

August 2005
Volume 12 Number 3

Interlocking CONCRETE PAVEMENT MAGAZINE

A publication
of the
Interlocking
Concrete
Pavement
Institute

Earth Rangers: Sustaining Nature with Permeable Pavers

Also:

New Wheelchair-Pavement Study

Porous Pavements Book Review

Contractor Focus: Edge Restraint FAQs

New Project Profile Brochures

Interlocking Concrete Pavement Magazine
Copyright ©2005 Interlocking Concrete
Pavement Institute—All rights reserved.
Reprinted with permission.

Earth Rangers Sustains Nature with Permeable Pavers

Entrances always communicate something about the character of a place. They set the mood and give hints about what's ahead. Pavement functions as the site entrance inevitably getting people to the building's entrance. For most buildings, conventional pavement typically doesn't say much about the building other than leading users to the front door. For the entrance to the Earth Rangers Centre, permeable interlocking concrete pavement says much about the place well before entering the building. The message from 8,800 sf (818 m²) of permeable pavement suggests that Earth Rangers helps the environment.

As a Canadian showcase of sustainable design, permeable interlocking concrete pavement introduces Earth Rangers on a 31 acres (12.5 ha) site in Woodbridge north of Toronto and its 62,350 sf (5,800 m²) building. Its wooded setting conveys a place at peace with nature. Earth Rangers functions as an animal rehabilitation center housed within an innovative structure demonstrating reduced pollution and natural resource conservation.

The building is a dream-come-true for philanthropist Robert Schad. He found wide financial support from other charitable groups and donations from construction material companies altogether creating a building worth Cdn\$23 million and taking two years to construct. The permeable pavers were donated by an ICPI member as the pavement was moving close to construction. Due to the timing of the donation, the best approach was to replace the asphalt entrance with permeable pavers and bedding material. The 16 in. (400 mm) thick dense-graded (Ontario Granular A) over heavy clay soil was in place and ready to receive the donated pavers.

While the dense-graded base doesn't have the reservoir capacity of open-graded aggregate typically used under permeable pavers, their surface openings and bedding provide some storage and reduction of water pollutants, certainly greater than that possible by the asphalt pavement originally planned for the entrance. Even over a dense-graded base, the extent of pollutant reduction using permeable pavers compared to asphalt was demonstrated

8,800 sf (818 m²) of permeable interlocking concrete pavement reinforces the environmental conservation character of the Earth Rangers site and building.



in the Glen Brook Green Subdivision of the Jordan Cove Watershed U.S. EPA-funded monitoring project chronicled in the August 2004 issue of the *Interlocking Concrete Pavement Magazine*.

At Earth Rangers, the 2 in. (50 mm) thick open-graded, crushed stone bed and filler in the openings of the 3 1/8 in. (80 mm) thick pavers stores about 0.5 in. (13 mm) rainfall, thereby capturing and filtering the highest pollutant concentrations at the beginning of each storm. With a 3% slope, the permeable pavement enables the runoff to be filtered before it reaches small landscaped detention areas adjacent to the parking lot. While runoff could have been released directly from asphalt to these detention areas and into the wooded site, the permeable pavement filters runoff before it gets there helping to lengthen the service life of the detention areas and preserve the integrity of the surrounding natural site.

The building is 100% radiant heated and cooled via the concrete floors and ceilings with liquid-filled, plastic tubing that enables the concrete to act as vast energy storage containers. The energy-efficient heating and cooling system is separate from the ventilation system. So there's a continual flow of fresh air entering through nine, 65 ft (20 m)

long concrete pipes buried below the frost line. Ambient air is drawn into them and the pipes pre-temper it prior to entering the building's air-handling system. In the summer, the pipes cool the inbound air and in the winter the pipes take the chill off the outside air before entering the air-handling system.

The underground pipes make a significant contribution to energy conservation with help from the thermal mass of the radiant heating and cooling in the concrete floors. Additional savings is found from solar panels for heating hot water and from large, well-insulated

The permeable pavers drain to small detention areas offering further filtering of pollutants before draining into the wooded site.



Earth Rangers includes 3,000 sf (280 m²) of solid concrete pavers for sidewalks set in a random pattern to simulate stone paving. These were set on 1 in. (25 mm) thick bedding layer and 10 in. (250 mm) of Ontario Granular A base.



Interlocking Concrete Pavement Magazine
Copyright ©2005 Interlocking Concrete
Pavement Institute—All rights reserved.
Reprinted with permission.

Earth Rangers *continued from p. 9*

windows that promote natural lighting. The building relies on a cistern to catch rainfall and recycles used water for non-potable uses. These innovative approaches reduced annual energy consumption by 63% and water consumption by 80% compared to building according to national code requirements.

Opened in October 2004, Earth Rangers attracted over 100,000 visitors in its first year many of which are children exposed to exciting education and wildlife programs. The building includes a small theater, interactive educational displays and one of the world's most specialized wildlife centers. In addition, the Earth Rangers Centre is capable of treating 5,000 animal visitors annually. Each will receive rehabilitation free of charge from veterinarians and dozens of volunteers whose donated time makes the center successful. Besides thousands of hours of volunteer time, the operation receives corporate, foundation and individual donations. Earth Rangers is in the process of completing an application for the Canadian Green Building Council's Leadership in Energy and Environmental Design (LEED) certification and the application will be submitted this summer. LEED certification uses third party verification to certify a "green building" designed according to their standards and guidelines. LEED credits fall under seven broad areas of building and site design and specific points are earned under each credit. A minimum of 26 points earns LEED certification with recognition for points earned above this number. The seven areas for earning credits include Sustainable Sites; Water Efficiency; Energy & Atmosphere; Materials & Resources; Indoor Environmental Quality and Innovation & Design Process.

The permeable interlocking concrete pavers may help earn Sustainable Site credits specifically reducing stormwater rate and quantity and reducing the urban heat island with high reflective pavement surfaces. The pavers will also help earn credits under Materials and Resources in that the pavers and their ingredients were made close to the site thereby reducing transportation and related energy costs.

LEED was developed as a means to reduce environmental impacts of buildings and reduce life-cycle and operating costs for building owners. While only a small portion of commercial buildings have earned LEED certification, the framework for evaluating building design is beginning to transform the market. LEED requires that architects, landscape architects, engineers, contractors and owners work together to reduce environmental impacts and operating costs. The approach is bringing about a new ethos and appearance to design as exemplified in the Earth Rangers project. Permeable interlocking concrete pavements are contributing to both. ❖

Energy and resource conservation of the site and building qualifies Earth Rangers for submission to the Canadian Green Building Council's Leadership in Energy and Environmental Design or LEED certification.

Project Manager
Husky Injection Molding Systems Ltd.
Bolton, ON

Construction Manager, Architects and Structural Engineer
Internorth Construction Company
Internorth Architects Inc.
Internorth Engineering Inc.
Mississauga, ON

Planning and Architectural Design
Bautech Developments Ltd.
Newmarket, ON

Landscape Architects
PMA Landscape Architects
Toronto, ON

Civil Engineers
Phillips Engineering
Burlington, ON



Interlocking Concrete Pavement Magazine
Copyright ©2005 Interlocking Concrete
Pavement Institute—All rights reserved.
Reprinted with permission.