



**WaterFurnace**<sup>®</sup>  
Commercial Solutions Group



# “Innovative Best Practices”

Proud Winner of Mayor’s Climate Protection Agreement Award!

Posted: 2015 04 30 In: SOA news



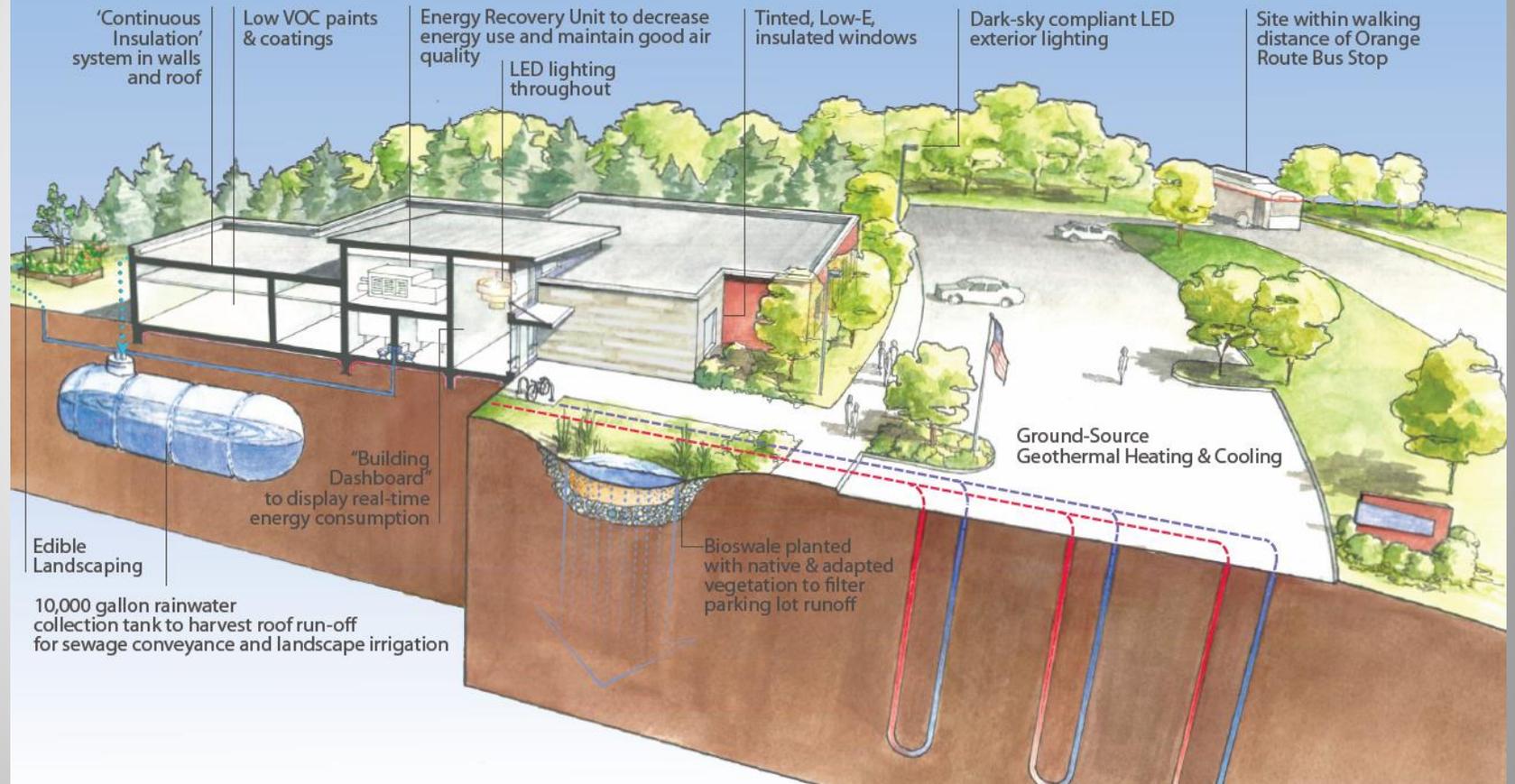
On April 20th, SOA’s new building was announced to be a winner in the “Innovative Best Practices” category for Columbia’s first annual Mayor’s Climate Protection Agreement Award! The building, designed by, and home to, SOA and CM Engineering, was selected for its extremely energy and water efficient design.



**MCPA Awards**

City of  
Columbia 

## Welcome to OHM Professional Offices!



**Simon Oswald Architects and CM Engineering**

**www.soa-inc.com or www.cmeng.com**

[https://www.youtube.com/watch?v=Rro4dsjdW\\_w&index=7&list=PLRUFCaIrdzZhJ0Hpwo3CriOWBt1Pley\\_7](https://www.youtube.com/watch?v=Rro4dsjdW_w&index=7&list=PLRUFCaIrdzZhJ0Hpwo3CriOWBt1Pley_7)

# **OHM: SOA & CM ENGINEERING**

**Projected Energy Star rating of 99/100**

**Reuses rainwater for flushing toilets  
and landscape irrigation**

**Geothermal system saves  
30-40% on cooling and 50-60% on heating**

**Office constructed using reclaimed materials**

# Goal: “showcase what has worked”

[CMEng.com](http://CMEng.com) – contains multiple case studies of renovated schools – we know Geo works

