



PROCEDURE MANUAL

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DEPARTMENT: Engineering

TITLE: Connection Guidelines and Specifications for Connection of Residential Buildings to the Gibsons Georexchange District Energy Utility

PURPOSE: To provide contractors with the steps necessary for connection to the Town's District Energy Utility

TABLE OF CONTENTS

SECTION 1 GENERAL.....	3
1.1 Purpose.....	3
1.2 Scope of Work.....	3
1.3 Specific Items to Be Furnished By the Contractor	4
1.4 Materials and Workmanship.....	4
SECTION 2 PRODUCTS.....	4
2.1 Pump module	4
2.2 Heat Pump	6
SECTION 3 EXECUTION	7
3.1 General.....	7
3.2 Flushing.....	8
3.3 System start up	12
3.4 Ethanol Caution.....	12

Connection Guidelines and Specifications for Connection of Residential Buildings to the
Gibsons Geoexchange District Energy Utility

SECTION 1 GENERAL

1.1 Purpose

- 1.1.1 The intent of this guide is to communicate to the contractor how to connect a residential heat pump to the district geothermal energy utility in a way that minimizes the air and debris introduced to the overall system.
- 1.1.2 All mechanical contractors must be registered with the Town of Gibsons, and be accredited with the Canadian Geothermal Coalition as an installer or International Ground Source Heat Pump equivalent to be allowed to connect a heat pump to the District Energy System.
- 1.1.3 In case of emergency contact 604-886-2274 Monday to Friday, 8:00 am until 4:30 pm. After hours call 1-866-257-2194

1.2 Scope of Work

- 1.2.1 The connection point of the residential system and the distribution system is the curb-side valve box located near the property of the home, (the Town supplies the valve box and valves at the cost of the developer). The valve marked with red paint is the supply line.



Figure 1: Curb-side valve box located near the property line of each home.

- 1.2.2 The contractor's scope of work is to furnish and assemble all parts of

the residential heat pump system from the curb-side valve box towards the home. This includes the heat pump(s), pump module, check valve, screen/filter, auto flow regulating valve, and all piping, fittings, and pipe insulation, duct work, etc. required by the system.

1.3 Specific Items to Be Furnished By the Contractor

- 1.3.1 The contractor shall furnish all labour, supervision, proper equipment in good working condition, supplies, tools, and materials required to complete the work specified in this specification and contractor's Scope of Work.
- 1.3.2 The contractor shall, as a minimum, provide all safety equipment to meet the requirements of all applicable Provincial and Federal codes and standards.
- 1.3.3 All contractors must file a proper heat loss calculation with the Town of Gibsons in the form attached to the Town of Gibsons District Energy Bylaw. All heat pumps must be installed as per the CSA standard CSA448. All equipment schematic and installation diagrams must be provided to the Town. Heat pump selection must be based on -1°C (30 °F) water for heating and 27 °C (80 °F) for cooling mode.
- 1.3.4 An installation inspection schedule and requirements will be provided to the mechanical contractor by the Town when the building permit is issued.

1.4 Materials and Workmanship

- 1.4.1 The contractor shall maintain adequate quality control to assure compliance with all items detailed in this specification.
- 1.4.2 All materials shall be of the type and quality specified and free from all defects of materials or workmanship which would adversely affect performance or service life of the installed Work, or which would cause unsightly or un-workmanlike appearance.
- 1.4.3 The Engineer shall have the right to inspect material at any time after delivery to the Site. Any material, which is damaged, defective, or does not meet requirements of this Contract may be rejected, and shall be corrected or replaced at the contractor's expense.

SECTION 2 PRODUCTS

2.1 Pump module

- 2.1.1 The pump module will use one or more circulator pumps to circulate

system fluid through the heat pump and back to the distribution system. It is from the pump module that the residential system will be purged of air.

