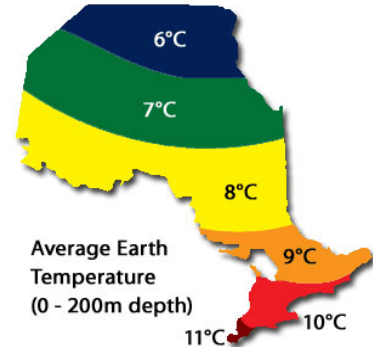


Building Permit Application Checklist

GEOHERMAL Open & Closed Loop



This checklist provides a summary of the Building Permit submission requirements for an open-loop or closed-loop geothermal system.

Requirements at time of submission:

- | | |
|--|---|
| <p>Provincial Building Permit Application:</p> <ul style="list-style-type: none"> <input type="checkbox"/> i) Application for a Permit to Construct or Demolish (2 sides) <input type="checkbox"/> ii) Annex 'A' of CAN/CSA-C448 (<i>to be completed by the installer</i>) <input type="checkbox"/> iii) Annex 'B' of CAN/CSA-C448 (<i>to be completed by the installer</i>) <p><input type="checkbox"/> Site Plan
(showing distances to property lines, location of piping, wells, natural land features, ponds, etc.) <i>see Annex 'B' - Site Survey Worksheet checklist</i></p> <p><input type="checkbox"/> Design of system in drawing and/or written description
(size of equipment, type of heat transfer fluid, open or closed-loop system, type of heat exchanger, cooling/heating loads, etc.)</p> <p>For Open-Loop Systems :
(<i>to be submitted after permit issued and system is installed</i>)</p> <ul style="list-style-type: none"> <input type="checkbox"/> i) Water Test <input type="checkbox"/> ii) Well Test <input type="checkbox"/> iii) Well Record/Certificate <p><input type="checkbox"/> All Applicable Fees</p> | <p>Office Use</p> <p><input type="radio"/></p> <p><input type="radio"/></p> <p><input type="radio"/></p> <p><input type="radio"/></p> <p><input type="radio"/></p> <p><input type="radio"/></p> <p><input type="radio"/></p> <p><input type="radio"/></p> <p><input type="radio"/></p> |
|--|---|

Geothermal (*ground or water source earth-energy system*)

To qualify for the ecoENERGY grant a company qualified by the Canadian GeoExchange Coalition (CGC) must install the new system or a complete replacement of an existing system (new heat pump unit and new loop). The CGC must also certify the system after installation.

For more information on Geoexchange System Certification please see the attached application form or visit: www.geo-exchange.ca



Application for a Permit to Construct or Demolish

This form is authorized under subsection 8(1.1) of the Building Code Act.

For use by Principal Authority			
Application number:		Permit number (if different):	
Date received:		Roll number:	
Application submitted to: TOWNSHIP OF NORTH DUNDAS (Name of municipality, upper-tier municipality, board of health or conservation authority)			
A. Project information			
Building number, street name		Unit number	Lot/con.
Municipality	Postal code	Plan number/other description	
Project value est. \$		Area of work (m ²)	
B. Purpose of application			
<input type="checkbox"/> New construction <input type="checkbox"/> Addition to an existing building <input type="checkbox"/> Alteration/repair <input type="checkbox"/> Demolition <input type="checkbox"/> Conditional Permit			
Proposed use of building		Current use of building	
Description of proposed work			
C. Applicant Applicant is: <input type="checkbox"/> Owner or <input type="checkbox"/> Authorized agent of owner			
Last name		First name	Corporation or partnership
Street address		Unit number	Lot/con.
Municipality	Postal code	Province	E-mail
Telephone number ()	Fax ()	Cell number ()	
D. Owner (if different from applicant)			
Last name		First name	Corporation or partnership
Street address		Unit number	Lot/con.
Municipality	Postal code	Province	E-mail
Telephone number ()	Fax ()	Cell number ()	

E. Builder (if different from applicant)				
Last name		First name	Corporation or partnership (if applicable)	
Street address			Unit number	Lot/con.
Municipality	Postal code	Province	E-mail	
Telephone number ()	Fax ()		Cell number ()	
F. Tarion Warranty Corporation (Ontario New Home Warranties Program)				
i. Is proposed construction for a new home as defined in the <i>Ontario New Home Warranties Plan Act</i> ? If no, go to section G.			<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii. Is registration required under the <i>Ontario New Home Warranties Plan Act</i> ?			<input type="checkbox"/> Yes	<input type="checkbox"/> No
iii. If yes to (ii) provide registration number(s): _____				
G. Required Schedules				
i) Attach Schedule 1 for each individual who reviews and takes responsibility for design activities.				
ii) Attach Schedule 2 where application is to construct on-site, install or repair a sewage system.				
H. Completeness and compliance with applicable law				
i) This application meets all the requirements of clauses 1.3.1.3 (5) (a) to (d) of Division C of the Building Code (the application is made in the correct form and by the owner or authorized agent, all applicable fields have been completed on the application and required schedules, and all required schedules are submitted). Payment has been made of all fees that are required, under the applicable by-law, resolution or regulation made under clause 7(1)(c) of the <i>Building Code Act, 1992</i> , to be paid when the application is made.			<input type="checkbox"/> Yes	<input type="checkbox"/> No
ii) This application is accompanied by the plans and specifications prescribed by the applicable by-law, resolution or regulation made under clause 7(1)(b) of the <i>Building Code Act, 1992</i> .			<input type="checkbox"/> Yes	<input type="checkbox"/> No
iii) This application is accompanied by the information and documents prescribed by the applicable by-law, resolution or regulation made under clause 7(1)(b) of the <i>Building Code Act, 1992</i> which enable the chief building official to determine whether the proposed building, construction or demolition will contravene any applicable law.			<input type="checkbox"/> Yes	<input type="checkbox"/> No
iv) The proposed building, construction or demolition will not contravene any applicable law.			<input type="checkbox"/> Yes	<input type="checkbox"/> No
I. Declaration of applicant				
<p>I _____ declare that:</p> <p>(print name)</p> <p>1. The information contained in this application, attached schedules, attached plans and specifications, and other attached documentation is true to the best of my knowledge.</p> <p>2. If the owner is a corporation or partnership, I have the authority to bind the corporation or partnership.</p> <p>_____</p> <p>Date Signature of applicant</p>				

