Geothermal Cooling & Heating Systems for India

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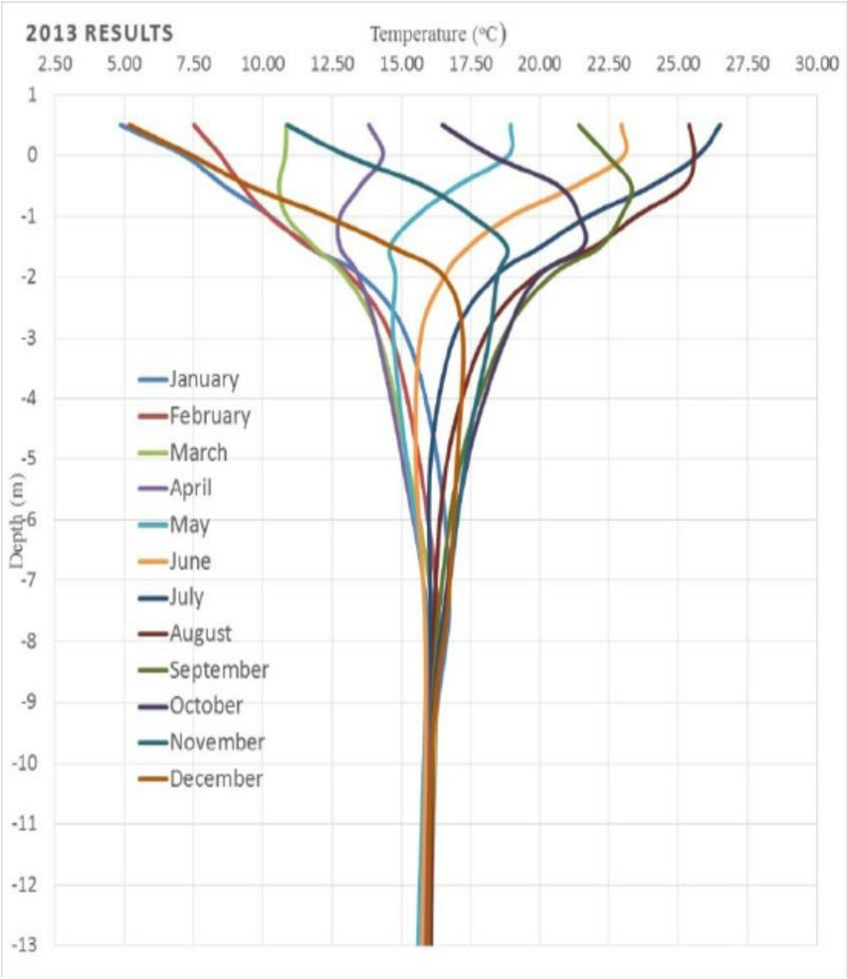
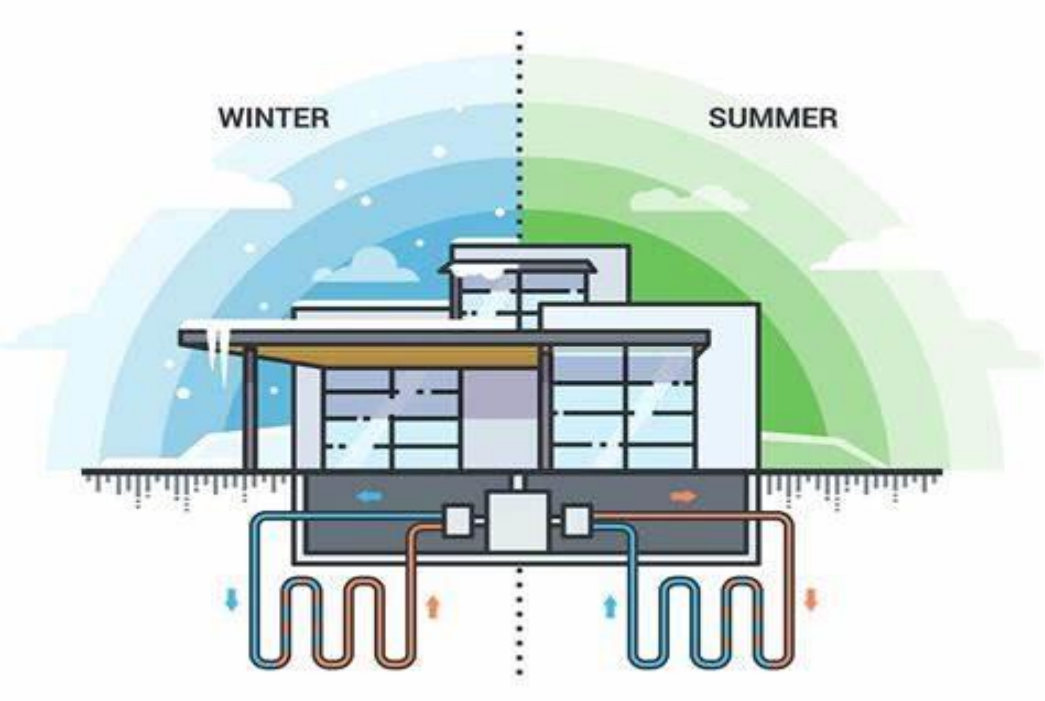
Introduction to Geothermal Systems

