

St. Louis County Residence

FIRST PLACE

ASHRAE Excellence in Engineering Award
Chapter Level

Project Highlights and Results

- Designed system eliminates reliance on natural gas for space heating and prepares the site for potential carbon neutral or net-zero operations.
- Geothermal field serves entire heating and cooling needs as well as DHW preheating.
- Working with Peter Rose + Partners and Transsolar KlimaEngineering, designed gravity wall units -- a relatively new technology to the U.S. -- meet sound and aesthetic requirements within limited ceiling space for implementation.
- Energy and custom, parametric TRNSYS model used to determine field performance for appropriate geothermal field sizing.
- System eliminates reliance on natural gas for space heating and prepares site for potential future carbon neutral or net zero operations.

Project Background

Location:	St. Louis County, MO
Team/Team Lead:	Don McLaughlan, Brian Malone, Bhupendra Tailor, Peter Rose + Partners, Transsolar KlimaEngineering
Elara Role:	MEP Design Engineer
Type:	New Construction

Project Overview

Building Type:	Single-Family Residential
Building Attributes:	3 Floors (plus basement); 14,790 SF w/ Heated Outdoor Pool and Pool House
Initial Construction:	2020
MEP Systems:	Geothermal Water Source Heat Pumps w/ Vertical Well-Field, Makeup Air Unit w/ Heat Recovery, VRF, Humidification, Gravity Wall Units, In-Floor Radiant, High-Efficiency Lighting, Back-Up Generator, Integrated Digital Controls

Innovation

- Due to zoning restrictions that limited building height and subsequently ceiling space to distribute sufficiently sized ductwork, 63 gravity wall units were utilized for space conditioning and to achieve desired aesthetics.
- Detailed modeling of the gravity wall units, including operational mockups, resulted in manufacturer design modifications to improve the units' condensate management.
- The geothermal field, with 22 wells at 300 feet in depth, serves the entire heating and cooling needs of the building, as well as pre-heating of the domestic hot water. Energy is recovered from the exhaust via an enthalpy wheel in the geothermal source makeup air unit.
- Quiet operation and significant reduction in energy associated with heating and cooling for the project derived from gravity wall units and radiant floors that minimize the need for fan operation associated with the heating and cooling of spaces.
- Geothermal source VRF system used for remote standalone pool house and lounge.
- Despite the sophisticated controls and overall energy efficient design of the project, system components were selected to allow for a large range of qualified personnel to service and maintain them.

