

GEOHERMAL HEATING & COOLING SYSTEMS

High Efficiency Comfort for Long Term Performance



1. WHAT IS A GEOHERMAL HEATING AND COOLING SYSTEM?

A geothermal (ground-source) system uses the earth's relatively constant underground temperature to heat and cool buildings. It circulates water (or a water/antifreeze mix) through underground piping—called a ground loop—to exchange heat with the earth, then uses high-efficiency heat pumps inside the building to deliver heating, cooling, and in some cases domestic hot water.

2. HOW DOES GEOHERMAL DIFFER FROM TRADITIONAL HVAC SYSTEMS?

Traditional systems burn fuel (natural gas, oil) or rely heavily on outdoor air temperatures. Geothermal systems:

- Do not burn fuel on-site
- Use the ground as a heat source in winter and a heat sink in summer
- Typically achieve much higher efficiency and more stable performance year-round

3. IS GEOHERMAL PROVEN TECHNOLOGY OR EXPERIMENTAL?

Geothermal is a well-established, mature technology. It has been used in U.S. schools, universities, hospitals, and government buildings for decades. Thousands of K-12 schools nationwide operate geothermal systems successfully, including many in Pennsylvania and neighboring states.

4. WHY IS GEOHERMAL WELL-SUITED FOR PENNSYLVANIA?

Pennsylvania's climate and geology make it an excellent candidate:

- Stable underground temperatures year-round
- Cold winters and warm summers maximize efficiency benefits
- Large campuses with open land are ideal for ground loops
- Long building lifespans align well with geothermal's durability

5. WHAT TYPES OF GEOHERMAL SYSTEMS ARE AVAILABLE?

Common system types include:

- Vertical closed-loop: Wells drilled vertically; ideal for limited land areas
- Horizontal closed-loop: Shallow trenches; cost-effective where land is available
- Hybrid systems: Combine geothermal with supplemental equipment

The appropriate system depends on site conditions, land availability, and project goals.

6. HOW MUCH ENERGY CAN A GEOHERMAL SYSTEM SAVE?

While results vary by building and design, geothermal systems typically:

- Reduce heating and cooling energy use by 25–50% or more
- Lower peak electrical demand

- Provide predictable, long-term operating costs

7. WHAT IS THE UPFRONT COST COMPARED TO CONVENTIONAL SYSTEMS?

Geothermal systems generally have higher initial costs, primarily due to ground loop installation. However:

- Mechanical equipment costs are often lower
- Fuel infrastructure (gas lines, boilers) may be eliminated
- Incentives, grants, and financing mechanisms can significantly reduce net cost

Over the life of the system, geothermal often results in lower total cost of ownership.

8. WHAT IS THE EXPECTED LIFESPAN OF A GEOTHERMAL SYSTEM?

- Ground loops: 50+ years
- Indoor heat pumps: 20–25 years

This exceeds the lifespan of many conventional HVAC components and aligns well with school capital planning horizons.

9. HOW DOES GEOTHERMAL IMPACT MAINTENANCE AND OPERATIONS?

Geothermal systems typically:

- Require less routine maintenance
- Eliminate boilers, cooling towers, and combustion equipment
- Reduce exposure to fuel price volatility

Maintenance staff training is required, but systems are generally simpler to operate once commissioned.

10. IS GEOTHERMAL SAFE FOR STUDENTS AND STAFF?

Yes. Geothermal systems:

- Have no on-site combustion or exhaust
- Eliminate carbon monoxide risks
- Operate quietly
- Improve indoor air quality when paired with modern ventilation systems

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