Geothermal HVAC and power systems use Earth temperature for heat exchange. While temperature variation occurs in atmosphere, temperatures underground remain constant.

In a geothermal HVAC system, an electrically powered heat pump cycles fluid, usually water or refrigerant, through long loops of underground pipes. It is through this process that heat is transferred from ambient air in the building to the ground and vice versa



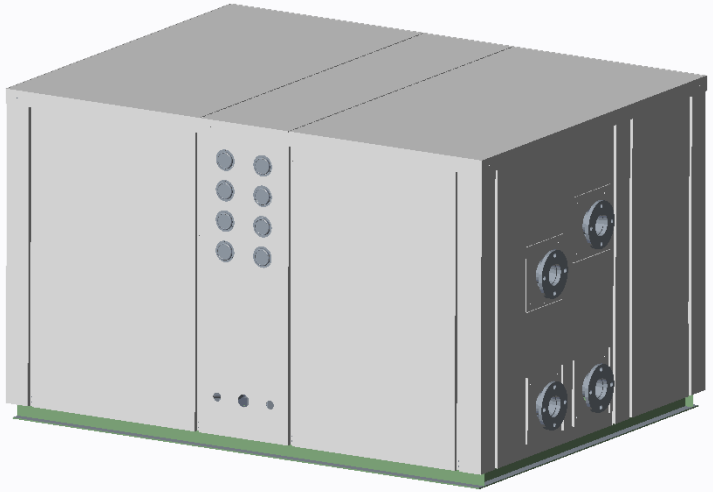
Geothermal HVAC Systems Cooling & Heating



During the winter, the heat pump sends fluid through the pipes where the warmer rock, soil, or water underground increases the temperature of the fluid. The warm fluid is then pumped back to the building. A heat exchanger can then transfer the heat from the fluid to the building's heating system to warm the air. A desuperheater can be used to increase the temperature of water for use in the building. The process is then repeated, with the cooler fluid being pumped back into the ground to be warmed and then returned to the building for heating.

Benefits

Reasons for using a ground coupled system.
1. Unlike a standard solar system, the loop operates day or night, rain or shine all year, delivering heat to and from the heat pump.
2. It is cost effective in northern or southern climates.
3. Because the water circulates through a sealed closed-loop of high strength plastic pipe, it eliminates scaling, corrosion, water shortage, pollution, waste and disposal problems possible in some open well water system
4. Saves up-to 70 % of operating cost compared to conventional HVAC systems
5. ROI is between 2 to 5 years



Design & Manufacturing

Our experience of over 30 years in manufacturing heating equipments has enabled us to design and build heat pumps with performance characteristics substantially superior to those available in the market.

Our In-house Design team has designed highly efficient heat pumps for Indian conditions. We are continuously evolving our heat pump designs using advanced design softwares to improve efficiency and life cycle of our machines even further.