Personal information contained in this form and schedules is collected under the authority of subsection 8(1.1) of the *Building Code Act, 1992*, and will be used in the administration and enforcement of the *Building Code Act, 1992*. Questions about the collection of personal information may be addressed to: a) the Chief Building Official of the municipality or upper-tier municipality to which this application is being made, or, b) the inspector having the powers and duties of a chief building official in relation to sewage systems or plumbing for an upper-tier municipality, board of health or conservation authority to whom this application is made, or, c) Director, Building and Development Branch, Ministry of Municipal Affairs and Housing 777 Bay St., 2nd Floor. Toronto, M5G 2E5 (416) 585-6666.



CANADIAN STANDARDS
ASSOCIATION

C448 Series-02
***Design and Installation of
Earth Energy Systems***

REAFFIRMED
2007
WITHOUT CHANGE



5.3.2

Piping, fittings, and pipe accessories that are part of a closed-loop ground-heat pump system or internal piping of a groundwater system separated by a water-to-water heat exchanger shall be appropriate for the intended use and shall be installed in accordance with the relevant safety and fire specifications and good industry practice.

5.3.3

Piping, fittings, pipe accessories, and all components that come into contact with the system heat-transfer fluid shall be compatible with that fluid.

5.3.4

Thread-to-thread, plastic-to-metal connections shall not be used.

5.3.5

All threaded joints shall utilize an industry-recognized sealant that is compatible with the system heat-transfer fluid, and the engineer shall specifically refer to this clause in specifications.

5.4 Pipe and Fitting On-Site Storage

The requirements of Clauses 5.4.1 and 5.4.2 of CSA Standard C448.1 shall apply.

5.5 Heat-Transfer Fluid

The requirements of Clauses 5.5.1 to 5.5.4 of CSA Standard C448.1 shall apply.

5.6 Backfill Materials

The requirements of Clauses 5.6.1 and 5.6.2 of CSA Standard C448.1 shall apply.

6. Site Survey Requirements

6.1 General

6.1.1

The contractor shall ensure that a site survey meeting the requirements of Clauses 6.1.2 to 6.1.4 is conducted prior to undertaking the system design.

6.1.2

The requirements of Clause 6.1.2 of CSA Standard C448.1 shall apply.

6.1.3

Water-well and other available geotechnical records for the area shall be reviewed to assess anticipated subsurface conditions, the water table, the potential for encountering a water supply aquifer, and any interference with neighbouring wells.

6.1.4

The ground coupling installer or subcontractor shall provide the contractor and building owner with a fully dimensioned site survey worksheet of the installed system which shall contain as a minimum the information identified in Annex B. This worksheet shall include dimensions and locations for septic systems, water inlet lines, and lot lines, and other pertinent information. In the case of an open system, a water-well record or well-pump test data shall also be provided.

Note: This site survey provides documentation of the ground coupling location for future reference.

6.2 Groundwater Systems

6.2.1

The contractor shall ensure that, where necessary, the well will yield enough water to supply both the domestic requirements and the heat pump requirements at the time of installation, as required by the authority having jurisdiction.

6.2.2

The contractor shall ensure that the pump will supply enough water for its designed purpose.

6.2.3

The contractor shall ensure that the building owner is informed of the possible effects on the supply water well due to the added load of an open loop system.

Note: *These possible effects include but are not limited to*

- (1) *change in water quality;*
- (2) *change in water quantity; and*
- (3) *adverse effects to the heat pump water-to-refrigerant coil (ie, due to mineral content).*

6.3 Ground-Heat Exchanger Systems

6.3.1 Horizontal Ground-Heat Exchanger Systems

6.3.1.1

Soil samples shall be taken for soil property determination.

Note: *Sampling is required only under conditions where soil samples are available.*

6.3.1.2

Water-well and other available geotechnical records for the area shall be reviewed to assess anticipated subsurface conditions and the water table.

6.3.2 Vertical Ground-Heat Exchanger Systems

Water-well and other available geotechnical records for the area shall be reviewed to assess anticipated subsurface conditions, soil/rock types, the water table, the potential for encountering a water supply aquifer, and any interference with neighbouring wells.

