CLIMATEMASTER®

WE Series

Water to Water Heat Pumps

Installation, Operating & Maintenance Instructions

TABLE OF CONTENTS

GENERAL INFORMATION

Inspection

Upon receipt of shipment at the job site, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the carton or crating of each unit and inspect each unit for damage. Assure that the carrier makes proper notation of any shortages or damage on all copies of the freight bill and that he completes a Carrier Inspection Report. Concealed damage not discovered during unloading must be reported to the carrier within 15 days of receipt of shipment. **NOTE: It is the responsibility of the purchaser to file all necessary claims with the carrier.** Notify the ClimateMaster Traffic Department of all damage within fifteen (15) days of shipment.

Introduction

This Installation and Operation Manual is for Climate Master Water to Water Heat Pump units (WE).

Electrical data is provided in the *Installation* section of this manual. Refer to project submittal drawings for specific unit technical data and wiring diagrams.

Storage

CAUTION: DO NOT store or install Water to Water units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life. Always move units in an upright position. Tilting units on their sides may cause equipment damage.

Upon the arrival of equipment at the job site, immediately store units in their shipping cartons in a clean, dry area. **Store units in an upright position at all times.** Stack Water to Water units a maximum of 3 units high. **Do not remove equipment from shipping cartons until equipment is required for installation.**

Unit Protection

Cover units on the job site with either shipping cartons, vinyl film, or an equivalent protective covering. Cap the open ends of pipe stored on the job site. In areas where painting, plastering, or the spraying of fireproof material has not been completed, all due precautions must be taken to avoid physical damage to the units and contamination by foreign material. Physical damage and contamination may prevent proper start-up and may result in costly equipment clean-up.

Examine all pipes, fittings, and valves before installing any of the system components. Remove any dirt found on these components.

Pre-Installation

Installation, operation and maintenance instructions are provided with each unit. Before unit start-up, read all manuals and become familiar with the unit and its operation. Thoroughly check out the system before operation.

Prepare Water to Water units for installation as follows:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Keep the unit covered with the shipping carton until installation is complete and all plastering, painting, etc. is finished.
3. Verify that refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.
5. Loosen compressor bolts on units equipped with external spring vibration isolations until the compressor rides freely on the springs. Remove shipping restraints. Note: Compressors on all WE units are internally spring mounted for quiet operation.

⚠ WARNING

To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must only be serviced by technicians which meet local, state and federal proficiency requirements.

All refrigerant discharged from this unit must be recovered without exception. Technicians must follow industry accepted guidelines and all local, state and federal statutes for the recovery and disposal of refrigerants.

When a compressor is removed from this unit, system refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, the refrigerant lines of the compressor must be sealed after it is removed.

Water to Water Units are typically installed in a floor level closet or a mechanical room. Install units with adequate clearance to allow maintenance and servicing. Follow the guidelines below when selecting unit location.

1. Provide an unobstructed path to the unit within the closet or mechanical room to enable access to the unit for servicing or for the removal of the unit if necessary.
2. Provide access to water valves and fittings and screwdriver access to unit panels and electrical connections.

The installation of Water to Water Heat Pump units and all associated components, parts and accessories that make up the installation shall be in accordance with the regulations of ALL Authorities having jurisdiction and MUST conform to all applicable Codes. It is the responsibility of the Installing Contractor to determine and comply with ALL applicable Codes and Regulations.

INSTALLATION

Installation of Supply and Return Piping

Follow these piping guidelines.

CAUTION: Piping must comply with all applicable Codes.

