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www.millercustomhomesonline.com

2913 Ryan Ct. Virginia Beach, VA 23456

Phone 757-426-9061 Fax 757-426-9062

MECHANICAL EQUIPMENT SALES, INC.

5025 Euclid Road, Virginia Beach, VA 23462

Phone (757) 490-0591 Fax (757) 490-9829

Email: mechanicalequip@aol.com

A COMPLETE QUESTION AND ANSWER GUIDE TO FHP CLOSED LOOP-SYSTEMS GROUND SOURCE HEATING, COOLING AND HOT WATER

QUESTION: WHAT IS A FHP CLOSED LOOP SYSTEM?

ANSWER: A FHP closed loop system is an electrically powered system that taps natural heat stored in the earth to heat in the winter and to cool your home or business in the summer. In addition, the system can heat your water.

QUESTION: HOW DOES IT WORK?

ANSWER: The FHP closed loop system moves heat energy from one place to another. Your refrigerator works on the same scientific principle. In the winter, FHP closed loop systems remove heat stored in the earth and transfer it to your home by using the refrigeration process. During the summer, the same system removes heat from your home and transfers it to the ground.

QUESTION: HOW IS HEAT TRANSFERRED BETWEEN THE EARTH AND YOUR HOME?

ANSWER: The earth has the ability to absorb and store heat energy from the sun. To tap that stored energy, heat is extracted from the earth by water circulated through underground pipes and pumped to a FHP unit. There the heat is used to heat your home. In summer, the process is reversed and indoor heat is extracted from your home and transferred to the earth through the liquid. As a side benefit, this system can also heat your water.

QUESTION: HOW LARGE ARE THE INDOOR COMPONENTS OF A FHP CLOSED LOOP SYSTEM?

ANSWER: The FHP closed loop system used for most residences is smaller than the typical washing machine.

QUESTION: CAN ONE SYSTEM PROVIDE BOTH HEATING AND COOLING? ANSWER:

Yes. One of the things that make a FHP closed loop system so versatile is its ability to be a combination heating and cooling system. You can change from one mode to another with a simple flick of a switch on your indoor thermostat.

QUESTION: HOW EFFICIENT IS A FHP CLOSED LOOP SYSTEM?

ANSWER: These systems are more than three times as efficient as the most efficient fossil fuel furnace. Instead of burning a combustible fuel to make heat, FHP closed loop systems

simply move heat that already exists. The system provides three units of energy for every one unit used to power the system.

QUESTION: WHAT IMPROVEMENTS IN EFFICIENCY CAN BE EXPECTED?

ANSWER: FHP is continuing to improve efficiency with COP's now over four. The use of the greatest solar collector, the earth, with the best heat exchange medium, water, takes full advantage of FHP closed loop system efficiency improvements. Oklahoma State University, a leading researcher in geothermal technology, is making rapid progress in improving the efficiency of this buried pipe system. A significant reduction in the cost of the buried system is now here.

QUESTION: CAN HOMEOWNERS AFFORD THE INVESTMENT?

ANSWER: The investment requirement for a FHP closed loop system, unlike other projects, produces a very attractive annual savings and payback, and increases the market value of the home. A typical payback period is three to five years. Your dealer/installer and your local utility will be able to advise you about the availability of special financing.

QUESTION: WHAT EFFECT WOULD INCREASED USE OF FHP CLOSED LOOP SYSTEMS HAVE ON ELECTRICITY COST AND AVAILABILITY?

ANSWER: The reduced peak load requirement would allow the utilities to serve more customers and to lower their fixed costs per customer. This will offset some increased variable costs and result in less cost per KW since the fixed investment for new capacity is high.

QUESTION: WHAT ARE THE COMPONENTS OF A FHP CLOSED LOOP SYSTEM?

ANSWER: There are three: the heat pump unit; the liquid exchange medium (the closed loop pipe system); and the air delivery system (duct work).

QUESTION: WHAT OTHER COSTS ARE THERE BESIDES THE FHP CLOSED LOOP SYSTEM?

ANSWER: You can expect and installation charge for any electrical work, ductwork, water hook-up and other provisions or adaptations to your home that are required. All of these costs can be estimated.

QUESTION: WHAT IS A CLOSED LOOP SYSTEM?

ANSWER: The term-closed loop is used to describe the FHP closed loop system, which uses a continuous loop of special buried pipe as a heat exchanger. The pipe is connected to the indoor heat pump to form a sealed, underground loop through which water is circulated.

QUESTION: WHERE ARE THESE LOOPS LOCATED?

