



Hybrid Ventilation System Control Diagram

No Scale

kg

Hybrid Ventilation System

Sequence of Operations

Heating (Winter) Modes

- * Occupied - Windows and Doors Closed
- * Outside air temperature and humidity are monitored by global sensors T-1 and H-1, mounted as high as possible on the north side of the building, shielded from the sun.
- * Inside space conditions are monitored and controlled by space sensors T-2 and H-2.
- * During Occupied - Windows and Doors Closed hours, the energy recovery unit (ERU) supply fan, SF-1, and exhaust fan, EF-1, are on with outside air damper, D-1, and exhaust damper, D-2, in the fully open position. Outside air enters through the exchange chimney and passes through the earth tubes to the ERU. Air passes through the desiccant wheel located in the ERU, then into the supply duct and through the geothermal coil, to maintain the temperature and humidity setpoints in the space.
- * The amount of supply ventilation air delivered is variable and is determined by actual statistical occupancy of the building (20 CFM per person).
- * Exhaust air is drawn from the space by EF-1, through the ERU, and then exhausted through the exchange chimney to atmosphere.
- * Variable speed exhaust is controlled by the building static pressure sensor so that building pressure relative to outdoor pressure is kept at a slight negative pressure (-0.02" w.c.). In summer, the building pressure will be maintained slightly positive (+0.02" w.c.).
- * Sensors monitor temperature and humidity at the entrance and exit of each component in the supply and exhaust systems.

Occupied - Windows and Doors Open

- * During heating modes, if Occupied - Windows and Doors Open hours are designated, a signal is sent to occupants that windows and designated doors may be opened for natural ventilation and mechanical components of the hybrid ventilation system are deactivated and locked out from operation. When conditions for natural ventilation are no longer valid, or at the end of the work day, occupants are sent a signal to close all windows and doors.

Unoccupied

- * During unoccupied hours, hybrid ventilation system is deactivated by time of day schedule and locked out from operation.

Emergency

- * Earth tubes have manual bypass dampers that may be opened to provide ventilation if there is a system failure.
- * Refer to manufacturer's operation and maintenance information for emergency information on packaged controls.

Cooling (Summer) Modes

Same as Heating (Winter) Modes

Earth Tubes

Earth tubes is a passive heating and cooling technique that uses the constant 50 degree temperature of the earth to pre-heat incoming air in the winter and pre-cool incoming air in the summer by passing the air through tubes buried under the earth before bringing it into the building envelope. This is actually an ancient technique used for thousands of years.

Key Design Elements:

- * Tube Length: 80 ft.
- * Tube Depth: 6 ft below the surface of the earth.
- * Tube Material: Smooth-wall sewer and drain pipe.
- * Tube Size and Number: Use 6 - 6 in diameter tubes
- * Tube Location: Backyard of the Green Garage because the it is in the shade and clay, 3 feet away from any buildings to reduce any negative effects either way.

Inlet Manifold:

- * Provide an inlet with a screen/filter (.3 - .5 microns) to keep bugs and small animals out of the tube.
- * Provide a secondary inlet near the building to bypass the earth tube when needed or the ambient air is preferred (e.g. air temp is 65 degrees and the ground is 50 degrees in the spring.)
- * Develop a manifold on each end. Insulate the upper 4ft of the tube and the manifold.

DATE	FOR REPORT	DATE	BY	REVISIONS
8/17/09				
	ISSUE FOR			
GREEN GARAGE, DETROIT 4444 SECOND AVE. DETROIT MI 48201				

Architects Planners Engineers

ARCHITECTS INTERMARKETIONAL, INC.
17100 Midwestern
Detroit, Michigan 48221
Phone: 313-541-7930
Fax: 313-541-6944

DESIGNED	TUB	CHECKED	PROJECT NO.
DRAWN	MAE		0923
APPROVED	TUB	DATE	SHEET NO.
			M-4

VENTILATION SYSTEM