- 2.1.2 The pump module should have pump(s), supply and return distribution pipe (ground loop) connections, supply and return heat pump connections, and two access ports for flushing and purging. The pump module shall also have two three-way valves to allow flow between the distribution piping and the heat pump, the distribution piping and the access ports, the heat pump and the access ports. See Figure 2.

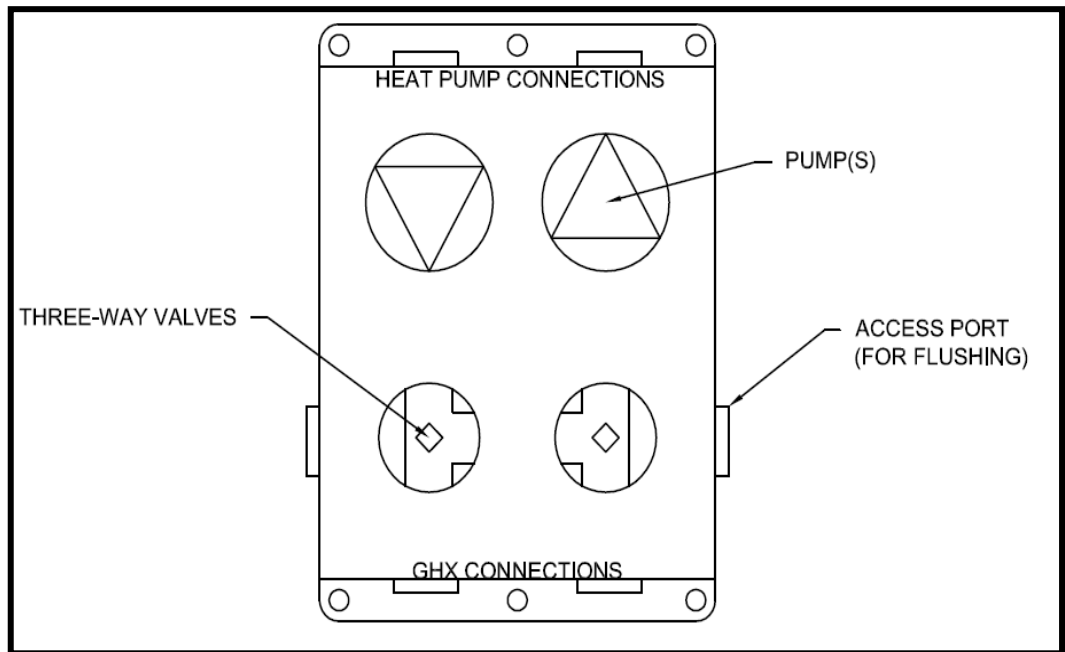


Figure 2: Typical pump module layout

- 2.1.3 The pump module being installed must be one that had been designed to work with a pressurized system. The heat pump is being connected to a pressurized system, un-pressurized pump modules are unacceptable.



- 2.1.4 Ensure that the pump module being installed has sufficient power to overcome the distribution system and the heat pump pressure drop. Consult a geo-exchange qualified consultant if you are unsure of the pressure drop.

2.2 Heat Pump

- 2.2.1 The Town of Gibsons has arranged special pricing and delivery of heat pumps with a heat pump manufacturer. Contractors may or may not choose to take advantage of this arrangement. Please contact the Town office for more detail.

- 2.2.2 Installations may have a desuperheater; two options are available;

- 2.2.2.1 Option A: Desuperheater with electric hot water tank.