“This is proven technology – keep it simple”, Kirk Mescher

One-pipe Geo Schools - add air conditioning and controls - Before and After								
School	retrofit cost \$/sq. ft.	Energy B4 Kbtu/sq. ft./yr.	Energy After Kbtu/sq. ft./yr.	Energy	Peak B4 Kbtu/sq. ft./mo.	Peak After Kbtu/sq. ft./mo.	Peak Month	Energy Star rating
				% of B4			% of B4	
Brigham	17.24	43.75	26.51	60.59%	9.00	3.50	38.89%	98
Douglas	20.00	55.40	24.80	44.77%	13.00	3.50	26.92%	
Fairview	16.25	68.00	22.60	33.24%	10.00	4.00	40.00%	
Glenn	15.75	68.00	23.60	34.71%	14.00	5.00	35.71%	99
Jefferson	19.20	79.30	34.90	44.01%	15.00	6.00	40.00%	
Oakdale	16.76	67.00	26.00	38.81%	16.00	5.00	31.25%	96
<b>Average</b>	<b>17.53</b>	<b>63.58</b>	<b>26.40</b>	<b>42.69%</b>	<b>12.83</b>	<b>4.50</b>	<b>35.46%</b>	<b>97.67</b>

# *Concept to Completion*

above is a concept and below is the real thing



## ***Owner Requirements – It has to be a functioning building Architect and MEP in one building plus a tenant!***



### **Fishbowl**

*“A large format, wall-mounted LCD monitor is connected to the firm’s network, allowing any SOA employee to remote in to their desktop computer from the “Fishbowl.”  
The “Fishbowl” and SOA’s office is completely acoustically separated.”*

### ***This is an HVAC Challenge:***

*“The two layers of glass separated by an airspace, combined with a gasketed, well-sealing door, make this space ideal for private conversations or larger meetings that might otherwise disrupt the office.”*

# Are people in their office or in a meeting? or another “HVAC challenge”



*“The **I Lounge** is a great space for small, private meetings with clients or conference calls. The room size and lighting is also appropriate for a private office, should the firm need to transition its use in the future.”*

*“The **Battleships** are two standing height tables with storage areas beneath. As their name implies, they are quite large, and the entire SOA team can gather ‘round for our Monday meetings.”*



**One-pipe Design accommodates design changes now and in the future**

## 12,000 sq. ft. and highly variable “people” and “plug” loads

*“By locating the building’s **Training Room** off the main entry lobby and coordinating event scheduling, three businesses are able to maximize the use of a space that, **however necessary, is frequently vacant.**”*



### The “Diner”

adjustable height tables and reconfigurable seating (with built-in outlets and USB ports!) is located just off our break room.