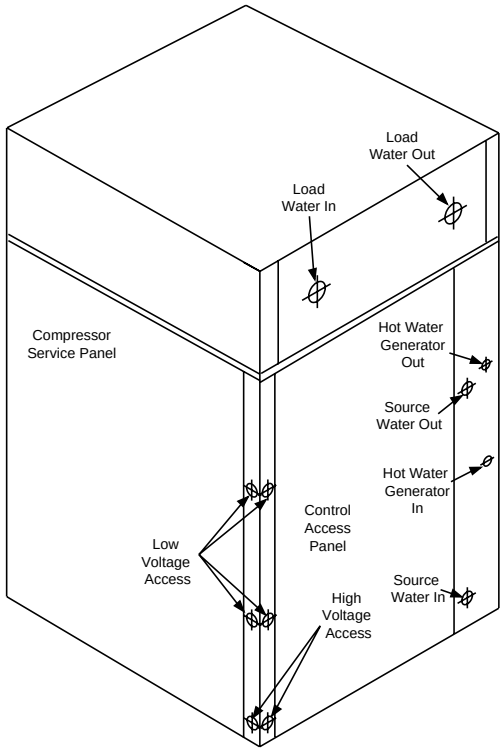
1. Install a drain valve at the base of each supply and return riser to facilitate system flushing.
2. Install shut-off/balancing valves and unions at each unit to permit unit removal for servicing.
3. Place strainers at the inlet of each system circulating pump.
4. Select the proper hose length to allow slack between connection points. Hoses may vary in length by +2% to -4% under pressure.
5. Refer to Table 1. Do not exceed the minimum bend radius for the hose selected. Exceeding the minimum bend radius may cause the hose to collapse which reduces water flow rate. Install an angle adapter to avoid sharp bends in the hose when the radius falls below the required minimum.

Insulation may be required on loop water piping (source side). Loop liquid temperatures can vary from 25 to 110 degrees Fahrenheit. When the unit is used as a chiller, uninsulated loop piping will form condensate when the piping temperature falls below the ambient air dew point temperature. When the unit is used as a boiler, uninsulated loop piping will disaspate heat when piping temperature raises above the ambient air temperature.

Table 1- Metal Hose Minimum Bend Radii

Hose in Inches	Minimum Bend Radius
1/2	2-1/2
3/4	4
1	5-1/2
1-1/4	6-3/4

Figure 1, Typical WE Unit



Pipe joint compound is not necessary when Teflon threaded tape is pre-applied to hose assemblies or when flared-end connections are used. If pipe joint compound is preferred, use compound only in small amounts on the male pipe threads of the fitting adapters. Prevent sealant from reaching the flared surfaces of the joint.

NOTE: When an anti-freeze solution is used in the system, the contractor must assure that the anti-freeze is compatible with any pipe joint compound or tape used on the piping or hose connections.

Maximum allowable torque for brass fittings is 30 foot-pounds. If a torque wrench is not available, tighten finger-tight plus one quarter turn. Tighten steel fittings as necessary.

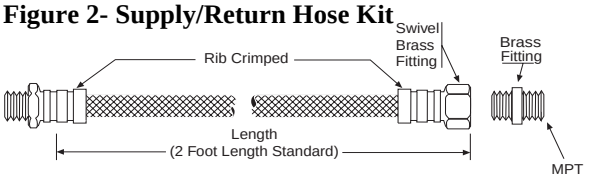
⚠ WARNING

Do not bend or kink supply lines or hoses.

Optional pressure-rated hose assemblies designed specifically for use with ClimateMaster units are available. Supply and return hoses are fitted with swivel-joint fittings at one end to prevent kinking during installation.

Refer to Figure 2 for an illustration of a Supply/Return Hose Kit. Male adapters secure hose assemblies to the unit and risers. Install hose assemblies properly and check them regularly to avoid system failure, reduced service life and possible damage to surrounding property.

Figure 2- Supply/Return Hose Kit



CAUTION: Corrosive system water requires corrosion-resistant fittings and hoses and may require water treatment.

WE units are typically installed on the floor or on shelves designed to support the weight of the unit. Install the unit on a piece of rubber or neoprene for sound isolation. The pad should be 3/8" to 1/2" in thickness. Extend the pad beyond all four edges of unit.

Electrical Wiring

⚠ WARNING

To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.

CAUTION: Use only copper conductors for field installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

All field installed wiring, including electrical ground, must comply with the National Electrical Code as well as all applicable local codes. In addition, all field wiring must conform to Class II temperature limitations described in the NEC.

Refer to the unit wiring diagrams included with submittal drawings for fuse sizes and a schematic of the field connections which must be made by the installing (or electrical) contractor.