6.4 Submerged Heat Exchangers

The segment of the surface water in the vicinity of the proposed submerged heat exchanger shall be investigated for potable water intakes and minimum water levels. A minimum distance of 2 m (6.6 ft) is required between any part of the submerged heat exchanger system and a potable water intake.

7. Design of Earth Coupling

7.1 All Systems

7.1.1

The contractor shall be responsible for ensuring that the earth coupling is designed in accordance with the requirements of Clauses 7.1.2 to 7.3.3, as applicable.

(m) piping passing through the foundations, floors, or walls. Such piping shall be protected against differential settlement.

7.2.6

In addition to Clause 7.2.5, a submerged system shall be designed with due consideration given to the following:

- (a) the physical limitations of the land area, eg, shoreline conditions;
- (b) the minimum disturbance to shoreline, lake, pond, or stream beds, aquatic habitat, and marine life (including fish spawning areas), as determined by the authority having jurisdiction;
- (c) protection against wave, ice, boat, or snowmobile damage;
- (d) a minimum distance between any part of the collector system and the lot line or potable water intakes of 10 m (33 ft);
- (e) the type of antifreeze and inhibitors used;
- (f) the end use of the water surface area;
- (g) weights and the fastening method used to secure the collector system below water level;
- (h) approval by the authority having jurisdiction; and
- (i) Items (a) to (h) in relation to normal minimum water levels.

7.2.7

Where a shoreline consists of bedrock and trenching is not possible, the design of a submerged collector system shall have the following characteristics:

- (a) the plastic pipe shall be encased in a large diameter protective pipe and insulated to protect all exposed pipe above the water surface and all pipe to a depth sufficient to meet the requirements of Clause 7.2.6; and
- (b) assemblies shall be securely fastened to the rock face or buried and suitably marked at the shoreline.

7.3 Open Systems

7.3.1

An open system includes a supply of groundwater and a groundwater rejection well, storm water drains, or drainage tiles.

7.3.2

An open system shall be designed with due consideration given to

- (a) proof of sustainable yield in excess of maximum requirements, even in drought conditions;
- (b) initial and final temperatures, and the quality and chemical composition of the water resource, in accordance with the manufacturer's recommendations;
- (c) returning water to the source aquifer to avoid the intermingling and depletion of aquifers;
- (d) any equipment, easements, or rights-of-access by other persons or bodies;
- (e) the unobstructed and sustainable return capacity of well or tile bed systems under winter conditions;
- (f) the most feasible direct pipe routing for collection and return lines both indoors and outdoors;
- (g) the minimum radii of pipe curves to avoid kinking;
- (h) appropriate sizing of pumps, taking into consideration pumping requirements and energy use;
- (i) minimizing water consumption; and
- (j) the distance between discharge and supply wells.

7.3.3

If an injection well is used, water shall be returned to the source or to an aquifer of like water quality to avoid the intermingling of contaminants and depletion of aquifers.

Table 1
Minimum CSA Standard B137.1 Certified Series
Number for Polyethylene Pipe
(See Clause 5.2.1.)

Outside nominal size, mm (in)	Vertical pipe series number	Horizontal pipe series number
19 (3/4)	160	160
25 (1)	160	125
32 (1-1/4)	160	125
38 (1-1/2)	160	125
50 (2)	—	100
75 (3)	—	100
100 (4)	—	100

Notes:

- (1) Horizontal pipe also refers to headers in vertical systems and submerged heat exchangers.
(2) Due consideration should be given to pressures caused by the depth of the borehole and the height of the building above grade.

6. Site Survey Requirements

6.1 General

6.1.1

The engineer shall ensure that a site survey meeting the requirements of Clauses 6.1.2 to 6.1.4 is conducted prior to undertaking the system design.

6.1.2

The site survey shall

- (a) confirm that the owner has right of access to the required ground or water resources;
- (b) identify the physical limitations of the land area, including its extent, structures, existing wells, pavements, trees, grading, ponds, waterways, easements, overhead and underground services, and septic systems; and
- (c) include a subsurface investigation that meets the requirements of Clause 6.2.

6.1.3

Water-well and other available geotechnical records for the area shall be reviewed by a hydrogeologist to assess general anticipated subsurface conditions, the water table, the potential for encountering a water supply aquifer, and any interference with neighbouring wells, and to recommend the number of test wells.

6.1.4

The subsurface investigation shall meet the requirements of Clause 6.2 for groundwater systems, as well as the requirements of Clause 6.3 for ground-heat exchanger systems and/or Clause 6.4 for submerged systems.

6.2 Groundwater Systems

6.2.1

Each test well shall be sampled to provide details of the stratigraphy, groundwater location, chemical and

physical characteristics, and temperature profiles. This data shall be recorded during the drilling by a professional hydrogeologist.

6.2.2

Each test well shall be tested for water yield for a duration of not less than 12 h.

6.2.3

All wells shall be tested for their recharge rate up to the maximum recharge capability required.

6.2.4

Water samples shall be collected, in accordance with established protocol, from each well during pumping tests and after well development for chemical and microbiological analysis to establish existing water quality levels as well as suitability of the water for groundwater system use.