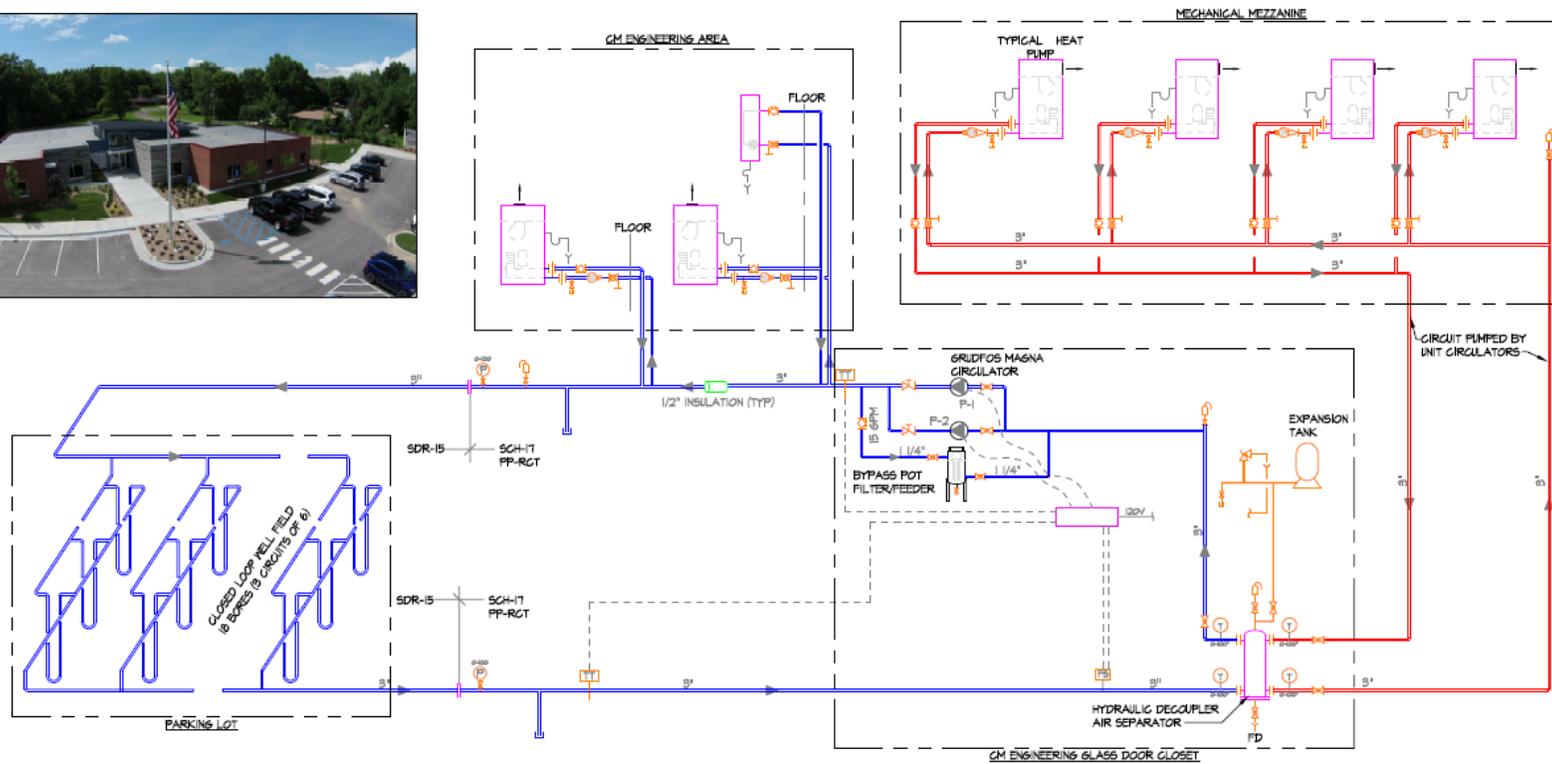


# Hybrid or One-pipe design

## 4-pipe performance, Demand Controlled

To showcase simple design practices all the equipment is visible in the CM Engineering side of the building.

**An additional "Owner Requirement"**



OHM BUILDING - GROUND SOURCE WATER LOOP DIAGRAM

*WSHP's Heat or Cool based on each occupant thermostat*

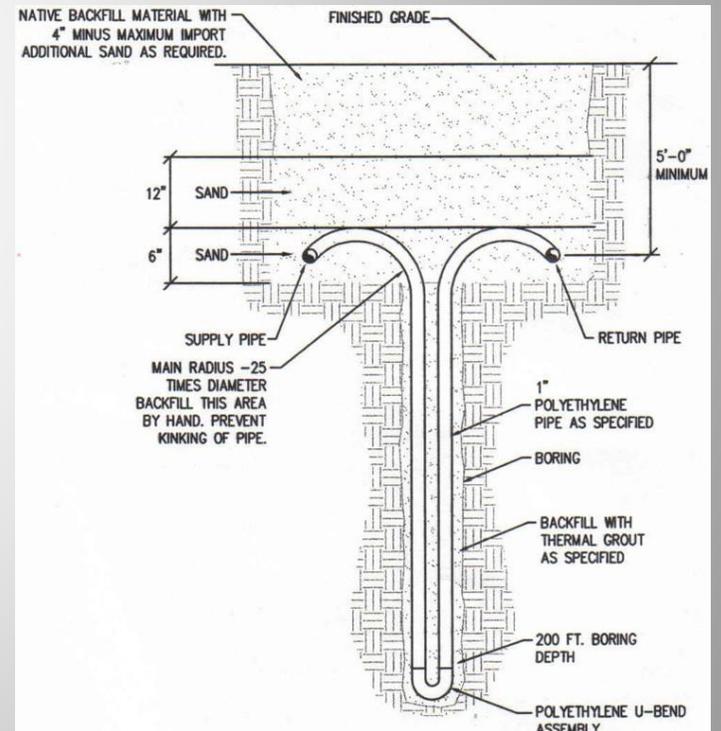
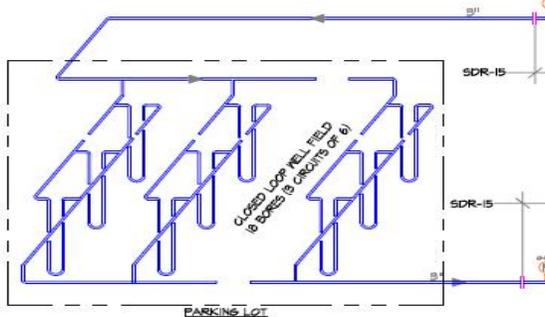
*The One-Pipe System operates within design Delta-T. Efficiency and capacity changes very little over the designed temperature range*

# move **Cost** from building to Ground

- No evaporative cooler and water use
- No Boiler, no gas service
- Simple pipe design, easy to communicate and manage
  - Less pipe
  - Fewer fittings
  - Couplings, adapters, insulation, hydronic specialties, even hangers
- Self-Balancing
- Low cost CONTROLS

# Ground loop under parking lot

1" dia. HDPE loop, fused U-bend  
5.125" diameter bore  
18-300 ft. deep  
Thermal grout elite  
(power tec graphite, 1.2 tc)