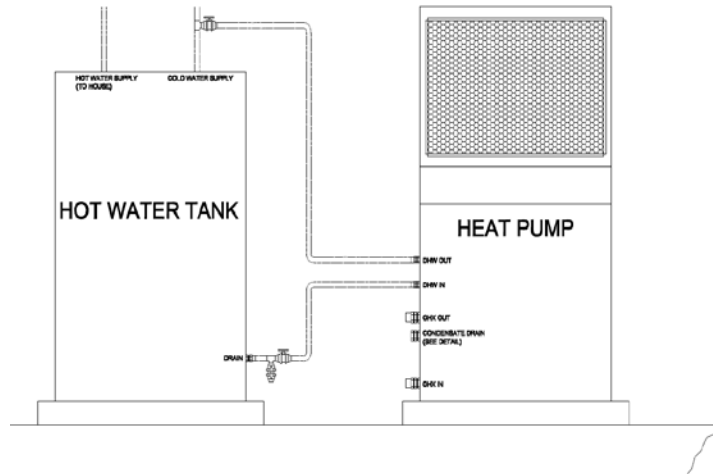


Figure 3: Desuperheater connection to hot water tank

- 2.2.2.2 Option B: Desuperheater with tankless hot water

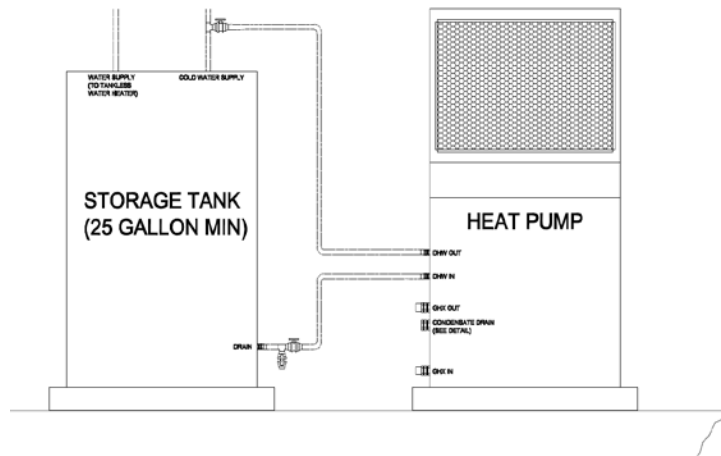


Figure 4: Desuperheater connection to tankless hot water system

SECTION 3 EXECUTION

3.1 General

- 3.1.6 No contractor shall open the curb stop without the authorization of the Town.
- 3.1.7 Follow the manufactures guidelines to install the heat pump in the home. Ensure that all piping is installed to avoid air traps. Clearly label supply pipe with red tape or paint and return pipe with blue paint or tape.
- 3.1.8 All piping shall be HDPE SRD 11 and must be pressure tested at 100 PSI, and inspected by the Town's Building Inspector.
- 3.1.9 The contractor may assume that the distribution supply and return lines have been purged of air. The job of the contractor is to flush the residential system starting from the curbside valve box and the heat pump. This is a two part process; first to flush the lines from the curbside valve box to the pump module; second to flush the heat pump system to the pump module.
- 3.1.10 The installer must be careful not to rotate the three-way valves located on the system pump module into a position that could introduce air into the system. Re-flushing may be required if this occurs.
- 3.1.11 A portable flush cart, not the pump located on the pump module, shall be used to flush the air from the heat. The flush cart shall consist of:
- Purge pump
 - Fluid reservoir
 - Filter assembly or strainer with minimum of 20 mesh filter material
- 3.1.12 The system has been designed to maintain pressure within acceptable limits. The Town of Gibsons is responsible for adding fluid to the system as it expands. Do not add water or antifreeze to the system that has not been removed from the system, do not attempt to pressurize the system.
- 3.1.13 The system has been designed with a peak system flow rate; it is important that each heat pump attached to the system only take the flow rates that are necessary. Flow should not exceed 3.0 gpm per ton of heating capacity. Once the system is running ensure that the flow regulating valve is calibrated to the heat pump that has been installed.

3.2 Flushing

3.2.1 Methodology to flush the district supply and return lines between the curb-side valve box and the pump module.

3.2.1.1 The curb-side valve box is the connection point to the residential system (see Figure 5). Note that the distribution supply line has a red mark just before the valve in the curb stop box.