6.2.5

Water samples shall be analyzed for standard drinking water fecal and coliform content, identification of bacterial iron, dissolved minerals, pH, hardness, and other inorganic constituents. At least one gas chromatography/mass spectrometry for volatile organic compounds shall be performed on one of the samples.

6.2.6

A hydrogeologist's report summarizing the results from Clauses 6.1 and 6.2 and chemical analysis results, documenting any groundwater contamination, and providing discussion, conclusions, and recommendations shall be prepared and submitted to the engineer.

6.2.7

Test wells that will not be used in the system or as permanent monitoring wells shall be properly abandoned in accordance with the authority having jurisdiction.

6.3 Ground-Heat Exchanger Systems

6.3.1 Horizontal Ground-Heat Exchanger Systems

6.3.1.1

Soil samples shall be taken for soil property determination.

Note: Sampling is required only under conditions where soil samples are available.

6.3.1.2

Water-well and other available geotechnical records for the area shall be reviewed to assess anticipated subsurface conditions and the water table.

6.3.1.3

Two test pits or at least one test pit per hectare of planned loop field, whichever is more, shall be dug to investigate subsurface conditions.

6.3.2 Vertical Ground-Heat Exchanger Systems

6.3.2.1

Water-well and other available geotechnical records for the area shall be reviewed to assess anticipated subsurface conditions, soil/rock types, the water table, the potential for encountering a water supply aquifer, and any interference with neighbouring wells. Where potable water is not likely to be encountered (based on local records), test wells as identified in Clause 6.3.2 shall not be mandatory.

Annex A (Informative)

Installation Checklist for Open- and Closed-Loop Earth Energy Heat Pump Systems

Note: This Annex is not a mandatory part of this Standard.

(Two Copies Are to Be Provided to the Owner)

Owner's Name _____ Date _____
 Address _____
 Province _____ Postal Code _____ Phone _____
 Contractor's Name _____ Date _____
 Address _____
 Province _____ Postal Code _____ Phone _____
 System Type: Open-Loop ☐ Closed-Loop ☐ House Size _____
 Design Heat Load (Building) _____ Design Method _____
 Design Cooling Load _____ Method _____
 Domestic Hot Water Load (Met By System) _____
 Total Heating Load _____
 Type Of Distribution System: Forced-Air ☐ Hydronic ☐
 Heat Pump Make _____ Model/Serial No. _____
 Heating Capacity _____ Cooling Capacity _____
 Check off appropriate entering water temperatures Heating EWT: 0°C (32°F) ☐ 10°C (50°F) ☐
 (EWT). (Refer to CSA Standard CAN/CSA-C13256-1) Cooling EWT: 25°C (77°F) ☐ 10°C (50°F) ☐

If A Closed-Loop System:

Heat Exchanger Length, if Horizontal _____
 Heat Exchanger Type, if Horizontal Single-Pipe ☐ Two-Pipe ☐
 Four-Pipe ☐ Other ☐
 Borehole Depth and Number, if Vertical _____
 Heat Exchanger Sized According to: Manufacturer ☐

If Software, Program Used:

Backfill Materials, Horizontal Trenches _____
 Borehole Fill Material, if Vertical _____
 Type Of Antifreeze/Inhibitors _____ Quantity _____
 Antifreeze Protection Level _____ Loop Test Pressure _____
 System Static Pressure _____

If An Open-Loop System:

Attach copy of water well record or well pump test and include the number and specifications of wells, intake, and pumps.

Marking/Instructions Checklist

If A Closed-Loop System:

Supply and Return Valves Marked Accordingly ☐
 Submerged Heat Exchanger Position Marked at Shoreline ☐
 Label at Loop Charging Valve Showing Antifreeze Type, Concentration, Contractor Information ☐
 Owner Given Manufacturer Documentation and Warranty on System ☐
 Owner Given Site Survey Worksheet of Installed System (Including Dimensions/Locations of all Piping, Diameter, Depths and Lengths of Loops, Septic Systems, Water Inlet Lines, Lot Lines, etc.) ☐

If An Open-Loop System:

Supply and Return Lines to be Identified by Marker at Point of Entry to Water Wells ☐
 Inform Owner of Possible Effects on Supply Water Well of Open-Loop System — Water Quality, Quantity, etc. ☐
 Ensure Water Supply Well is Sealed in Accordance with Approved Well Construction Practices ☐
 Ensure Water Well Yields Water to Supply Both Domestic and Heat Pump Requirements at Time of Installation ☐

This installation was done in accordance with CSA Standard C448.2, *Design and Installation of Earth Energy Systems for Residential and Other Small Buildings*, and currently applicable regulations.