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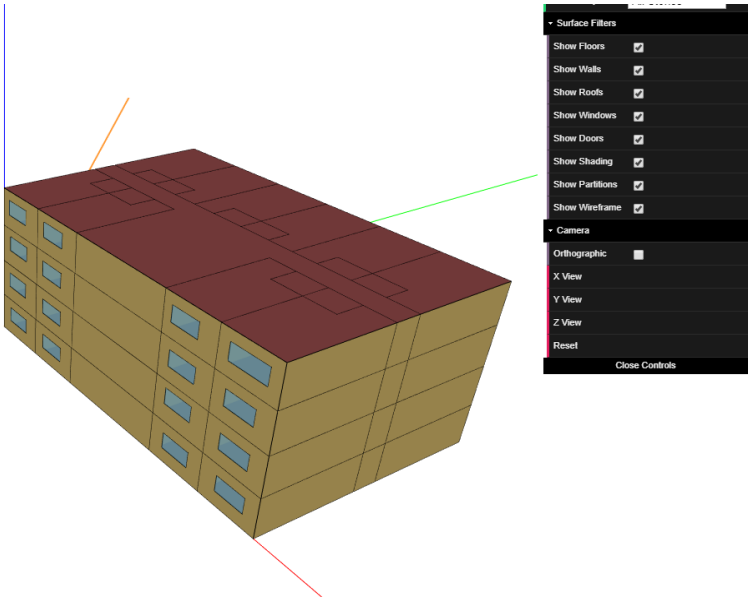
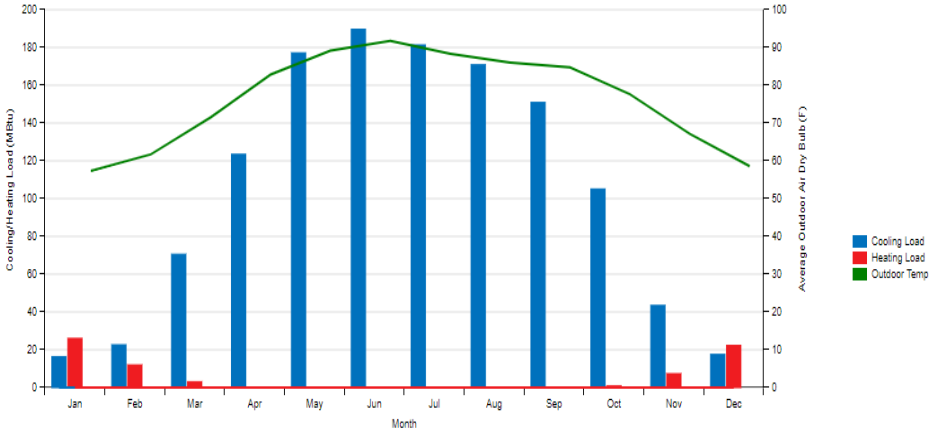
Services and products we provide – Energy Modelling (8760 analysis)



Complete energy modelling analysis of premises which includes 8760 hours of energy simulation with 3D modelling of structure

Based on Geographical data, peak load and total HVAC load of all the months are simulated for given site conditions.

	Cooling		Heating	
	Kbtu	Kbtu/hr	Kbtu	Kbtu/hr
Jan	16000	121	26000	118
Feb	23000	150	12000	87
Mar	71000	263	3000	49
April	123000	368	0	0
May	177000	418	0	0
June	190000	434	0	0
Jult	181000	400	0	0
Aug	171000	363	0	0
Sep	151000	331	0	0
Oct	105000	384	0	0
Nov	43000	213	7000	73
Dec	18000	110	22000	119
Total	1269000		70000	



