GEOEXCHANGE

THE BEST COURSE TO ENERGY SAVINGS FOR SCHOOLS AND UNIVERSITIES
GeoExchange technology has a tremendous future, but it’s as old as the earth itself. By tapping into the relatively constant temperature of the earth below the frost line, GeoExchange heats and cools buildings at significant savings — 25%-40% compared to traditional systems. It’s the world’s most efficient way to heat and cool homes, buildings and institutions.

GeoExchange systems are in operation at more than 500 schools, nationwide. Switching to GeoExchange technology saves Great Bridge Middle School South in Chesapeake, VA, $41,500 annually. And Salem Community College in Carney’s Point, NJ, anticipates savings exceeding $60,000 in annual energy costs. With educational institutions facing increasingly tight budgets, these savings translate into financial solutions. In 1995 alone, US schools that switched to GeoExchange heating and cooling saved an estimated $6 million — cash they reallocated for books, computers, teacher salaries and more.

GeoExchange is ideal whether you’re building a new school, renovating an existing one or simply replacing your old HVAC system. The more you learn about GeoExchange, the more comfortable, cost-efficient and environmentally conscious your school will be.
Unlike traditional furnaces that burn fuels for heat and require separate air conditioning or chiller systems, GeoExchange systems transfer heat from one place to another using a simple process to provide both warmth and cooling. There are two types of GeoExchange systems. Each taps the earth’s inexhaustible supply of renewable thermal energy, under ground or under water.

“Closed loop” systems use the earth as the heat transfer medium, employing a mixture of water and non-toxic antifreeze pumped through a continuous loop of sealed polyethylene pipes buried beneath the ground, vertically or horizontally. “Open loop” systems draw water directly from a well, lake or pond and pump it through a heat exchanger at the geothermal heat pump; after which, the water is returned to the source.

In winter, GeoExchange systems bring the earth’s natural warmth up to a building and then transfer it into each room or zone via a heat pump. In summer, they work in reverse to provide air conditioning, absorbing the heat from inside a building and transferring it to the cooler earth below.

**HIGHER EFFICIENCY THAN OTHER SYSTEMS**

The Environmental Protection Agency found that, even on a source fuel basis — accounting for all losses in the fuel cycle including electricity generation at power plants — GeoExchange systems average 40% greater efficiency than air source heat pumps, 48% greater efficiency than the best gas furnaces and 75% greater efficiency than oil furnaces. Today’s best GeoExchange systems outperform the best gas technology, gas heat pumps, by an average of 36% in heating mode and 43% in cooling mode!
OUTSTANDING COMFORT INSIDE, VIRTUALLY INVISIBLE OUTSIDE

Traditional systems have two major shortcomings. They heat or cool an entire building at once, with little or no ability to control comfort levels in individual rooms or zones. Second, they occupy tremendous space, both inside and outside the building.

A GeoExchange system creates an exceptionally comfortable learning environment by giving educators precise temperature control, room by room. The system can compensate for morning or afternoon shade, heat build-up or temperature variance anywhere in a building. Auditoriums and gyms can also be controlled by separate heat pumps — so there’s no need to heat or cool the rest of the school if only these spaces are in use after-hours or on weekends.

GeoExchange systems are much more compact than traditional systems, and out of sight. Mechanical rooms can be smaller. There are no boilers, smoke stacks or fuel tanks. No massive rooftop chillers requiring added structural support, labor and construction costs. No holes drilled in roofs to secure them, either, reducing the risk of leaks. No above-ground equipment to be seen at all.

In fact, the surface above a ground loop can be used for athletic fields, parking lots, walking paths or courtyards. And because GeoExchange equipment is usually underground (wells and piping) and inside (heat pumps), it’s not exposed to damage from weather or vandals and not a temptation for children to play on.

↑ Center: Currently, one of the world’s largest GeoExchange systems is at Richard Stockton College in Pomona, NJ
MORE DESIGN FLEXIBILITY,
MORE AVAILABLE SPACE

Traditional systems limit architects, designers and engineers to traditional thinking. GeoExchange permits them to envision a new world of exterior and interior design possibilities.