Consult the unit wiring diagram located on the inside of the compressor access panel to ensure proper electrical hookup.

Units rated 208-230 volts that have a 24 volt transformer must have the transformer connection modified if the actual power supply is 230 volts. Refer to the unit wiring diagram for details of this procedure.

All final electrical connections must be made with a length of flexible conduit to minimize vibration and sound transmission to the building.

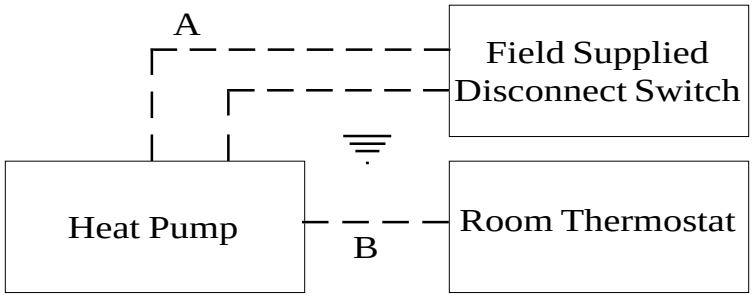
For additional wiring information pertinent to units supplied with solid state controls, a ClimateMaster Controller AOM is supplied with this unit.

Typical Field Installed Wiring

CAUTION: USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE.

⚠ WARNING

DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK.



A= Two power wires on single-phase units: three power wires on three-phase units. B= 1 heat /1 cool /manual or Auto Change-over remote 24V thermostat. Note: All customer-supplied wiring to be copper only and must conform to NEC and local electrical codes. Wiring shown with dashed lines must be field-supplied and field-installed.

Operating Limits

Environment -This unit is designed for indoor installation ONLY.

Power Supply - A voltage variation of +/- 10% of nameplate utilization voltage is acceptable. Three-phase system imbalance shall not exceed 2%.

WE units start and operate with entering water at 40° F, and with water at the stated flow rates for initial winter start-up

NOTES

1. These are not normal or continuous operating conditions. It is assumed that winter start-up is to bring the building space up to occupancy temperatures.
2. Voltage utilization range complies with ARI Standard 110.

Table 2- Water Limits

Source Side Water Limits	**Cooling**	**Heating**
Min. Entering Liquid	40° F	25° F
Normal Entering Water	85° F	60° F
Max Entering Water	110° F	80° F
Load Side Water Limits		
Min. Entering Water	40° F	50° F
Normal Entering Water	50° F	100° F
Max Entering Water	80° F	120° F

START-UP PREPARATION

System Cleaning and Flushing

Cleaning and flushing the unit is the single most important step to ensure proper start-up and continued efficient operation of the system.

Follow the instructions below to properly clean and flush the system:

⚠ WARNING ⚠

To prevent injury or death due to electrical shock or contact with moving parts, open unit disconnect before servicing unit.

1. Verify that electrical power to the units is disconnected.
2. Install the system with the supply hose connected directly to the return riser valve. Use a single length of flexible hose.
3. Open all air vents. Fill the system with water. DO NOT allow system to overflow. Bleed all air from the system. Check the system for leaks and repair appropriately.
4. Verify that all strainers are in place. Start the pumps and systematically check each vent to ensure that all air is bled from the system.
5. Verify that make-up water is available. Adjust make-up water appropriately to replace the air which was bled from the system. Check and adjust the water/air level in the expansion tank.
6. Set the boiler to raise the loop temperature to approximately 85° F. Open a drain at the lowest point in the system. Adjust the make-up water replacement rate to equal the rate of bleed.
7. Refill the system and add trisodium phosphate in a proportion of approximately one pound per 150 gallons of water. Reset the boiler to raise the loop temperature to about 100° F.

⚠ CAUTION

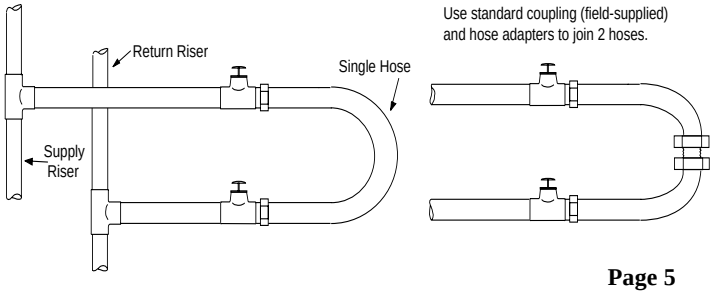
To avoid possible damage to piping systems constructed of plastic piping, DO NOT allow loop temperature to exceed 110° F.

