

Leopold Legacy Center Construction Journal
Report 15.1 – Mechanical Systems

July 28, 2006

Green Feature: Earth Tubes



Laying the earth tubes begins

The Leopold Legacy Center's green design includes many systems designed to be as much as 80% more efficient than conventional heating and cooling systems. A particularly unique system is a set of earth tubes designed to ventilate the building. An integral part of the HVAC system for heating and cooling the building, they were installed underneath the foundation early in the construction process.



Cutting tube to length

All commercial buildings are required to have a mechanical ventilation system capable of introducing a specific amount of outdoor air into the building while occupied. The air is heated or cooled, then circulated throughout the building. Heating and cooling is traditionally an expensive portion of the energy budget, especially in periods of temperature extremes. Earth tubes are designed to reduce this expenditure by moderating the temperature of the air before it enters the heating or cooling elements. In

the Legacy Center, the incoming air will travel through a series of underground concrete tubes, taking on the ambient temperature of the earth. Compared to the extreme outdoor temperatures ranging from -20° to 95°, the air in the earth tubes after traveling through the system will have a minimum temperature of 17° and a maximum temperature of 74°.



Workers make sure tubes are level and aligned correctly

concrete pipe, very much like stormwater drainage pipe. The sections are connected with a rubber gasket to prevent gases in the soil from leaching into the ventilation system. The pipe itself is permeable enough to allow evaporation of any water that may condense on the inside of the tubes.



Lowering the air intake tube into place. This piece will remain above-ground.



Completed earth tube array



The next day soil was filled in over the tubes , leaving only the vertical intake tube visible (at right)

The sections of pipe were picked up by the backhoe and laid in place with the help of the construction crew on the ground. Our system is made up of 66 sections of pipe totally 600 linear feet and covering just over 5,000 square feet, a third of it under the building itself. When the building is complete, it will be between ten and twelve feet below the ground surface.

The pipes are connected at one end to a larger vertical pipe that will extend above ground and serve as the air intake. In the finished system, it will be covered by a metal roof and the sides will be enclosed with mesh to prevent entrance of insects or debris. At the other end, the maze of pipes is connected to the basement of the building, where the air will go through a filter and UV lamp to eliminate mold and bacteria before being heated or cooled and circulated throughout the building.



The tubes connect to mechanical ventilation systems in the main building basement

Building design by:
The Kubala Washatko Architects
 Cedarburg, WI



Thanks to:

- LMS Construction*
- H&H Industries*
- Matrix Mechanical Solutions*
- Helios Design*
- Hines & Company*
- Supersymmetry USA*
- Thermal Energy System Specialists*
- County Materials*
- Middleton Concrete*