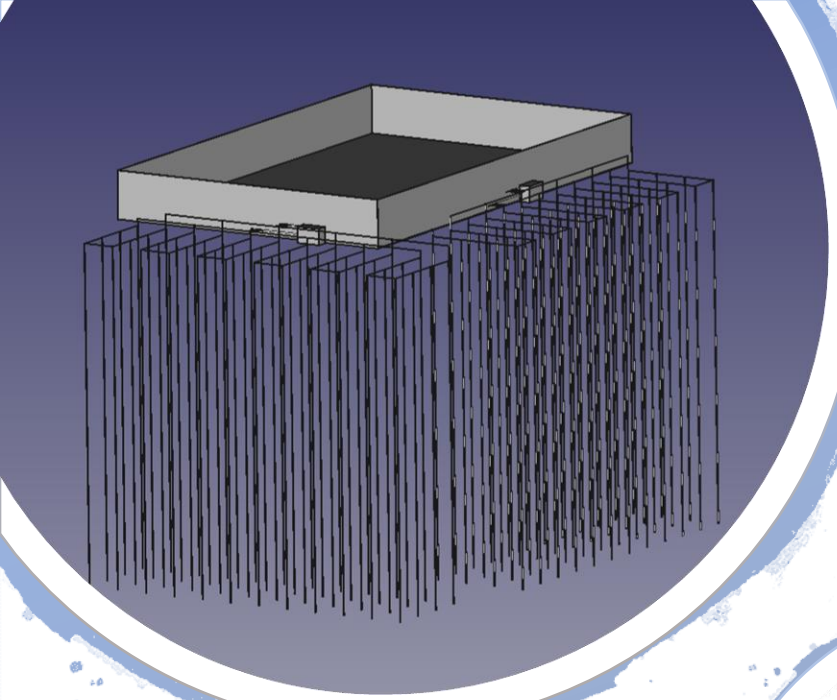
Resistivity survey of plot

To determine:

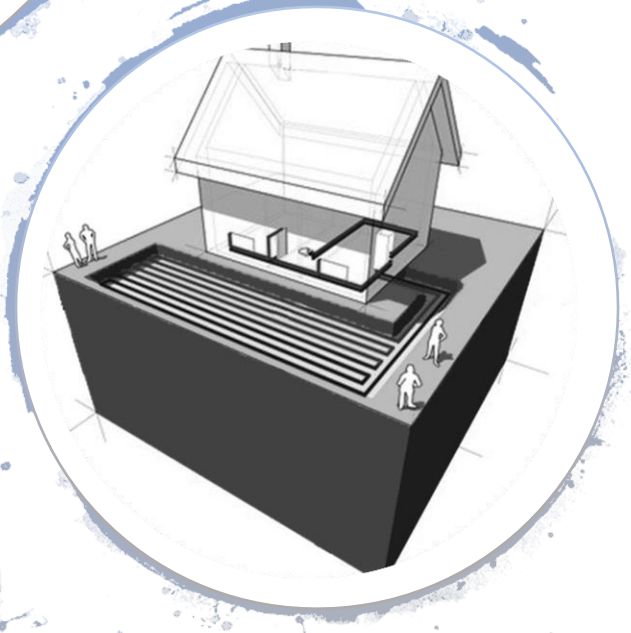
1. **Heat Dissipating ability of earth layers and formations up to a dept of 500ft**
2. **Depth of Confined Aquifers**
3. **Possibility and Probability of Unconfined aquifers below your feet**

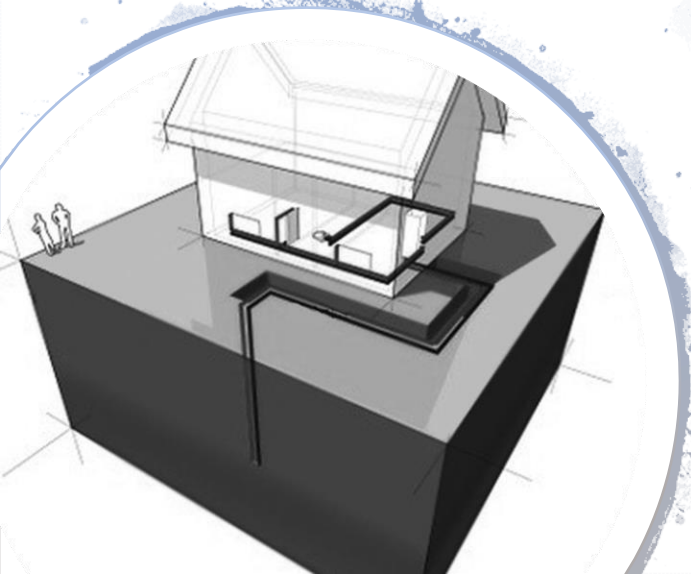
Resulting outputs:

- **Geothermal ground looping and heat exchanger design detailing if Closed Loops or Open Well – Loop to be deployed**
- **Impacts final cost and time line of project**