8. Circulate the solution for a minimum of 8 to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if necessary.
9. When the cleaning process is complete, remove the short-circuited hoses. Re-connect the hoses to the proper supply and return the connections to each of the Large Commercial Units. Refill the system and bleed off all air.
10. Test the system pH with litmus paper. The system water should be slightly alkaline (pH 7.5 to 8.5). Add chemicals as appropriate to maintain acidity levels.

⚠ CAUTION

DO NOT use "Stop-Leak" or any similar chemical agent in this system. Addition of these chemicals to the loop water will foul the system and will inhibit unit operation.

10. When the system is successfully cleaned, flushed, refilled and bled, check the main system panels, safety cutouts, and alarms. Set the controls to properly maintain loop temperatures.



Optional Hot Water Generator

When the unit is equipped with an optional hot water generator it will contain a coaxial tube-in-tube, vented double-wall heat exchanger.

CAUTION: To avoid equipment damage, do not seal the vents located at each end of the coaxial coil.

Two (2) FPT connections are located on the front of the unit labeled "HWG IN" and "HWG OUT" which connect to the hot water generator.

Connect the heat exchanger as follows:

1) Plumb the unit to the water tank as described in the ClimateMaster Geo-Thermal Heat Pump Manual Volume 3.
2) Fill the system with water.
3) Purge the system of air.
4) Connect low voltage wiring to activate the circulating pump. See wiring diagram.

CAUTION: To avoid damage to the circulating pump, do not connect the wire until plumbing is complete and the system is filled with water and purged of air.

UNIT START-UP

Use the procedure outlined below to initiate proper unit start-up:

⚠ WARNING

When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with energized equipment.

1. Adjust all valves to their full open position. Turn on the line power to all heat pump units.
2. Operate each unit in the cooling cycle. Loop water temperature entering the heat pumps should be between 70° F and 110° F.
3. Operate each heat pump in the heating cycle immediately after checking cooling cycle operation. A time delay will prevent the compressor from re-starting for approximately five (5) minutes..
4. Establish a permanent operating record by logging the unit operating conditions at initial start-up for each unit.
5. If a unit fails to operate, conduct the following checks:

a. Check the voltage and current. They should comply with the electrical specifications described on the unit nameplate.

b. Look for wiring errors. Check for loose terminal screws where wire connections have been made on both the line and low-voltage terminal boards.

c. Check the supply and return piping. They must be properly connected to the inlet and outlet connections on the unit.

d. If the checks described above fail to reveal the problem and the unit still will not operate, contact a trained service technician to ensure proper diagnosis and repair of the equipment.

MAINTENANCE

Maintenance Procedures

Perform the maintenance procedures outlined below periodically as indicated.

⚠ WARNING

To prevent injury or death due to electrical shock or contact with moving parts, open unit disconnect switch before servicing unit.

UNIT AMPERAGE: Conduct amperage checks annually. Amperage draw should not exceed normal full load or rated load amps by more than 10 percent of the values noted on the unit nameplate. Maintain a log of amperage values to detect deterioration prior to component failure.

UNIT INSPECTION: Visually inspect the unit annually. Pay special attention to hose assemblies. Repair any leaks and replace deteriorated hoses immediately.

COMPRESSOR: Conduct an amperage check on the compressor annually. Amperage draw should not exceed normal full load or rated load amps by more than 10 percent of the values noted on the unit nameplate. Maintain a log of amperage values to detect deterioration prior to component failure.

HEAT EXCHANGERS: Clean heat exchan more frequently if the unit is located in a “dirty” environment.