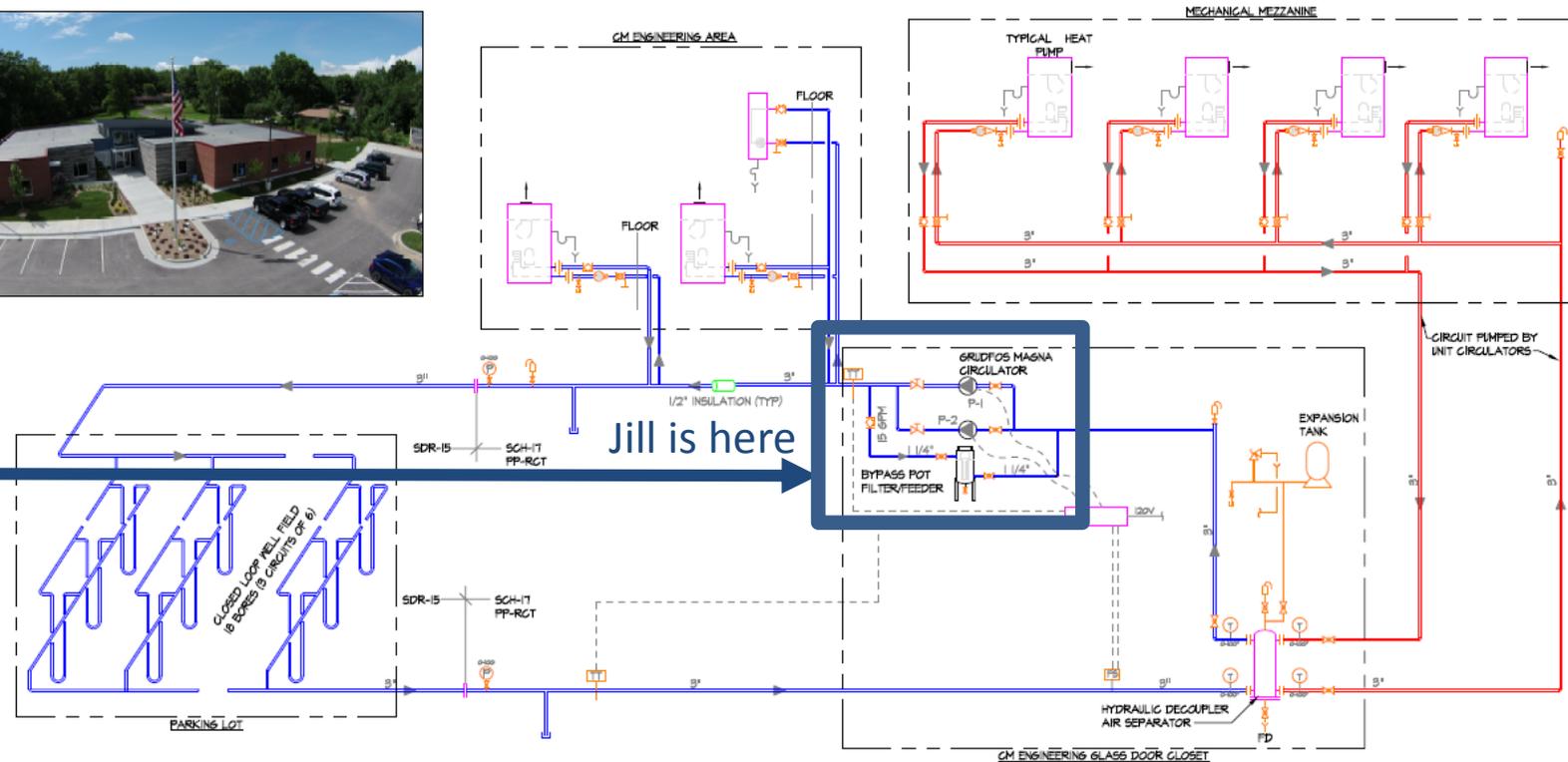
# Ground Source Water Loop Diagram

Entering CM Engineering you meet Jill and the Mechanical Room



One-pipe Geothermal through the building to the ground and back

**CM**  
ENGINEERING  
2801 Woodard Drive  
Suite 105  
Columbia, Missouri  
65202  
Ph. - 573/874-9455  
Fax - 573/874-9474