Geothermal loop design & installation





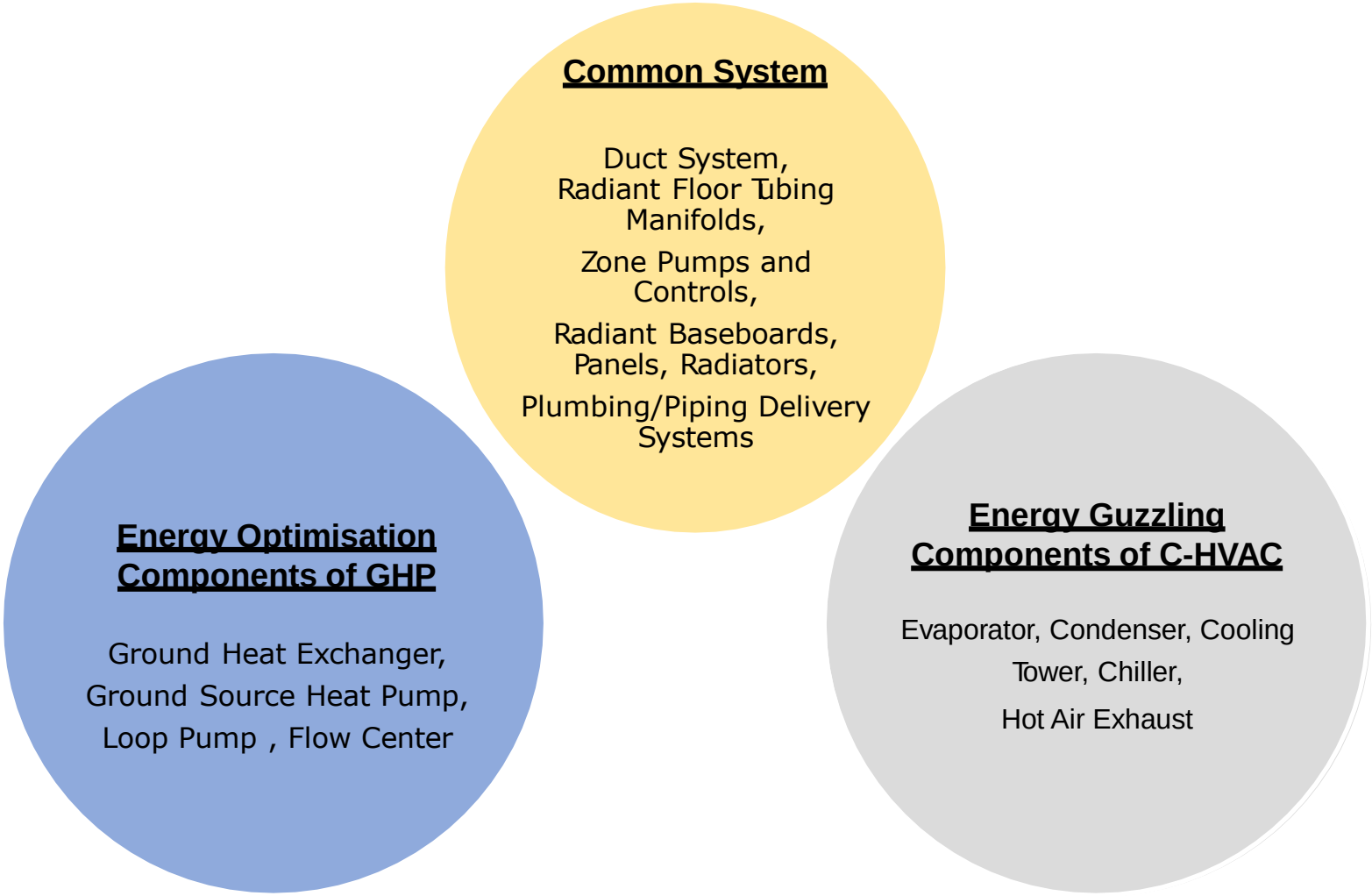
Endorsed by

IGSHPA

International Ground Source Heat Pump Association