Controller and safety protection

The microprocessor-based controller monitors and controls unit operation. The controller provides compressor sequencing, high and low pressure monitoring, field selectable source and load coil freeze protection sensing, over/under voltage monitoring, and unit performance sentinel. The control provides a test mode, short cycle protection, random start-up, a fault LED, fault memory, and intelligent fault retry.

Note the controls operation below and refer to the controller AOM provided with each unit for specific controller features, specifications and operation.

Interstage Time Delay: On two compressor units, a time delay between stage 1 and stage 2 can be set with a dip switch on compressor 2 controller.

Pressure Switches: Pressure switches are normally closed during normal operating conditions, and open upon fault. The high pressure switch opens at 375 PSIG and automatically closes at 300 PSIG. The low pressure switch opens at 10 PSIG and automatically closes at 33 PSIG. The low pressure switch must be open for 30 continuous seconds to cause a fault.

Freeze Protection: Thermistors used for freeze protection, are a NTC (negative temperature coefficient) type. Freeze protection is set at 30 degrees Fahrenheit for water systems. If antifreeze is used, the freeze protection can be set at 10 degrees Fahrenheit by cutting a jumper on the controller.

Over/Under Voltage: When the controller senses a voltage over 30Vac or under 19Vac for .5 second the unit will shutdown. When the voltage returns to a value between 19Vac and 30Vac, the controller will automatically reset and restart the unit.

Anti Short Cycle: The controller provides 5-minute anti-short cycle protection for the compressor. The controller provides a random start upon power up from 5-80 seconds.

LED: The status LED on the controller advises the current status or faults of the controller. The unit performance sentinel will give a warning when the heat pump is operating inefficiently. Refer to the wiring diagram for LED fault codes and unit operating status.

Controller Lockout: Controllers can be reset from lockout mode by cycling the thermostat off and on, or cycling the disconnect off and on.

Test Mode Test mode can be entered by momentarily shorting the test pins on the controller. The unit will stay in test mode for 20 minutes.

NOTE: If the unit must be reset more than twice, check the unit for abnormal entering water temperature, inadequate or excessive water flow and internal malfunction. If the unit continues to cutout, contact a trained service technician.

CLOSED LOOP EARTH COUPLED APPLICATIONS

Introduction

CAUTION: The following instructions represent industry accepted installation practices for Closed Loop Earth Coupled Heat Pump Systems. They are provided to assist the contractor in installing trouble free ground loops. These instructions are recommendations only. State and Local Codes MUST be followed and installations MUST conform to all applicable Codes. It is the responsibility of the Installing Contractor to determine and comply with ALL applicable Codes and Regulations.

Closed Loop Earth Coupled Heat Pump systems are commonly installed in one of three configurations: horizontal, vertical or pond loop. Each configuration provides the benefit of using the moderate temperature of the earth as a heat source/heat sink. Piping configurations can be either series or parallel.

Series piping configurations typically use 1-1/4", 1-1/2" or 2" pipe. Parallel piping configurations typically use 3/4" or 1" pipe for loops and 1-1/4", 1-1/2" or 2" pipe for headers and service lines. Parallel configurations require headers to be either "closed-coupled" short headers or reverse return design.

Select the installation configuration which provides the most cost effective method of installation after considering all application constraints.

Refer to IGSHPA publication *Closed Loop/Ground Source Heat Pump Systems Installation Guide* (Sections 4-6) for complete ground loop design, materials requirements and joining information.

Pre-Installation

Prior to installation, locate and mark all existing underground utilities, piping, etc. Install loops for new construction before sidewalks, patios, driveways and other construction has begun. During construction, accurately mark all ground loop piping on the plot plan as an aid in avoiding potential future damage to the installation.

Horizontal Applications

To install Horizontal earth couplings, dig trenches using either a chain-type trenching machine or a backhoe. Dig trenches approximately 5 feet apart. Trenches must be at least 5 feet from existing utility lines, foundations and property lines and at least 10 feet from privies and wells. Trenches may be curved to avoid obstructions and may be turned around corners.

When multiple pipes are laid in a trench, space pipes properly and backfill carefully to avoid disturbing the spacing of the pipes in the trench.

Vertical Applications

To install Vertical earth couplings, drill boreholes using any size drilling equipment. Regulations which govern water well installations also apply to vertical ground loop installations. Vertical applications typically require multiple boreholes. Space boreholes a minimum of 10 feet apart.