Name: (Please Print or Type) _____ Signature _____
 Date _____

Annex B (Informative)

Site Survey Worksheet

Customer _____ Date _____
 Address _____ Phone _____
 Legal Description _____
 Performed by _____ (Name) _____ Phone _____
 Company Name _____ Signature _____
 New Construction ☐ Retrofit ☐ Construction Permit and Number _____
 Heat Loss and Energy Analysis by _____
 Soil/Rock Types and Conditions _____
 Drill Regulations _____
 Special Requirements _____

SERVICE LOCATE CHECKLIST

- ☐ POWER LINES
 - Overhead
 - Underground
- ☐ NATURAL GAS
- ☐ PROPANE
- ☐ PUBLIC WATER
- ☐ WATER WELL
 - _____ Depth, m (ft)
- ☐ PUBLIC SEWER
- ☐ ON-SITE SEWER
- ☐ TELEPHONE LINE
 - Overhead
 - Underground
- ☐ TV CABLE
- ☐ FUEL LINES
- ☐ EASEMENTS
- ☐ SPRINKLER
- ☐ TILE DRAIN
- ☐ BUILDING ENTRANCE
- ☐ UNIT LOCATION
- ☐ POND
 - Size _____
 - Avg. Depth _____
 - Min. Depth _____
- ☐ OTHER _____
- ☐ ELEVATION
- ☐ POND/HOUSE
- ☐ FUTURE BUILDING
(Buildings, pools, etc)

Acknowledged By: _____

Owner/Agent _____

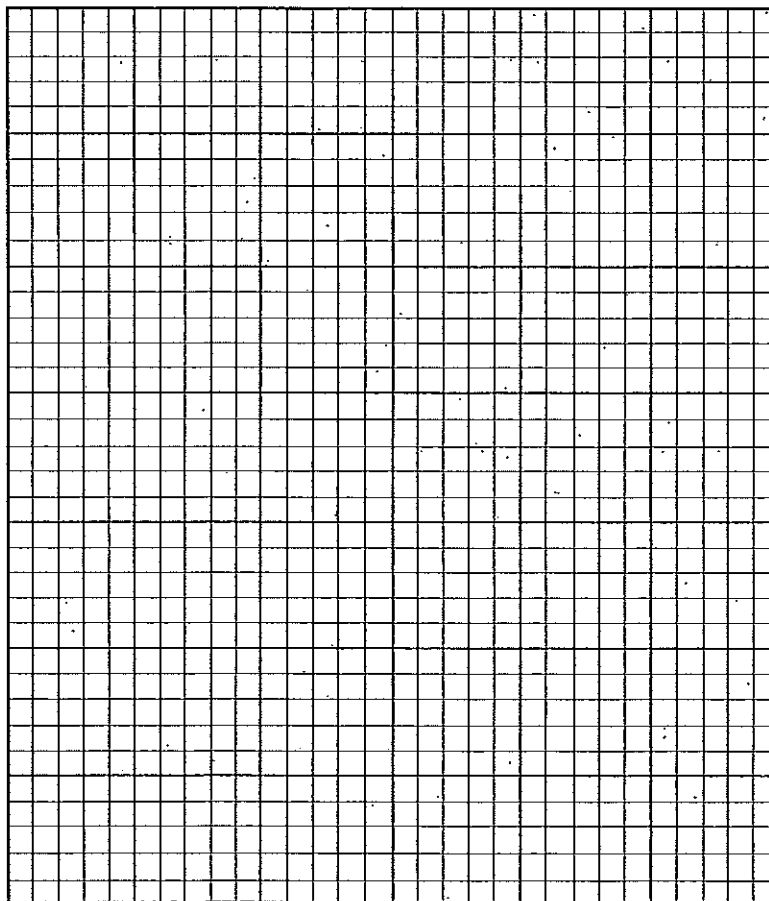
(Date) _____

Installation Date _____

Scale _____ = _____

SITE PLAN COMPANY HEADING

Locate property lines, existing structures or obstructions, future consideration sites, utilities and services, heat pump unit, circulating pump kit where it enters structure, slopes (% and direction), and equipment access routes.