Component Level Analysis

GHP Vs Conventional HVAC



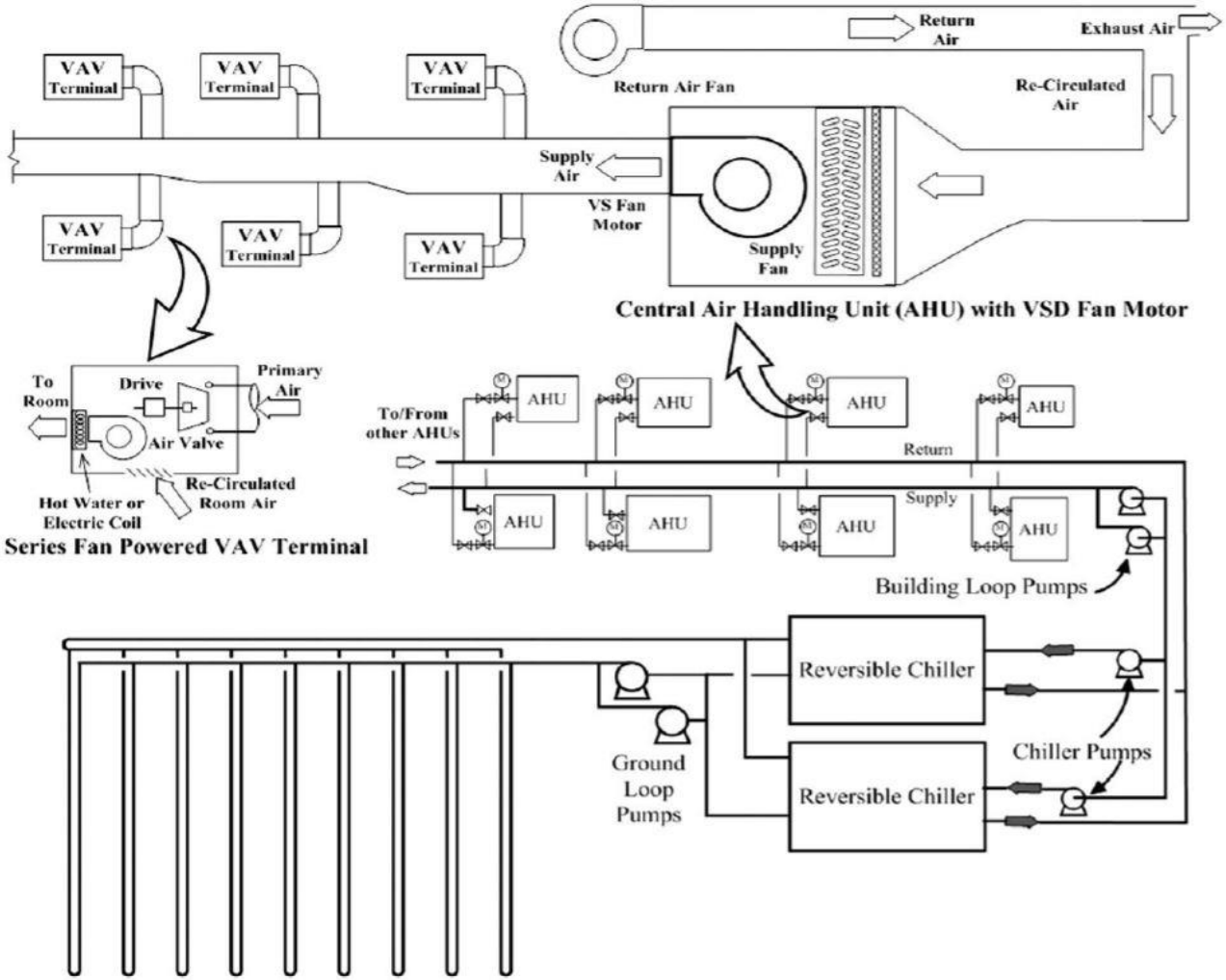
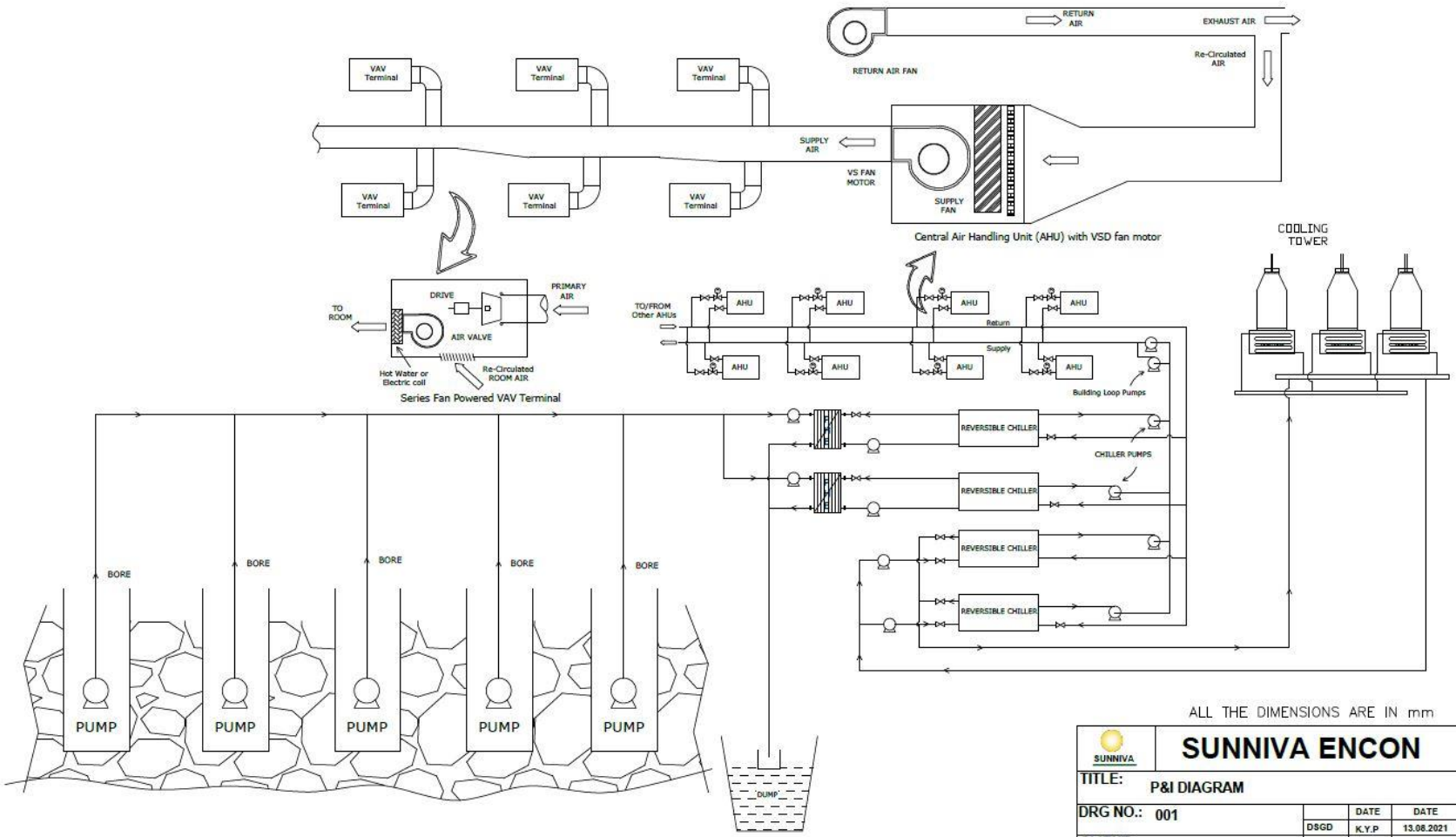