ANSWER: These closed loops are laid in trenches, horizontally, or in wells, vertically. Both are placed in yards adjacent to the building. Any area near a home or business with appropriate soil conditions and adequate square footage will work. The design used depends on available space, but neither design is superior to the other.

QUESTION: WILL I NEED SEPARATE GROUND LOOPS FOR HEATING AND COOLING?
ANSWER: No. The same loop works for both. Changing from heating and cooling, or vice versa, is very simple. The flow of heat is simply reversed with the flick of a switch.

QUESTION: HOW EFFECTIVE IS THIS UNDERGROUND SYSTEM?

ANSWER: The buried pipe, or ground loop, is the most recent technical advancement in heat pump technology. The idea to bury pipe in the ground to gather heat energy began in the 1940's. Only recently, however, have new heat pump designs and improved pipe materials been combined to make FHP closed loop systems the most efficient heating and cooling systems available.

QUESTION: ARE FHP CLOSED LOOP SYSTEMS DIFFICULT TO INSTALL?

ANSWER: Most units are easy to install, especially when they are replacing another forced-air system. This is known as retrofit. They can be installed in areas unsuitable for fossil fuel furnaces because this is no combustion, thus no need to vent exhaust gases. Ductwork must be installed in homes that don't have an existing air distribution system. The cost of installing ductwork can be assessed by your dealer/installer.

QUESTION: WILL MY EXISTING DUCT WORK FUNCTION WITH THIS SYSTEM?

ANSWER: Yes, in most cases. Your dealer/installer will be able to determine ductwork requirements and minor modifications needed, if any.

QUESTION: CAN I INSTALL AN EARTH LOOP MYSELF?

ANSWER: It is not recommended. In addition to thermal fusion of the pipe, drilling and trenching are procedures best handled by licensed professionals. Non-professional installations may result in less than optimum performances, which could cancel out the anticipated savings and equipment warranties.

QUESTION: WHAT KIND OF PIPE CAN BE USED?

ANSWER: Use high-density geothermal polyethylene pipe. A licensed installer can give you the proper cell classification needed to keep the warranty on FHP equipment.

QUESTION: WHAT METHODS CAN BE USED TO JOIN POLYETHYLENE PIPE? ANSWER: Butt or socket fusion is best. Butt fusion is not recommended for two inch and smaller polyethylene.

QUESTION: SHOULD BARBED FITTINGS AND CLAMPS BE USED WITH HIGH DENSITY POLYETHYLENE PIPE?

A. Absolutely not! Polyethylene pipe has a cold flow and creep characteristic that will result in potential leaks and joint failure when installed with barbed fittings and clamps. Only butt fusion or socket fusion is acceptable.

QUESTION: WHICH POLYETHYLENE PIPE SHOULD BE USED?

ANSWER: The international ground source heat pump association recommends the minimum cell classification number acceptable for polyethylene is PE355434C, PE345534C, PE345444C or PE345464C when tested under ASTM 3350.

QUESTION: HOW LONG WILL LOOP PIPE LAST?

ANSWER: Properly installed, these pipes will last indefinitely. These pipes are minimally rated for 160 pounds per' square inch of pressure, which is four times the maximum operating pressure in the system. These pipes are inert to chemicals normally found in soil and have good heat conducting properties. PVC pipe should never be used.

QUESTION: HOW LONG SHOULD THE PIPE BE?

ANSWER: The length and diameter are determined by the size of the loop of the FHP loop system, climate, soil type, depth and operating cycle pattern for the installation.

QUESTION: HOW FAR APART SHOULD THE TRENCHES AND VERTICAL BORE HOLES BE SPACED?

ANSWER: Space trenches ten feet for triple slinky horizontal loops, twenty to twenty-five feet for vertical bore holes.

QUESTION: FORA HORIZONTAL SYSTEM, HOW DEEP AND LONG ARE THE TRENCHES?

ANSWER: Trenches are normally four to six feet deep. One of the advantages of a horizontal loop system is the availability to lay the trenches according to the shape of the land. As a rule, 400-600 feet of pipe are required per ton of heat pump capacity. A well-insulated 2,000 square foot home may need about a three and a half ton system with 3,600 feet of pipe utilizing a triple slinky.

QUESTION: HOW MANY PIPES ARE IN A TRENCH?

ANSWER: Normally, a run of pipe is laid at six feet, three "extended slinky" loops are put in bottom and both sides of a three-foot wide trench. This allows more length of pipe to be put in one trench and has no effect on system efficiency. Other loop designs use two, four, or six pipes and require more trenching.

QUESTION: HOW LONG DOES IT TAKE TO INSTALL A HORIZONTAL SYSTEM?