A GeoExchange system needs only about one-third the space of a traditional boiler room. Pipes hidden above the ceiling transport warmth to or from individual room heat pumps concealed in small closets. Large blower units and radiators need no longer be a visual detriment in the classroom. And the eyesore of above-ground and rooftop equipment completely disappears from view.

The result? Unlimited architectural creativity. GeoExchange systems permit more attractive exterior and roof designs. They allow historic buildings to be modernized without negatively impacting their appearance. They also permit more room in every classroom, with higher indoor air quality. More overall space available throughout the building. And preservation of the natural beauty surrounding your school.
“It’s not just the simplicity of GeoExchange systems — it’s the environmental and economic advantages, and the ease of maintenance and operation.”

- David Samokar
  Architect, educational facilities
  Clotfelter-Samokar
  Lexington, Kentucky

“In terms of its efficiency and effectiveness, there’s no comparison between GeoExchange and other systems.”

- Herman Tester
  Principal,
  Daniel Boone High School
  Washington County, Tennessee

**ENVIRONMENTALLY SAFER IN THE AIR AND THE GROUND**

Even the most advanced fossil fuel systems release emissions into the air during combustion. The possibility of carbon monoxide fumes in buildings and the possibility of leaks from underground fuel tanks are serious concerns, too.

That’s why GeoExchange systems are fully endorsed by the Department of Energy and the Environmental Protection Agency. GeoExchange is environmentally responsible, creating warmth without combustion while drastically reducing greenhouse gas emissions. In fact, GeoExchange systems in use at just 600 schools each year could eliminate some 120 million pounds of carbon dioxide, more than 900,000 pounds of sulfur dioxide and 425,000 pounds of nitric oxide.

**A STUDY IN SAVINGS**

**DANIEL BOONE HIGH SCHOOL**

- **WASHINGTON COUNTY, TENNESSEE**
- **Original Construction:** 1971, 160,000 sq. ft.
- **Original HVAC:** 2-pipe chiller water system, electric resistance heat
- **Annual Energy Cost:** $238,452
- **HVAC Retrofit:** 1995
- **Total Area:** 160,000 sq. ft.
- **New HVAC:** GeoExchange, 320 bores, 150 ft. deep, 300 tons capacity
- **Annual Energy Cost:** $155,513
- **Annual Savings:** $82,939
If US educational institutions replaced their conventional HVAC systems with GeoExchange technology, they'd do more than demonstrate good stewardship of our earth’s resources. They'd have the same effect as planting 8 million acres of trees, or reducing oil imports by 61 million barrels annually, or removing 37 million cars from our roads and saving 2.6 billion gallons of gasoline. All of which help to keep America’s blue skies blue.

**EXPERTS IN THE KNOW, AS CLOSE AS YOUR PHONE**

The GeoExchange industry is growing rapidly, with an expanding infrastructure of knowledgeable experts skilled in the technology. From design engineers and architects to well drillers, pipe fitters, HVAC contractors and equipment specifiers, you can find everyone you need to help design, install and maintain a GeoExchange system precisely tailored to your school’s present and future needs.

These people can put you “in the loop” quickly, bring you up to speed on the latest technology, and show you other schools that have benefited, economically and ecologically, from GeoExchange heating and cooling.

### WHITE PINE COUNTY HIGH SCHOOL, WELLS, NV

**SAVINGS AT WORK IN RENOVATION**

**THE NEFF ELEMENTARY SCHOOL**

**LANCASTER, PENNSYLVANIA**

- Original Construction: 1929-1962 (various additions)
- Original HVAC: Steam boilers with unit ventilators, no air conditioning
- Renovated: 1995-1996
- Total Area: 148,530 sq. ft.
- New HVAC: GeoExchange, 140 bores, 288 ft. deep, 350 tons capacity
- Annual savings: $37,140
A CONSTANT SUPPLY OF HOT WATER

Another GeoExchange extra is plentiful hot water — an added plus for cafeterias, locker rooms, restrooms and dorms. In the summer, hot water is virtually free — produced by the waste heat extracted from interior air during the cooling cycle. Year-round, GeoExchange systems help make hot water abundant and up to 30% less expensive by reducing the amount of electricity or gas consumed by hot water heaters.