Figure 2.18 Chilled-Water VAV Vertical Ground-Loop System



ALL THE DIMENSIONS ARE IN mm

SUNNIVA	**SUNNIVA ENCON**		
TITLE:	**P&I DIAGRAM**		
DRG NO.: 001		DATE	DATE
	DSGD	K.Y.P	13.08.2021
CLIENT: M/S SHRI SADGURU SEVA SANGH TURST (CHITRAKOOT)	DRN	HANU	13.08.2021
	CHD	K.Y.P	13.08.2021
	APPROVAL:		
	SCALE: NTS		
	SHEET NO.		

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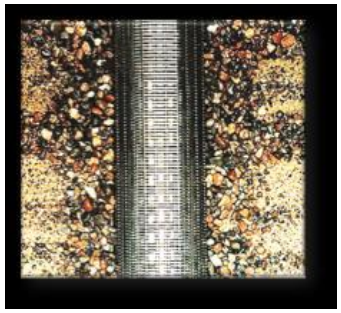
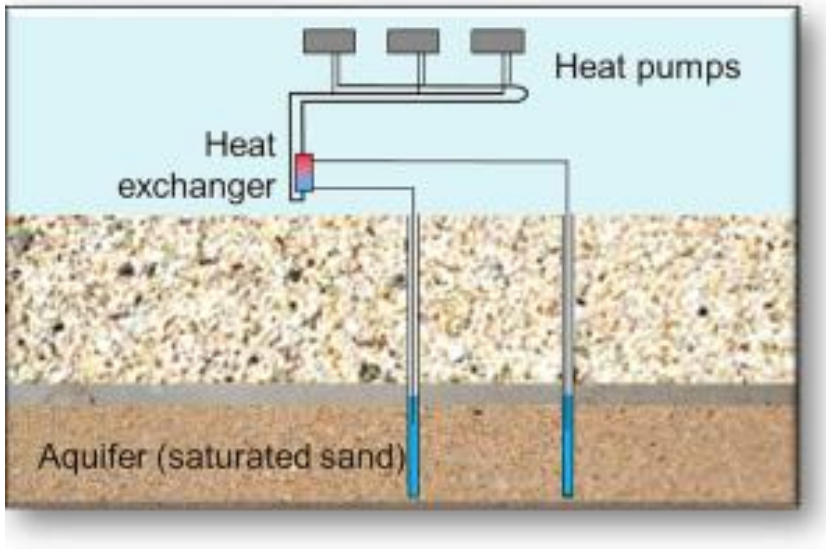
Case study