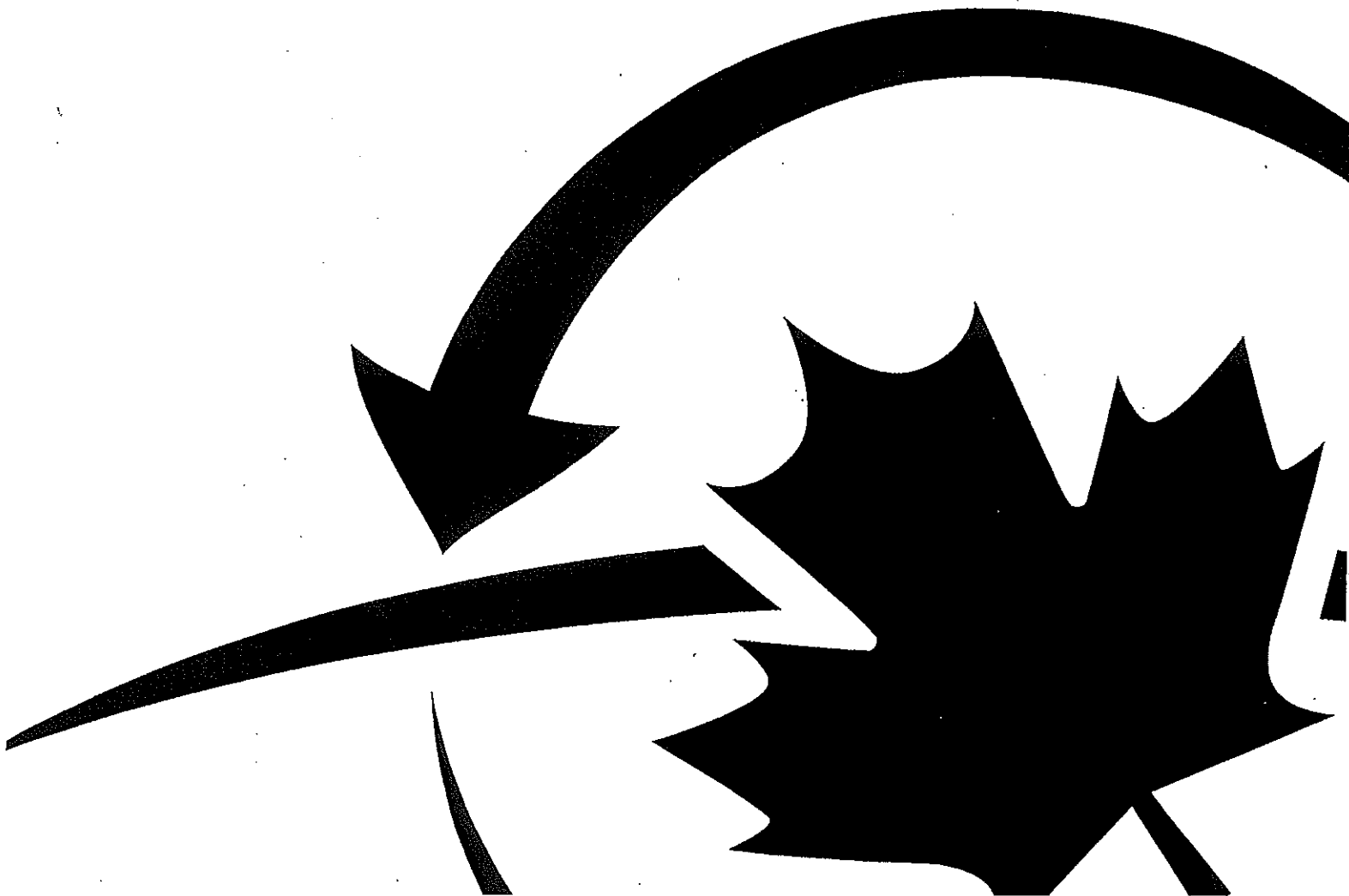


Coalition
Canadian
GeoExchange
Coalition

Coalition
canadienne
de l'énergie
géothermique

APPLICATION FORM

GEOEXCHANGE SYSTEM CERTIFICATION





APPLICATION FORM

GEOEXCHANGE SYSTEM CERTIFICATION

(rev. July 2011)

INSTRUCTIONS TO COMPLETE THIS CERTIFICATION FORM

- 1) All spaces must be completed with information or "N/A" if not applicable
- 2) A copy of this document must be kept by the customer and one copy sent to the Canadian GeoExchange Coalition (CGC). Complete one form for each operating heat pump system. Where one heat pump system (at one given civic address) uses more than one heat pump unit, applicants must provide serial numbers and any particular details in section IV, subsection seven, "Other System Specifications."
- 3) Incomplete forms will be returned to applicants for completion, before approval can be granted. Please therefore fully complete this form. Please ensure that all sections are fully completed.
- 4) Instructions for each section are generally provided at the beginning of each section, next to section titles.
- 5) If normal CGC or CSA protocols are not followed in the completion of this form, the professional responsible for the work should provide a separate page describing the deviation, the reasoning for it, and requesting a specific exception for specific reasons. Please note that CGC will not and does not guarantee that any accommodation will be made in certifying systems which do not follow to the letter of C-448-02.
- 6) This Certification Form may be used to fit the needs of financial assistance programs developed by utilities, municipality, provincial and federal governments and other stakeholders. Please be as accurate as possible in providing information, as the approval of financial assistance to customers may depend on the quality and accuracy of the information provided herein.
- 7) Note that when interpreting C-448 or local requirements, the Authority Having Jurisdiction—usually represented by a Municipal Inspector or provincial building code authority — may serve as a resource and holds the final word around permitting.
- 8) Once this form is complete, all information will be kept confidential by CGC except for any authorized used per Section VII of this form, or as ordered by a Court of Law having jurisdiction in Canada.

Certification fee: 125 \$ (including taxes)

Installation companies are invited to cover the system certification fee, complete this form and return to the Canadian GeoExchange Coalition as a service to their own customers.

A numbered certificate (sticker) to be fixed visibly on the system along with a 8 1/2 x 11 paper certificate will be mailed directly to the customer. Depending on the province and the financial assistance program you are applying for, you will need to either produce the certificate number or a copy of the paper certificate.

Why pay a Certification fee? Why demand CGC System Certification?

Certification confirms that the System installed at the address listed in Section I-B has been designed and installed in full compliance with standard C448 Series-02 Design and Installation of Earth Energy Systems (amended). In addition, part of the certification process requires that the installation team review your system materials and operating procedures with you (the customer), and provide documentation which can be of essential help in the unlikely event of a system problem. Finally, certification means that design and installation professionals have passed the industry standard training courses in the technology, conduct their business affairs honourably in general, and already have a positive track record of high quality installations. The Certification fee helps CGC manage this quality process.