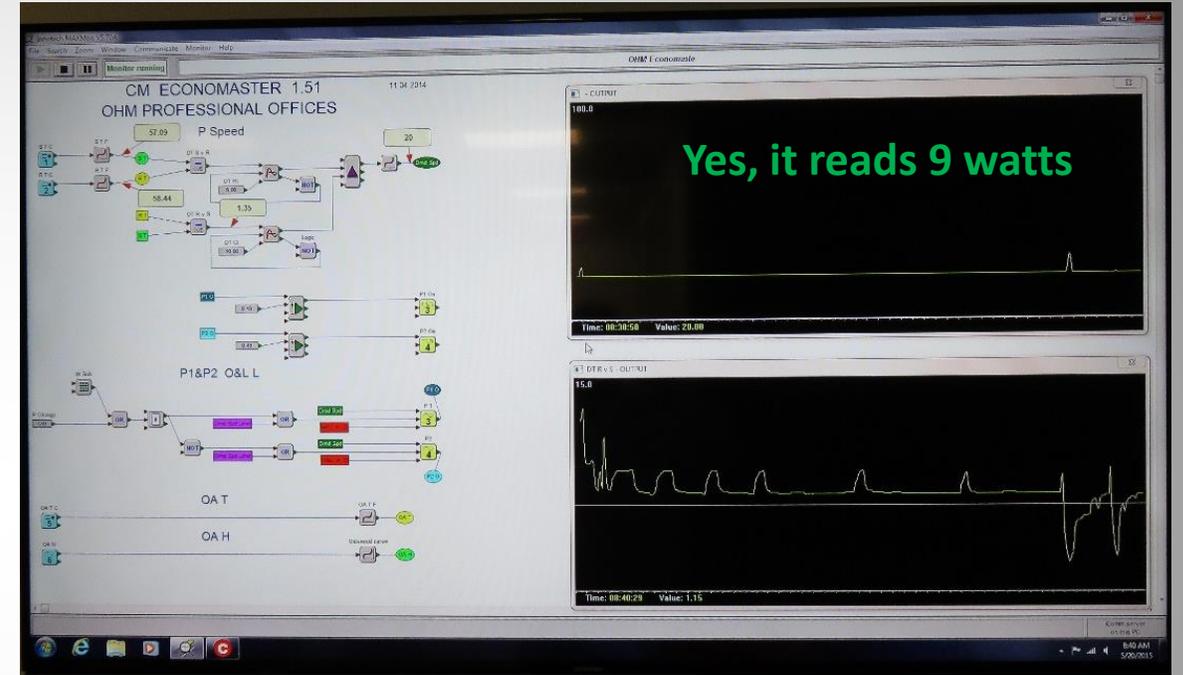


OHM BUILDING - GROUND SOURCE WATER LOOP DIAGRAM

# Energy Management

Energy Transport Horsepower  
Variable digital control

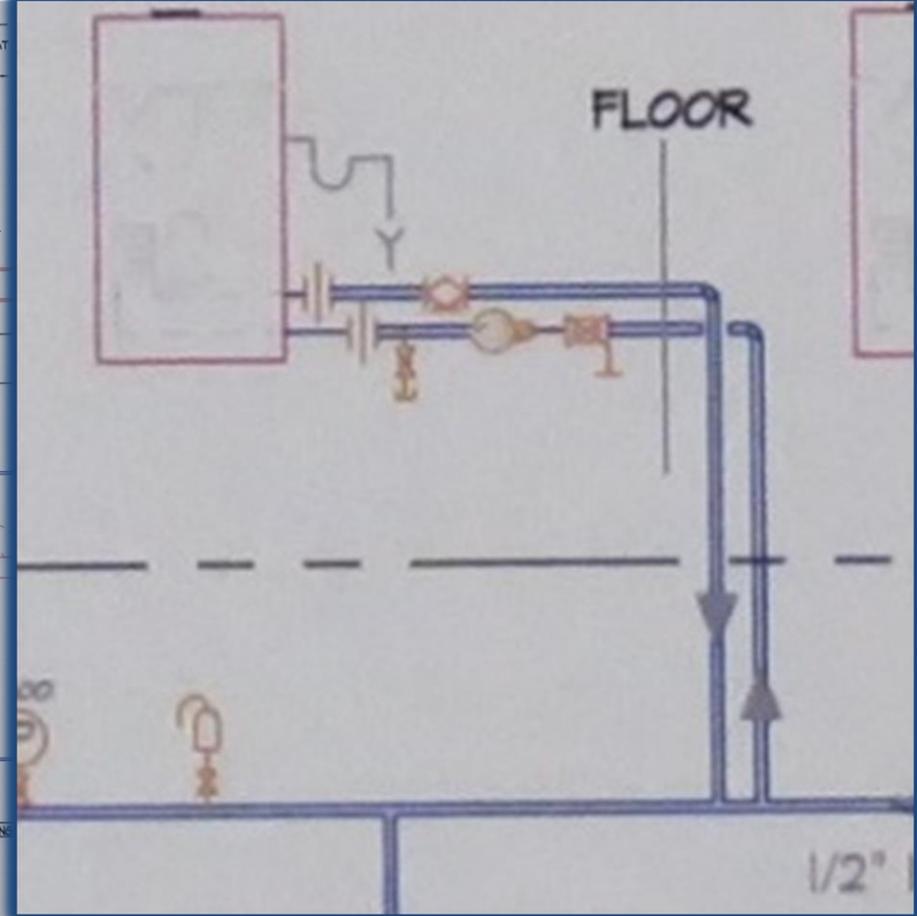
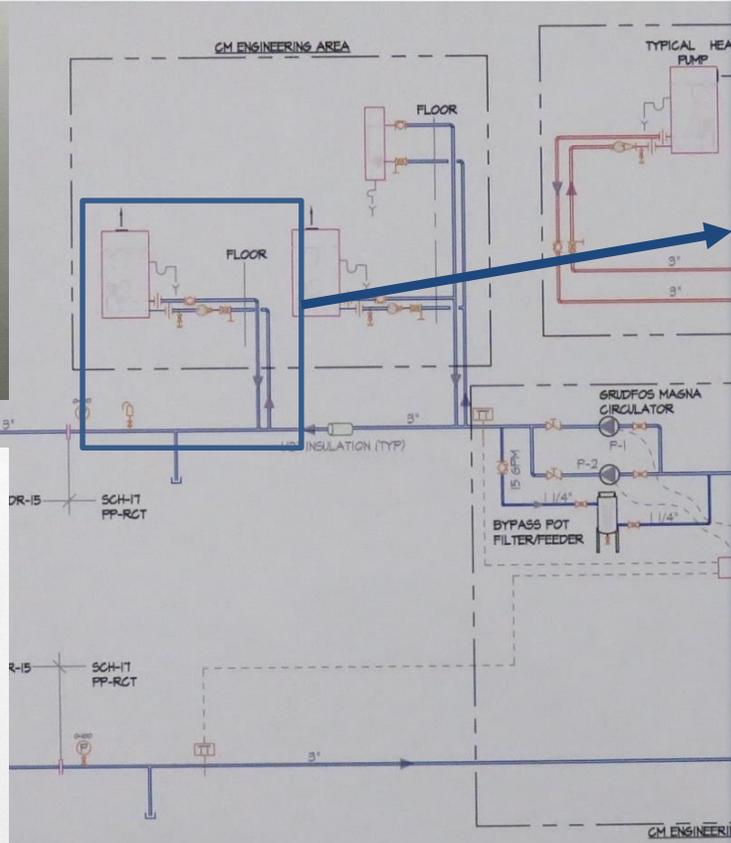
- Minimum pressure
- Loop Delta-T
- Units have individual circulators
  - Demand controlled
  - Self-balancing
  - Control signal and power from the unit
- One primary pump set for building and ground HX
- Water uses 1/10<sup>th</sup> the energy to move Btu's Vs. air



