a tight, well-insulated building envelope with high-performance windows.”

Radiant ceiling heating also creates a uniformly comfortable environment for the animals, without the drafts, dust and noise sometimes associated with forced-air systems.

“So far it's been very comfortable here,” said Phil Ruhl, facility manager for the Earth Rangers Centre. “Due to the pleasing climate, there's also been a lot of interest in radiant heating systems from those touring the facility.”

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## **Braving the Elements**

Cold weather with temperatures down to -13° F posed a challenge during the winter installation of the system. Nonetheless, it was successfully installed with Klimatrol's supervision and tested as leak-free upon start-up.

"The flexible nature of RAUPEX allowed workers to quickly and easily install the pipe in the counterflow spiral loop design specifications provided by Klimatrol," said Mark Euteneier.

The REHAU EVERLOC<sup>®</sup> fitting system also proved to be an ideal solution during these challenging construction conditions.

"REHAU EVERLOC fittings provided the security of a high-quality repair coupling when several pipes were damaged due to the severe construction conditions and the rapid pace of the job," said Euteneier. "Having the fittings on-site allowed us to continue the pace of the project with no slow-downs—and more importantly, no leaks."

20 REHAU PRO-BALANCE<sup>®</sup> manifolds were also installed to distribute flow to the various temperature controlled zones.

"All manifolds were pressure tested to 68 psi prior to the concrete pour and throughout the duration of the project," Euteneier added.

## **Specialized Ventilation System**

Because the building also serves as a health care facility, it required 100-percent outdoor air ventilation with no interior recirculation. To meet this demand, as well as enhance the building's energy efficiency, the ventilation system was designed using a total of nine 66-foot long concrete "earth tubes" buried below the frost line. These tubes pre-temper the air prior to entering the building's air handling unit by an average of 5° F in winter and summer, further

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complementing the efficiencies of the radiant heating and cooling system.

The ventilation system was designed to reduce heating and cooling load energy requirements by 30 kW. This reduction provides a 12-percent increase in ventilation heat recovery effectiveness, and an estimated \$7,000 per year operating cost reduction.

In all, the Earth Rangers ventilation system is believed to be the largest ground heat exchange system of its type in a North American building.

### **A Model for the Future**

As a complete system, the Earth Rangers Centre is an ideal example of how forward-thinking design can create cost and energy savings for the future. Currently up and running in Woodbridge, Ontario, the centre welcomes public tours during regular operating hours.

“We are certainly enthusiastic about people seeing what the centre does to help animals, as well as how it has been designed with energy efficiency as a top priority,” said Richard Lay. “It is our hope that the building design, coupled with that of the heating and cooling systems, will be entertained for other construction projects in the near future.”

For additional information on REHAU radiant heating and other building products, contact REHAU Incorporated, P.O. Box 1706, Leesburg, VA 20177. Phone: 1.800.247.9445. Fax: 1.800.627.3428. Web site: [www.REHAU-NA.com/Construction](http://www.REHAU-NA.com/Construction).

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Please do not convert REHAU to lowercase. Thank you