Unless other requirements are mandated by code, use the following guideline when locating boreholes:

- 5 feet from foundations and lot lines
- 10 feet from utility lines and drain fields
- 20 feet from non-public wells
- 50 feet from public wells
- 100 feet from cesspools, feedlots, lagoons, privies, seepage pits and septic tanks.

The minimum diameter for 3/4" or 1" U-bend well bores is 4 inches. Larger diameter boreholes may be drilled if convenient unless local code requires an expensive method of backfilling. Assemble each U-bend assembly, fill with water and pressure test prior to insertion into the borehole.

To add weight and prevent the pipe from curving and digging into the borehole wall during insertion, tape a length of conduit, pipe or reinforcing bar to the U-bend end of the assembly. This technique is particularly useful when inserting the assembly into a borehole filled with water or drilling mud solutions, since a water filled U-bend assembly is somewhat buoyant under these circumstances. Tape the pipes together approximately every 10 feet to prevent the assembly from separating under downward pressure and bowing out against the borehole wall.

Carefully backfill the boreholes to within 10 feet of the surface. Follow IGSHPA specifications for backfilling unless local codes mandate otherwise.

When all U-bends are installed, dig the header trench 4 to 6 feet deep and as close to the boreholes as possible. Use a spade to break through from ground level to the bottom of the trench. At the bottom of the trench, dig a relief to allow the pipe to bend for proper access to the header.

Building Entry

Seal and protect the entry point of the earth coupling into the building as shown in Figures 4-7 below.

Slab on Grade Construction

New Construction: When possible, position the pipe in the proper location prior to pouring the slab. To prevent wear as the pipe expands and contracts, protect the pipe with a layer of insulation as shown in Figure 4. When the slab is poured prior to installation, create a chase through the slab for the service lines with 4" PVC street elbows and sleeves. Refer to Section 4 of the IGSHPA manual for details.

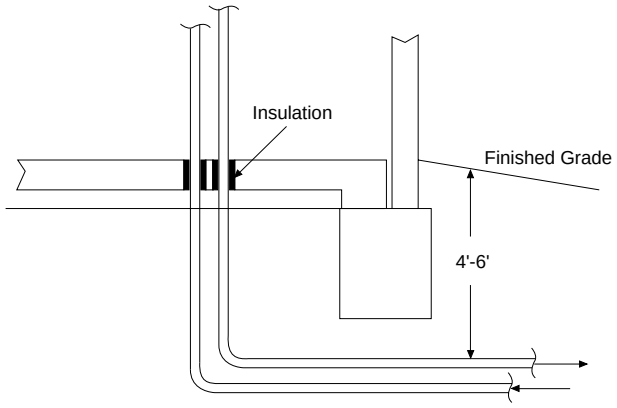


Figure 4

Retrofit Construction: Trench as close as possible to the footing. Bring the loop pipe up along the outside wall of the footing until it is higher than the slab. Enter the building as close to the slab as the construction allows. Shield and insulate the pipe to protect it from damage and the elements as shown in Figure 5.

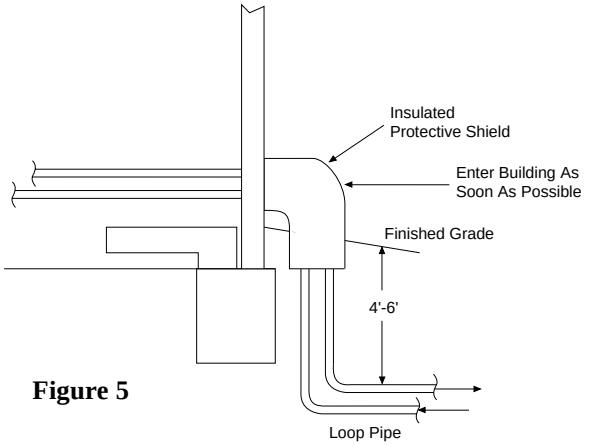


Figure 5

Pier and Beam (crawl space)

New and Retrofit Construction: Bury the pipe beneath the footing and between piers to the point that it is directly below the point of entry into the building. Bring the pipe up into the building. Shield and insulate piping as shown in Figure 6 to protect it from damage.