**System Pump Horsepower 9 watts**



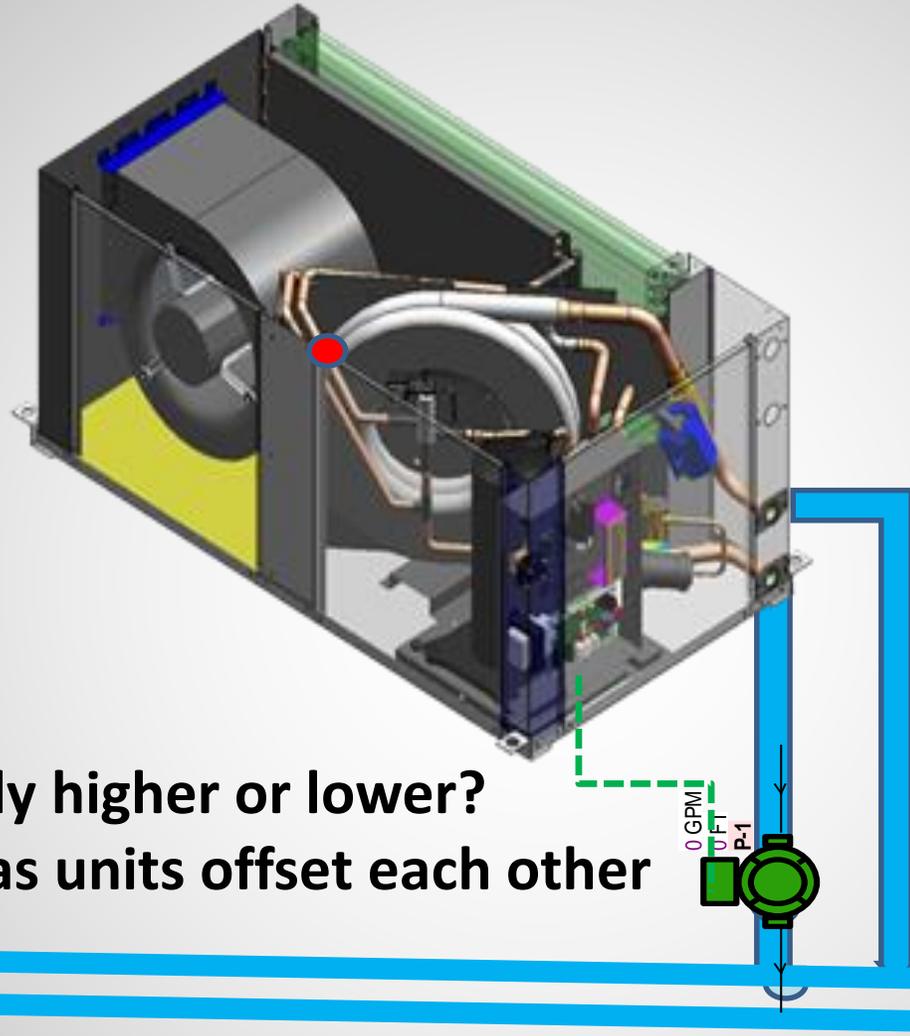
# One-pipe in the building thermostat call starts flow



01 GROUND SOURCE WATER LOOP DIAGRAM  
SCALE: NONE

*This system "Nets" the energy in the building before it goes to the ground*

*Moving Btu's - primary secondary pumping – One-pipe distribution (1x4-Pipe system)*



Thermostat signal  
To Circulator  
Instead of two-way valve

Compressor  
Activated  
in “heat” or “cool”

EWT to next unit is slightly higher or lower?  
One-pipe “Nets” energy as units offset each other

Flow in the main, a one-pipe design for entire building  
– or typically - reverse return mains for multi-story buildings  
to one-pipe distribution. Each loop is sized for the load at a delta-t.