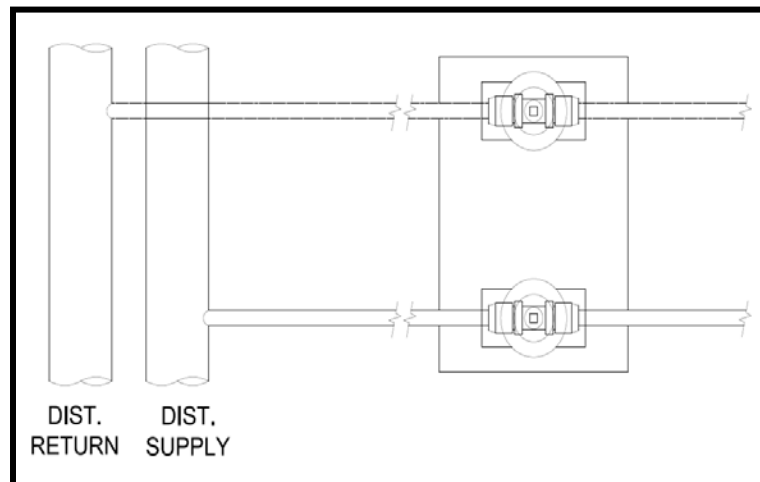


Figure 5: Curb-side valve box diagram

3.2.1.2 Connect the pump module to the distribution supply and return lines at the curb stop valve box. Ensure that the pipes connecting the distribution lines and the residential system stay clean throughout the installation process.

3.2.1.3 Remove caps from pump module access ports.

3.2.1.4 Position the three-way valves such that fluid flows from the distribution lines through the access ports (see Figure 6).

3.2.1.5 Open the distribution supply-line valve located in the curb stop box. The system pressure of the supply line will be sufficient to force water through the supply line up to the pump module. Leave the pump module valve open until system fluid, rather than air, is coming through the access port on the pump module. Capture the fluid that escapes from the access port as it will be re-injected later. Ensure that the lines are flushed of air and debris; it is possible to have upwards of 5 gallons of fluid escape from the access ports.

3.2.1.6 Close the supply-side three-way valve located on the pump module. Ensure to rotate the three-way valve in such a way as

to prevent any fluid or air on the heat pump side from entering the distribution side.

- 3.2.1.7 Open the distribution return-line valve located in the curb stop box. The system pressure of the return line will be sufficient to force water through the return line up to the pump module. Leave the pump module valve open until system fluid, rather than air, is coming through the access port on the pump module. Capture the fluid that escapes from the access port as it will be re-injected later. Ensure that the lines are flushed of air and debris; it is alright to have upwards of 5 gallons of fluid escape from the access ports.

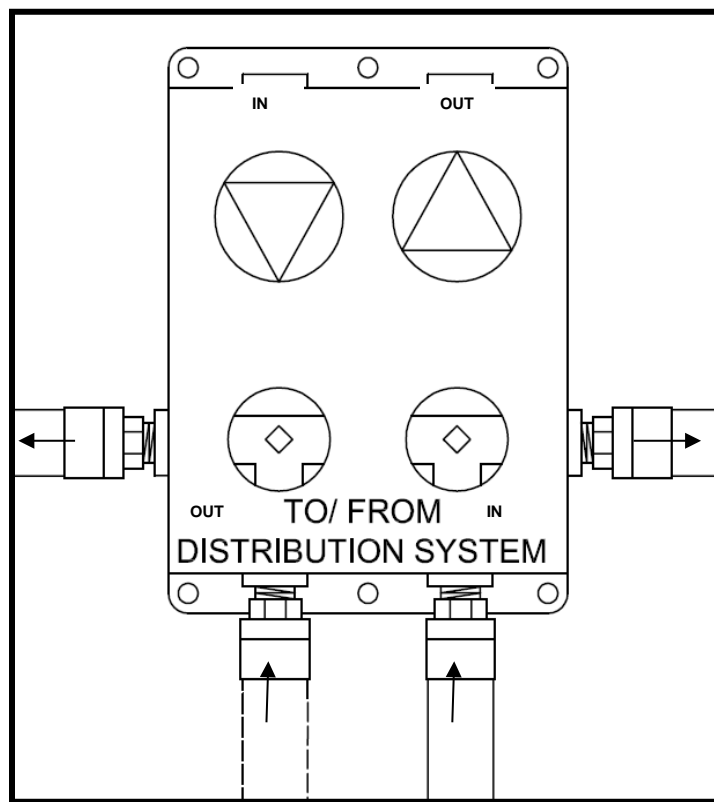


Figure 6: Three-way valve position for distribution side flushing.