Please return the completed form accompanied with supporting documents and payment to:

By mail:

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

By Fax:

(866) 643-1375

Or scan and e-mail to:

marie-claude@geo-exchange.ca



Application Form — CGC System Certification

Please complete and return:

- ♦ Pages 1 to 6 ONLY.
- ♦ Include a copy of the site worksheet (use the blank form in CSA 448 or your own company worksheet)
- ♦ A drilling report (page 5) if a borehole was constructed (use the model provided by CGC or government-approved drilling log, or company borehole / loop installation report containing the same information)
- ♦ Horizontal loop and pond loop report (page 6), if it is this type of construction (new loop)
- ♦ A summary report of the heat loss calculation (do not send the entire document, just the summary)
- ♦ A copy of the municipal building permit for work and renovation (if required by your municipality or provincial government)
- ♦ A payment of \$125 for the analysis and certification process

I. SYSTEM OWNER IDENTIFICATION

System Owner's Name: _____		
Address of installation: _____		
Address (line 2): _____		
City: _____	Province/State: _____	Postal/Zip Code: _____
Mailing Address (if different from the above)		
Address : _____		
City: _____		
Telephone: _____	Fax: _____	
E-mail: _____		

II. CGC ACCREDITED PROFESSIONALS INVOLVED IN THE DESIGN, DRILLING AND INSTALLATION OF THE GX SYSTEM OR DX SYSTEM

1) Accredited Installer: _____	CGC Accreditation Number: _____
2) Accredited DX Installer: _____	CGC Accreditation Number: _____
3) Accredited Designer: _____	CGC Accreditation Number: _____
4) Qualified (Drilling) Firm: _____	CGC Qualification Number: _____
<p><u>If relevant</u>, please list <u>all</u> other professionals involved in the installation of this geothermal system. Depending on the province or municipality, this may include general contractors, subcontractors, drillers, electricians, plumbers, and/or other construction professionals.</p> <p><u>Please use another sheet if you need to provide more names.</u></p>	
1) Name of professional : Title & Role on this Project: (e.g. General Contractor, Sub, etc.) _____	
2) Name of professional : Title & Role on this Project: (e.g. General Contractor, Sub, etc.) _____	

III. CSA 448 DESIGN AND INSTALLATION COMPLIANCE & COMMISSIONING REPORT

(To be completed by a CGC accredited professional)

CGC-CERT-E-07/2011

1. Building information

size of the building ☐ ft² ☐ bungalow ☐ cottage ☐ chalet ☐ farm house ☐ town house ☐ other
☐ m² ☐ single-family home ☐ row house ☐ condominium ☐ apartment building

☐ new construction ☐ old construction (+6 months) _____ year(s)
 ① ☐ plinth ☐ boiler ☐ DX heat pump (geo) ☐ GX heat pump (geo)
☐ fan convector ☐ furnace ☐ air to air heat pump
 ② ☐ electricity ☐ wood ☐ wood pellets ☐ natural gas ☐ propane ☐ fuel oil (mazout)

geoexchange system used for:

☐ living area space heating ☐ domestic water heating ☐ sauna ☐ other: _____
☐ living area space cooling ☐ pool water heating ☐ heating & cooling adjacent buildings

date construction began: _____ date construction ended: _____ total costs (design+installation): _____

building design heat load: _____ building design cooling load: _____

A copy of load calculations was given to the customer and another one is attached to this document ☐

Note: The load calculations has to be compliant with CSA F280

2. System components

auxiliary heating ☐ desuperheated ☐ anti vibration (mandatory in CSA C448.2 clause 10.6)
☐ heat pump #: _____ kW ☐ pumping kit (non corrosive parts) ☐ flow reader
☐ heat pump #: _____ kW ☐ filter: _____ ☐ PT plugs (mandatory in CSA C448.2 clause 10.18)
☐ heat pump #: _____ kW ☐ thermostat, model: _____ ☐ humidification: _____

3. Loop Information

OPEN LOOP (new or existing)

SUPPLY WELL
flow rate capacity: _____ GPH

RECHARGE WELL
flow rate capacity: _____ GPH

existing loop ☐ new loop ☐

COMPLETE THE CGC's "DRILLING REPORT"

EXISTING CLOSED LOOP

antifreeze: _____
☐ vol./vol.
 concentration: _____ % ☐ wt./wt.

old heat pump specifications

heat pump make: _____

heat pump model: _____

heating capacity @ EWT=32°F: _____

COP @ EWT=32°F: _____

CLOSED LOOP

ANTIFREEZE System | DX System

antifreeze: _____ refrigerant type: _____
 concentration: _____ ☐ vol./vol. ☐ wt./wt. refrigerant charge: _____ lbs

LOOP CONFIGURATION

horizontal loop ☐ vertical loop ☐
 pond loop ☐ diagonal loop ☐

COMPLETE THE CGC's
"HORIZONTAL LOOP AND
POND LOOP REPORT"

COMPLETE THE CGC's
"DRILLING REPORT"

4. Heat pump(s) specifications and operating conditions at full capacity

heat pump # _____

heat pump make: _____	heat pump model: _____
heat pump serial number: _____	type of heat pump: <input type="checkbox"/> forced-air <input type="checkbox"/> hydronic
If the system is an open loop, the heating specifications entered below are at 50°F and the cooling specifications entered below are at 60°F. If the system is a closed loop, the heating specifications entered below are at 32°F and the cooling specifications entered below are at 77°F.	
heating capacity (HC): _____	cooling capacity (TC): _____
coefficient of performance (COP): _____	energy efficiency rating (EER): _____

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.