LESS MAINTENANCE, FEWER INTERRUPTIONS

It's a fact that traditional HVAC systems can be complex and costly to maintain. Oil and gas-fired boilers demand regular cleanings and component maintenance. Chillers need routine check-ups, fluid testing and replacement. Both systems require the attention of skilled technicians to ensure reliable operation. And should either system fail, the school could shut down with it.

GeoExchange systems, however, are remarkably simple and reliable. They consist of standard pumps, water valves and heat exchange units. The polyethylene pipes underground can last 50 years or longer. Routine maintenance consists primarily of air filter replacement. And in the unlikely event that an individual heat pump, water pump, pipe or valve should fail, that component can be taken off-line and repaired, without affecting the rest of the units in the school.

In recent studies by Kentucky Utilities and Nebraska's Lincoln Electric System, operating and maintenance costs...
of GeoExchange systems were estimated to be 12% to 19% lower than traditional systems over a 20-year period. ASHRAE manuals estimate up to 50% savings, with maintenance costs averaging 12¢ to 15¢/sq. ft. versus 30¢/sq. ft. for conventional systems. One school district even reported annual GeoExchange maintenance costs as low as 3¢/sq. ft!

WHY YOUR SCHOOL SHOULD LEARN MORE
GeoExchange is the earth’s most efficient, most environmentally responsible heating and cooling technology for your school. For a world of good reasons.

It is unrivaled for economy — comparable to traditional systems on first-installed costs and vastly superior over the long term — with energy cost savings of 25% to 40% annually. It offers precise control of comfort levels in individual classrooms or zones. It affords exciting new architectural possibilities, inside and out. Its simple design and equipment ensure years of reliable performance with much less maintenance than traditional systems.

GeoExchange also enables educators to teach the lessons of global stewardship by example, utilizing a limitless supply of natural heating and cooling energy with no impact on the environment. Or on the world's dwindling supply of fossil fuels.

If you’d like to learn more about the very real benefits of GeoExchange heating and cooling for your school, or receive a list of GeoExchange contractors in your area, contact the Geothermal Heat Pump Consortium toll-free at 1-888-ALL-4-GEO (255-4436) or visit our web site at http://www.geoexchange.org

NEW CONSTRUCTION SOLUTION
CAMERON MIDDLE SCHOOL
CAMERON, MISSOURI
Completed: ................ December 1992
Total Area: ................ 63,000 sq. ft.
HVAC: ..................... Closed loop GeoExchange, 257 bores, 46 heat pumps
Annual Cost: .............. $12,876
Comparison: ............... Traditional HVAC system, similar-sized school. Natural gas heat with electric air conditioning
Annual Cost: .............. $32,058
Annual Savings ............ $19,182
“I really was skeptical... I couldn’t see where the savings to run the water pumps would be more than... a boiler or cooling tower. But they’ve proven it to me. Without a doubt, this is a lot more efficient system. Actually, I wouldn’t be overstating to say it’s incredible.”

Bryan Martin
Maintenance Director
Lake City School District
Coeur d’Alene, Idaho

GEOEXCHANGE ADVANTAGES

- Cuts heating and cooling costs 25%-40%
- Increases comfort and control
- Preserves building aesthetics and beauty of land
- Simpler design, maintenance and operation
- Environmentally friendly technology

Credits: Photos of Campbell Elementary School, Paint Lick Elementary School and Discovery Junior High School were provided courtesy of Water Furnace, Ft. Wayne, IN.
The Geothermal Heat Pump Consortium, Inc. (GHPC) is a nonprofit organization whose goal is to advance the use of GeoExchange heating and cooling systems. GHPC is a partnership made up of the nation’s electric utilities and trade associations, the geothermal heat pump industry, the US Department of Energy, and the US Environmental Protection Agency.