- 3.2.1.8 Close the return-side three-way valve located on the pump module. Ensure to rotate the three-way valve in such a way as to prevent any fluid or air on the heat pump side from entering the distribution side.
- 3.2.1.9 Ensure that enough system fluid is collected from the distribution piping to flush the heat pump side of the residential system. Depending on the model and size of heat pump being used, this volume will be between 0.5 USgal and 2.5 USgal plus the volume of the piping connecting the pump module to

the heat pump. This fluid should go through a minimum 20 mesh filter before being re-installed into the system.

3.2.2 Methodology to flush the lines between the pump module and through the heat pump.

3.2.2.1 Ensure that the heat pump has been connected to the pump module correctly.

3.2.2.2 Rotate the three-way valves located on the pump module to isolate the distribution system, and gain access to only the heat pump side of the system (see Figure 7)

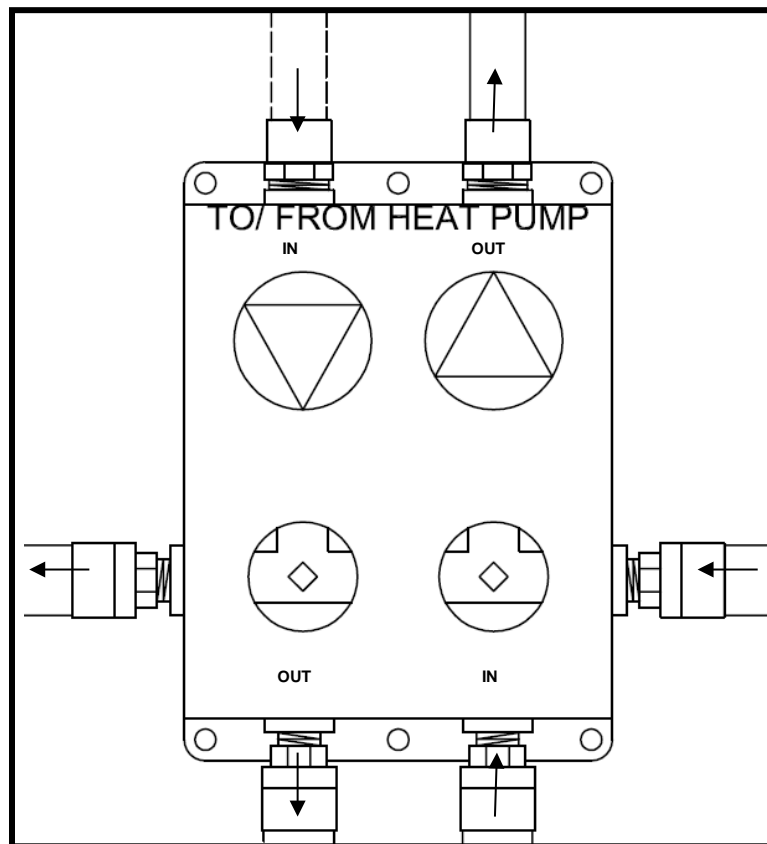


Figure 7 Three-way valve position for heat pump side flushing.

3.2.2.3 Connect the flush cart hoses to the pump module.

3.2.2.4 Flush the pump module and heat pump with the fluid captured from the distribution side.

3.2.2.5 Flush in one direction only; do NOT reverse flush because the system has a check-valve.

3.2.2.6 Once all air has been purged from the system, rotate the three-

way valve located on the return side to the distribution system of the pump module to the normal operating position (see Figure 8).