ANSWER: Time is dependent on soil conditions, length and depth of pipe and the equipment required. A typical installation can be completed in one to three days.

QUESTION: WHAT CHANGES IN PERFORMANCE CAN BE EXPECTED AT FREEZING OPERATING CONDITIONS?

ANSWER: A drop in soil temperature from 40F to 30 F results in a loss of capacity and efficiency of about 10%. At 30 F, the latent heat of the freezing moisture in the soil adds considerably to the capacity of the system, allowing very successful performance of the systems in Sweden and Canada.

QUESTION: WHAT IF THERE IS NOT ENOUGH ROOM FOR THE LOOP?

ANSWER: FHP closed loop systems can be vertical. Holes are bored to about 160-200 feet per ton of heat capacity. U-shaped loops of pipe are inserted in the hole. The holes are then backfilled with a sealing solution.

QUESTION: WHAT CHANGES ARE REQUIRED FOR VERTICAL LOOP SYSTEMS?

ANSWER: Adequate length per ton and hole spacing will prevent objectionable soil movement and allow adequate earth heat recharge during the summer.

QUESTION: HOW LONG DOES IT TAKE TO INSTALL A VERTICAL SYSTEM?

ANSWER: With the vertical installation, time varies with conditions at the site such as type and depth of the overburden, type and hardness of the bedrock, and presence of aquifers. Typical drilling times are one to two days and the total installation can usually be accomplished in three days.

QUESTION: WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF THE HORIZONTAL VERSUS VERTICAL INSTALLATION?

ANSWER: Horizontals require low cost equipment and less training of installers. However, they require longer lengths of pipe due to variations of soil temperature and moisture content, and installations can be affected more by extensive rainy weather. A much larger area is required. Extensive hard rock may dictate a vertical installation. Verticals require more highly trained operators for the drilling machines, but less pipe length is required which offsets much of the drilling cost. Vertical installations, however, are ideal solutions where land area is limited.

QUESTION: HOW CAN I BE SURE THE PIPE IS INSTALLED PROPERLY?

ANSWER: Use a reputable contractor. Don't be afraid to ask for references. Reputable dealers and loop installers will be happy to give you names and phone numbers for you to call and confirm their capabilities. Also, check your utility company representative.

QUESTION: WILL AN UNDERGROUND LOOP AFFECT MY LAWN OR LANDSCAPE?

ANSWER: No. Research has proven that loops have no adverse effect on grass, trees, or shrubs. Most horizontal loop installations use trenches about six inches wide. Temporary bare areas can be restored with grass seed or sod. Vertical loops require little space and result in no significant lawn damage.

QUESTION: DO FHP CLOSED LOOP SYSTEMS HAVE OUTDOOR UNITS?

ANSWER: No. The equipment goes inside your home, in the basement, garages or crawl space. Because FHP closed loop systems are housed indoors, the life span of the compressor and major components are greatly extended, most lasting 20 years or more and you won't have the noise or service problems you have with an outdoor unit.

QUESTION: SO MUCH FOR ECONOMY, WHAT ABOUT COMFORT?

ANSWER: A FHP closed loop system moves warm air (90F-105F) throughout your home via standard ductwork. An even comfort level is created because the warm air is moved in slightly higher volumes, and saturates the home with warmth more evenly. This helps to even out cold spots and eliminates the cold air blast common with fossil fuel furnaces.

QUESTION: WHAT ARE THE ADVANTAGES TO A HVAC DEALER?

ANSWER: FHP closed loop systems create a huge retrofit market not subject to wild fluctuations in housing construction. There is also ample opportunity for stable growth benefiting the dealer and his employees. In addition, these systems are relatively maintenance free. This means fewer maintenance and support calls.

QUESTION: WHY SO MUCH EMPHASIS ON TRAINING?

ANSWER: An emphasis on training promotes the dissemination of reliable, thoroughly tested design and installation information, reducing the number of problematic systems. The goal is to leapfrog the painful learning-by-making-mistakes phase that plagues those involved in the implementation of most new technologies.

QUESTION: WHO IN MY AREA CAN BENEFIT MOST FROM THE INSTALLATION OF FHP CLOSED LOOP SYSTEMS?

ANSWER: Those who use electric resistance air-to-air heat pumps, propane or fuel oil to heat their homes are candidates for the greatest savings. Larger and older houses have greater savings.

QUESTION: WHERE CAN I GET ADDITIONAL HELP DESIGNING THE FHP CLOSED LOOP SYSTEM?

ANSWER: You can contact Mechanical Service Co. at 757-427-0016.