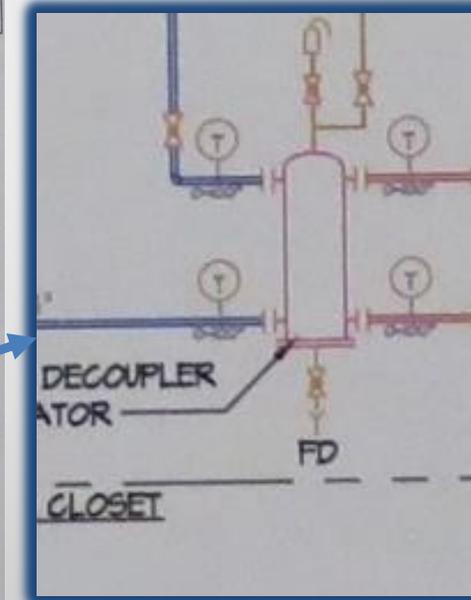
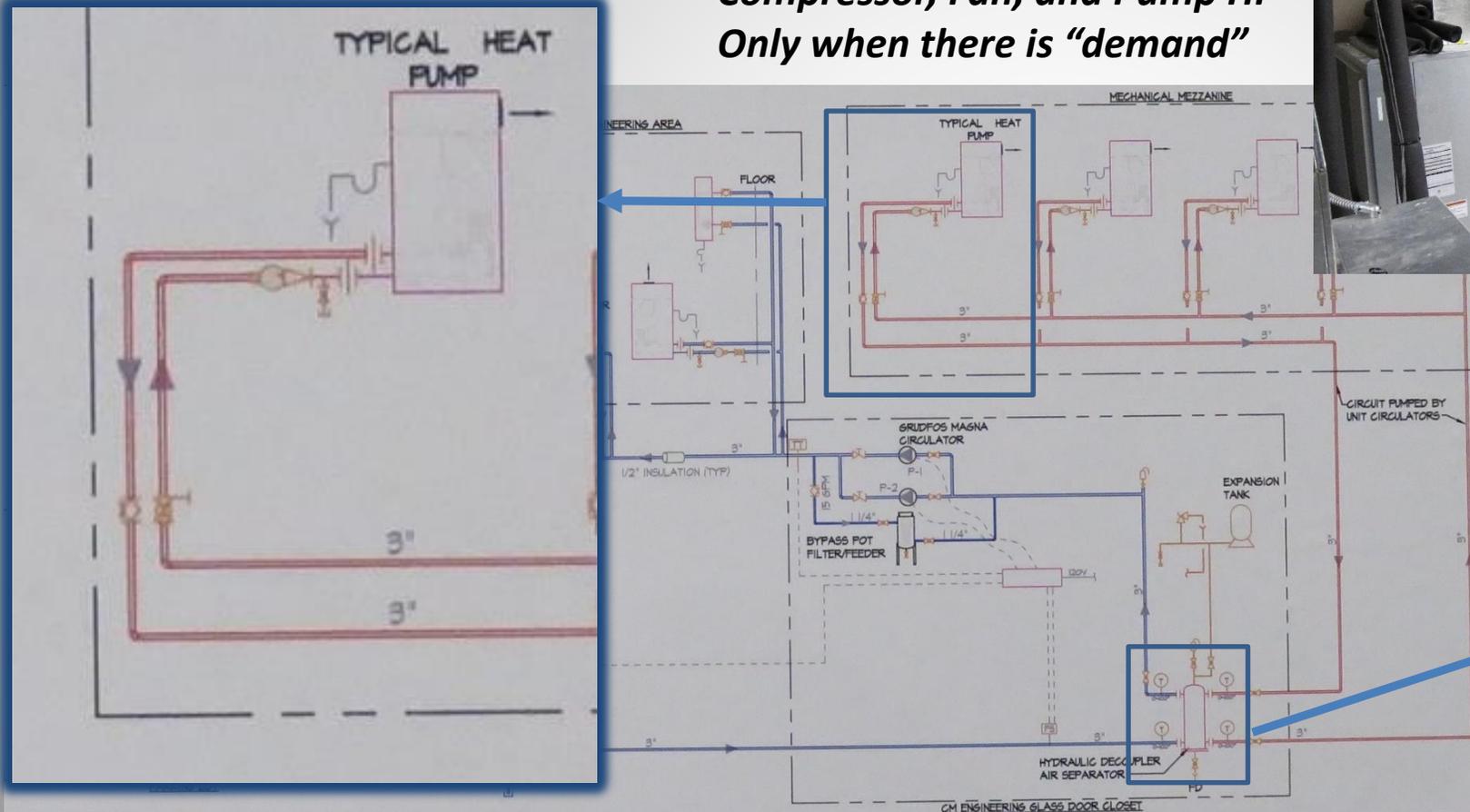
# Hydraulic Decoupler

(no primary pump)