- 3.2.2.7 Add the remaining fluid that was captured earlier to the system. Ensure not to suck any air back into the system. Return any fluid that cannot be re-injected into the system to the Town of Gibsons in a sealed container.

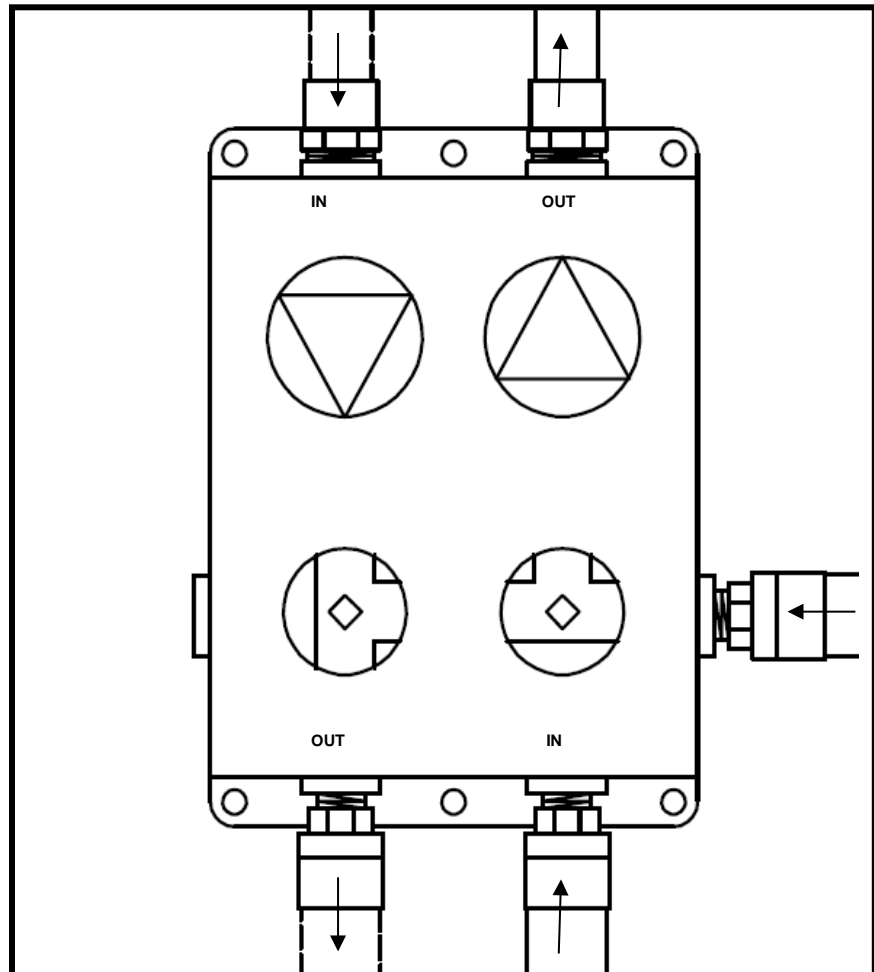


Figure 8: Three-way valve positions to reinstall fluid.

- 3.2.2.8 Rotate the three-way valve located on the supply side to the distribution system of the pump module to the normal operating position (see Figure 7).
- 3.2.2.9 Disconnect the flush cart from the pump module, and replace access port caps on the pump module.