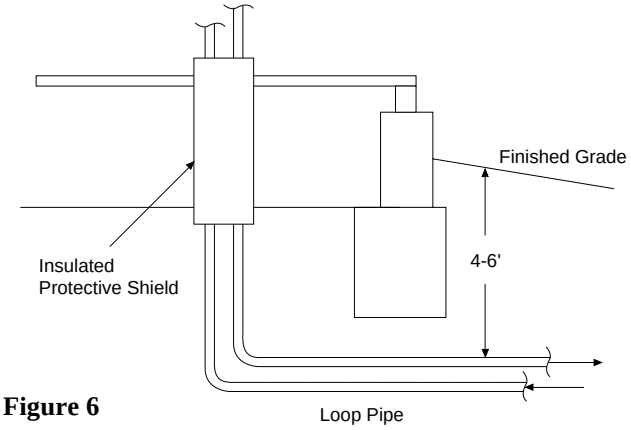


Figure 6

Below Grade Entry

New and Retrofit Construction: Bring the pipe through the wall as shown in Figure 7. For applications in which loop temperature may fall below freezing, insulate pipes at least 4 feet into the trench to prevent ice forming near the wall.

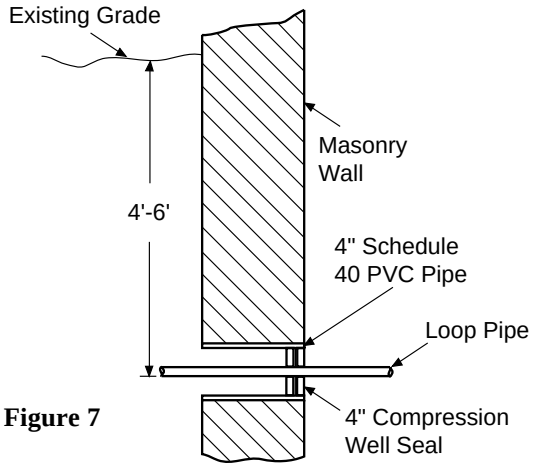


Figure 7

Loop Testing

Upon completion of the ground loop piping, pressure test the loop to assure a leak free system.

Parallel systems: Test Parallel systems as each leg is completed. Test again prior to the connection of the headers. Test the system for a final time when the entire loop is assembled and all legs are attached.

Series Systems: Test individual loops as installed. Test entire system when all loops are assembled.

Horizontal Systems: Test individual loops as installed. Test entire system when all loops are assembled.

Vertical U-Bends and Pool Loop systems: Test Vertical U-bends and pond loop assemblies prior to installation with a test pressure of at least 100 psi. Either water or air may be used as the testing medium.

Flushing and Purging

Upon completion of system installation and testing, flush the system to remove all foreign objects and purge to remove all air. See Table 3 below for approximate fluid volumes.

Table 3- Approximate Fluid Volume per 100' of Pipe

Size	Pipe	Volume (Gallons)
1"	Copper	4.1
1.25"	Copper	6.4
.75" Schedule 40	Polyethylene	2.77
.75" SDR-11	Polyethylene	3.01
1" Schedule 40	Polyethylene	4.49
1" SDR-11	Polyethylene	4.73
1.25" Schedule 40	Polyethylene	7.7
1.5" Schedule 40	Polyethylene	10.6
2" Schedule 40	Polyethylene	17.4

Refer to Section 7 of the IGSHPA manual for more information on flushing and purging Closed Loop Earth Coupled Systems.

Add antifreeze if necessary. Refer to the IGSHPA manual for the correct type and amount of antifreeze to add.

⚠ WARNING

DO NOT use calcium chloride in ClimateMaster units. The use of calcium chloride voids the equipment warranty.

Flushing, Purging, Adding Anti-Freeze and Pressurizing the System

Refer to GEO-EZ Pumping Module Series IOM (document number 70-MI110-9410) for complete instructions on flushing, purging, adding anti-freeze and pressurizing the system.

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