*Variable flow*

*Compressor, Fan, and Pump HP*

*Only when there is "demand"*



01 GROUND SOURCE WATER LOOP DIAGRAM

SCALE: NONE

# Mechanical Showroom



Demand Control  
Power  
Control signal  
Circulator fusing  
By  
**WaterFurnace**

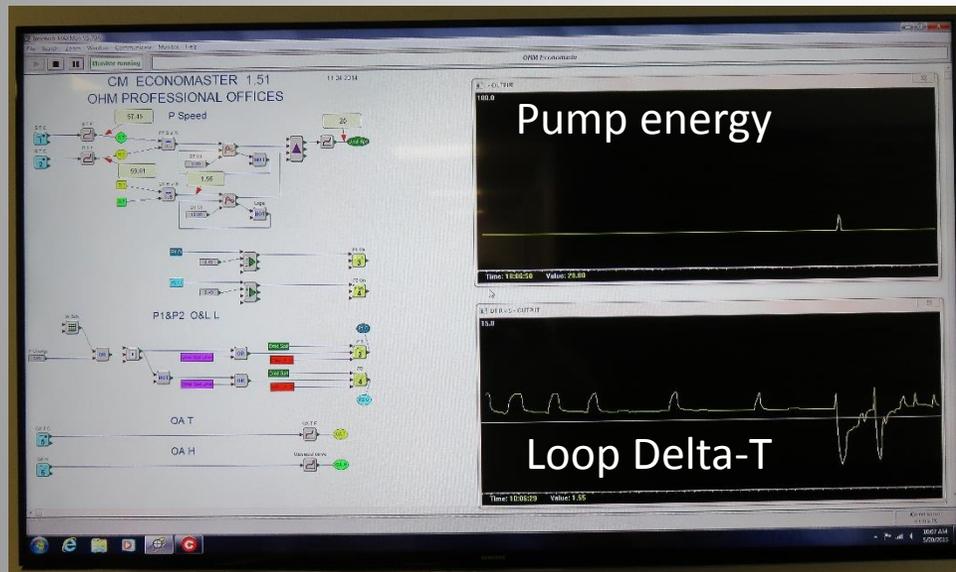


# Planning to Performance

Kirk Mescher, CM Engineering, Owner:

***"I'm a businessman and an energy guy. \$34 a working day for 12,000 sq. ft. I think we can afford it!"***

24 hour real time display



2015 MCPA Winner: OHM: Simon Oswald Architecture and CM Engineering



**Adrienne Stolwyk, RA, LEED AP BD+C**  
**Architect**

- *“Architects and Interior Designers, like many professionals, often work in teams. Teams need to meet frequently and for a variety of purposes. Having a variety of spaces for SOA’s designers to meet was an important part of the design for our new office.”*
- Question:  
*“How do I explain the efficiency of a Water Source Heat Pump versus an air source heat pump?”*

## *Response, Kirk Mescher, PE, Owner:*

- *“They are both heat pumps, and can be 400% efficient, but water transfers heat 10 times better than air.*
- *One difference is that the air source efficiency is reported as adjusted, based on seasonal and part-load operating points.*
  - *Water Source efficiency is calculated at the extremes of operation.*
    - *Air Source capacity and efficiency is penalized when it is hot and cold outside.*
    - *A double penalty because that’s when utility rates and equipment loads **peak***
  - *Water Source always operates inside the “certified” test points.*
- *It is like buying energy where it is never hotter than 90 degrees or colder than 37°F outside.”*

# Planning for Performance

- Owner requirements for the Whole Building
  - **SOA ...what we believe**
    - *Good design is a thoughtful process producing inspiring spaces and places to enrich people's lives.*
    - *The result is “appropriate design”*
  - **CM Engineering...the new office building is another example of our commitment to the environment**
    - *to engineering excellence*
    - *In budget*
    - *Simple – Low Maintenance*
- *“Our new building showcases many of the same technologies that we utilize in our client work. It will be among the most energy-efficient buildings in the area.”*

# Thanks to OHM for selecting **WaterFurnace** Equipment

## *In The Loop*

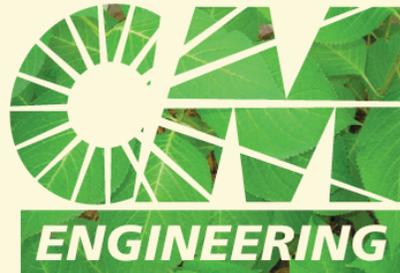
By far the biggest energy savings comes from our one-pipe, closed loop, ground source geothermal exchange HVAC system. With it, we're able to remove excess heat energy from the indoor environment in warm months. This energy is stored in the ground until cooler months when it can be re-introduced to the building.

## *Bountiful Harvest*

We're protecting the environment in other ways, too. Our rainwater harvesting system will supplement our gray water and irrigation needs. It will limit run-off into local storm drains and water ways and it will reduce our demand on the municipal water system.

The new office building is another example of our commitment to the environment and to engineering excellence.

On December 1, find us at 2801 Woodard Drive, Suite A, in north Columbia.  
Zip code will be 65202.



**BRIGHT SOLUTIONS IN ENGINEERING**



*Kirk Mescher passed away after this was prepared. He always was searching for a way to keep designs simple and perform better than expected. He is already missed.*