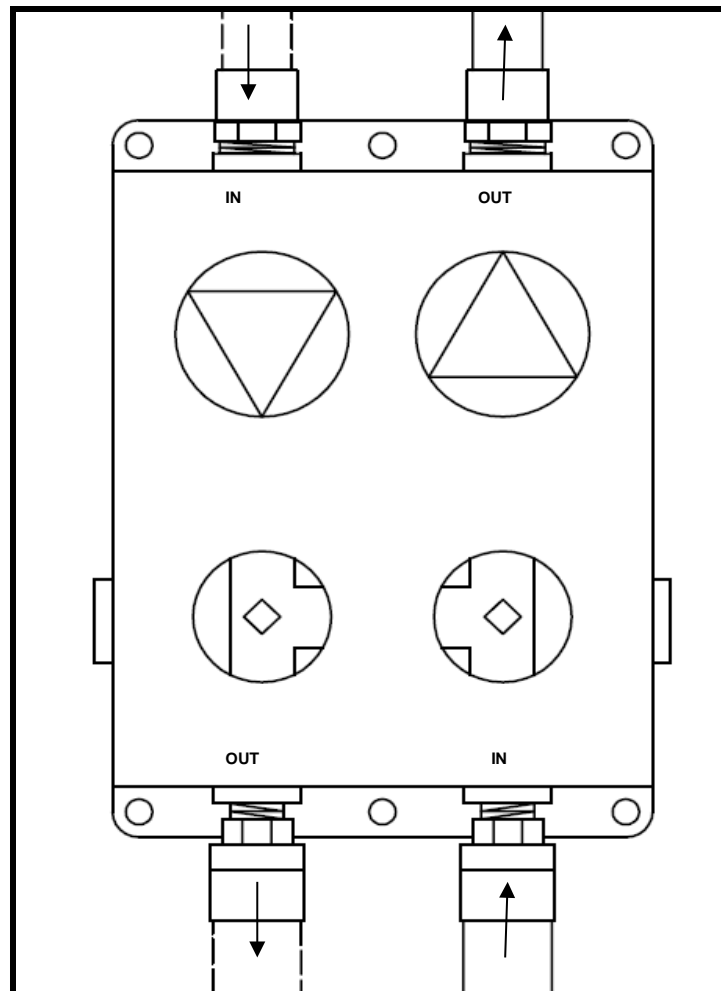


Figure 9: Three-way valve positions during normal operation.

3.3 System start up

- 3.3.1 Follow manufactures guidelines for system start up.
- 3.3.2 Ensure that no leaks are present around any of the fittings.
- 3.3.3 Ensure the CSA-448 Design and Installation Compliance & Commissioning Report documents are completed (see Appendix A) and forward to the Town of Gibsons. Also leave a copy attached to the heat pump with all other paperwork as per the CSA Standard.

3.4 Ethanol Caution

- 3.4.1 The system is filled with water and ethanol solution, it is possible that the solution is not completely mixed between the distribution piping and the curb stop supplying each residence. Special care to all personal handling the solution must be taken. Please refer to Appendix B for handling procedure.

APPENDIX A

CSA 448 Design and Installation Compliance And Commissioning Report



CSA 448 Design and Installation Compliance & Commissioning Report

NOTE: A copy of this document must be given to the customer and one copy sent to the Canadian GeoExchange Coalition (CGC)

This document should be completed for all **ecoENERGY Retrofit—Homes** grant applications filed with Natural Resources Canada for a geoexchange system installed before April 1st, 2008. Starting April 1st, 2008, grant applications will require CGC system certification. Please consult CGC website for more information: www.geo-exchange.ca

A. Affidavit

By my signature, I certify that the geoexchange system installed at the address listed in Section B has been designed and installed in full compliance with the **C448 Series-02 Design and Installation of Earth Energy Systems** standard. I understand that knowingly false declaration is perjury and may result in criminal charges in court of law.