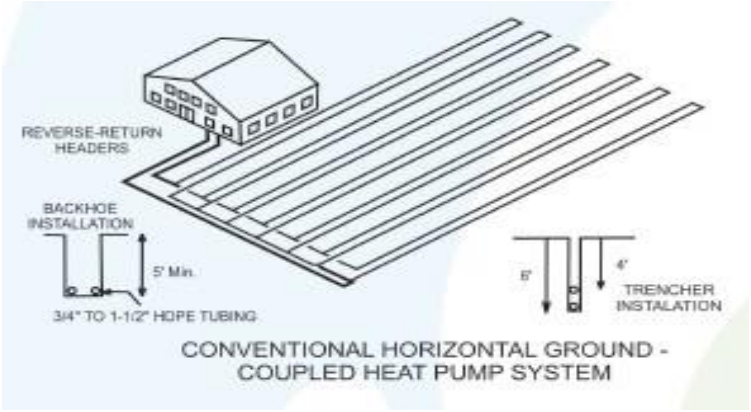
Particulars	Details
Developer/ consultant	IFGC
Target	Phama Wearhouse
Location	Maharashtra
Size	22 tonnes
Type of system	Open Bore well Re-circulating
Construction time	3 months
Savings in energy	Since trial operation started. 64% during trial run. Target = 75%



Projects Executed: India (as a Co.)

International School

Particulars	Details
Developer	Geosyndicate Power
Target	International School
Location	Andhra Pradesh
Size	495 tonnes
Type of system	Horizontal Closed loop system
Construction time	8 months from NTP
Savings in energy	**70% over conventional HVAC consumption**



Savings and Profitability Analysis LG AIR VRV vs Geothermal

Particulars	Units	VRV Air Cooled	VRV Water Cooled GHP
Area to be Cooled	Sq. Ft.	200	200
Area Covered per Ton	T/Sq. Ft	140	140
Estimated Tonnage	Tr	1.43	1.43
Cost per Tonne (Assumed)	Rs.	85,000	145,000
Total Cost of System	Rs.	121,429	207,143 1.71x
Energy Consumption	kWh/Tr	1.10	0.45
Total Energy Consumption	kWh/p.a. for 12 Hours	6,883	2,816
Incremental Cost	Rs.	85,714	
Decrease in Energy Consumption	kWh/p.a.	4,067	
Cost of Electricity	Rs. / kWh	9.00	
Annual Savings on Electricity	Rs.	36,604	
Pay Back period for Incremental Cost	Years	2.34	
Pay Back period for Total Cost	Years	5.66	

Pan-India Network

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About author

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Member of:

BNI IGSHPA ISHRAE KRTA INSTITUTE OF INDIAN INTERIOR DESIGNERS

First-generation Entrepreneur proficient in Sustainability & Innovation with 9 years experience in Heat Pump Industry and successfully completed over 600+ energy saving projects using heat pumps.

Under his leadership, Sunniva Encon - near Mumbai - manufactures world class Heat-Pumps that mitigate CO_2 emission equivalent to 506 acres of forest during his journey.

Currently catering clients across India, across sectors (Hospitality, Developers, Pharma & Food) with attractive ROI using Heat Pumps

Interests:

- Business Development
- Renewable Energy
- Sustainability & innovation
- Geothermal Heating & Cooling

Other publications:

http://www.sciencedirect.com/science/article/pii/S1877050915007735

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