Signature: _____ Print Name: _____ Date: _____
 Name of Company: _____
 City: _____ Province: _____ Postal Code: _____
 Telephone: _____ Fax: _____
 E-mail: _____
 Witness: _____ Print Name: _____ Date: _____

B. Owner's information

Name of Owner: _____ Telephone: _____
 Address: _____
 City: _____ Province: _____ Postal Code: _____

1. General Information on the Building and the Geoexchange System

New construction: Existing building: Type of building (bungalow, cottage, etc.): _____
 If existing building: Type of heating system before retrofit: _____ Type of cooling system before retrofit: _____
 Age of the building: _____ Insulation work completed: _____ Size of the building in ft² or m² (excluding basement): _____
 Geoexchange system used for: Living area space heating & cooling Sauna
 Domestic water heating Heating & cooling of other adjacent buildings
 Pool water heating Other _____
 Date installation began: _____ Date installation ended: _____ Total costs of geoexchange installation & desing: _____

2. Specific System Information

Type of distribution system: Forced-air Hydronic Design heat load (building): _____
 A copy of load calculations was given to the customer Design cooling load (building): _____
 Heat pump make: _____ Model / Serial No.: _____
 Heating capacity: _____ Cooling capacity: _____
 Coefficient of performance—heating (nominal): _____ Seasonal Energy Efficiency Rating: _____
 Check off appropriate entering water temperature (Refer to CAN/CSA-C13256) Heating: 0° C 10° C Cooling: 25° C 15° C

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3. Loop Information

Open-Loop Flow (data from driller): _____ Imp. Gallon / hour or US gallon / min

Vertical } Type of soil at depths: _____
 Number of boreholes: _____ Depth of boreholes: _____ Flow: _____ US gallon / min

Closed-Loop Horizontal } Types of soil: _____
 Depth of loop / heat exchanger: _____ Length of heat exchanger: _____
 Flow: _____ US gallon / min Pipes diameter: _____

Pond Loop } Depth of loop / heat exchanger: _____ Length of heat exchanger: _____
 Flow: _____ US gallon / min Pipes diameter: _____
 Heat transfer fluid: _____ Concentration (%): _____

4. Full Load Operating Conditions

Turn off the desuperheater and emergency heating unit if applicable. For commissioning and measurement of operating conditions, please operate to full capacity (compressor and EMC at 100 %) and all zones open. Do not forget to turn the desuperheater and the emergency heating unit back on if applicable.

	HEATING			COOLING		
	In	Out	Delta	In	Out	Delta
Air (water for water to water)	_____ °F	_____ °F	ΔT= _____ °F	_____ °F	_____ °F	ΔT= _____ °F
Water temperature	_____ °F	_____ °F	ΔT= _____ °F	_____ °F	_____ °F	ΔT= _____ °F
Pressure (water)	_____ PSI	_____ PSI	ΔP= _____ PSI	_____ PSI	_____ PSI	ΔP= _____ PSI
Compressor	_____ amps			_____ amps		
Ventilator	_____ amps			_____ amps		

5. System Components

<input type="checkbox"/> 1. Auxiliary heating	<input type="checkbox"/> 4. Pumping kit	<input type="checkbox"/> 7. Flow reader
<input type="checkbox"/> 2. Desuperheater	<input type="checkbox"/> 5. Filter _____	<input type="checkbox"/> 8. Pete's plug
<input type="checkbox"/> 3. Anti vibration	<input type="checkbox"/> 6. Thermostat, model _____	<input type="checkbox"/> 9. Humidification _____
<input type="checkbox"/> Other _____		

6. Emergency Heating Unit (for air distribution systems only)

	In	Out	Delta		
Air	_____ °F	_____ °F	ΔT= _____ °F	Voltage (measured)	_____ V
Nominal capacity :	_____ kW	Nominal voltage :	_____ V	PCM = $\frac{kW \times 3400}{1.1 \times \Delta T^{\circ}F}$ = _____	

Please return the completed form to **By mail:** **Canadian GeoExchange Coalition** **By Fax: (514) 807-8221**

1030 Cherrier St, Suite 405
Montréal (Québec) H2L 1H9

Or scan and e-mail to: reg@geo-exchange.ca

APPENDIX B

Ethanol Handling Instructions

For detailed ethanol handling instructions please reference the following sources:

1. Current Worksafe BC Material Safety Data Sheet (MSDS) for ethanol,
2. Any other relevant Federal or Provincial agency legislation or regulations concerning safe work procedures for ethanol.