In CAN/CSA C448.2-02, clause 10.18: "Isolation valves on closed-loop or open-loop systems shall include adequate connections (PT plugs) to flush, purge, test for flow and temperature, and to pressurize the system as a normal service procedure."

	HEATING			COOLING		
	in	out	Δ (delta)	in	out	Δ(delta)
air (forced-air unit) A	°F	°F	°F	°F	°F	°F
water (hydronic unit)	°F	°F	°F	°F	°F	°F
loop temperature at heat pump B	°F	°F	°F	°F	°F	°F
loop pressure at heat pump C	psi	psi	psi	psi	psi	psi
ground loop flow rate D	GPM			GPM		
compressor measurements E	amps	Volts		amps	Volts	
fan (forced-air unit) F	amps	Volts		amps	Volts	
circulator pump (hydronic unit)						

heat pump # _____

heat pump make: _____	heat pump model: _____
heat pump serial number: _____	type of heat pump: <input type="checkbox"/> forced-air <input type="checkbox"/> hydronic
If the system is an open loop, the heating specifications entered below are at 50°F and the cooling specifications entered below are at 60°F. If the system is a closed loop, the heating specifications entered below are at 32°F and the cooling specifications entered below are at 77°F.	
heating capacity (HC): _____	cooling capacity (TC): _____
coefficient of performance (COP): _____	energy efficiency rating (EER): _____

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.

In CAN/CSA C448.2-02, clause 10.18: "Isolation valves on closed-loop or open-loop systems shall include adequate connections (PT plugs) to flush, purge, test for flow and temperature, and to pressurize the system as a normal service procedure."

	HEATING			COOLING		
	in	out	Δ (delta)	in	out	Δ(delta)
air (forced-air unit) A	°F	°F	°F	°F	°F	°F
water (hydronic unit)	°F	°F	°F	°F	°F	°F
loop temperature at heat pump B	°F	°F	°F	°F	°F	°F
loop pressure at heat pump C	psi	psi	psi	psi	psi	psi
ground loop flow rate D	GPM			GPM		
compressor measurements E	amps	Volts		amps	Volts	
fan (forced-air unit) F	amps	Volts		amps	Volts	
circulator pump (hydronic unit)						

*Print a duplicate of this page if the system has more than 2 heat pumps because each heat pump has to be identified and tested at full capacity.

IV. AFFIDAVIT — To be completed and signed by the company / firm representative providing workmanship guarantee on the system

Solemn declaration of professional in construction industry

I, undersigned, _____ [na-

[position]

for _____
[Company]

having its principal place of business located at

(hereinafter referred to as the "Company"), hereby solemnly declare that:

I am the _____ [position] for the Company and I have held this position since _____ [year].

1. Because of my functions and position within the Company, I am generally aware of its business activities and possess full authority to represent it herein by subscribing to this solemn declaration. I am particularly aware of the circumstances surrounding it and I have access to all relevant documents and information.
2. To the best of my and the Company's knowledge, all the information contained in this application is true and accurate.
3. Although membership in the CGC is not mandatory to apply for Certification, all the work related to the system within this form ("System") has been conducted in accordance with and meets the highest ethical standards in geoechange work.
4. The Company understands, accepts and recognizes that Certification is only granted to systems which at a minimum meet current Standards for design and installation (or accepted government deviations / utility program requirements), and meet current Canadian standards for safety and performance.
5. The Company understands, accepts and recognizes that unless and until an industry recognized standard is formally adopted, Certification does not cover standing column well systems.
6. The System installed at the address listed in Section I-B has been designed and installed in full compliance with the *C448 Series-02 Design and Installation of Earth Energy Systems* standard, as specified in the National Building Code and provincial codes.
7. The Company understands, accepts and recognizes that a false declaration may result in the loss of its accreditation / qualification status with the CGC.
8. The Company understands, accepts and recognizes that Certification can be immediately revoked at any time, at the sole discretion of the CGC, and without any formality, if the Company fails to provide or to continue providing evidence that the System is designed, installed and is performing to standards, per Instructions in this certification form.

Signed in [city / province]

This [day / month] of [year]

Signature: _____

Please print name

Witness: _____

Please print name

Client's Understanding and Approval of Certification

I, undersigned, _____ [na-

domiciled and residing at _____
[address]

hereby solemnly declare that:

1. I am applying to the Canadian Geospatial Coalition ("CGC") to have the System certified. I am the owner of the System.
2. I understand that one of the criteria for CGC certification ("Certification") is that I verify that the System has been delivered in good order along with the "As-built" book.
3. In this regard, I hereby confirm that a member of the Installation team has provided me with:
 - ♦ A full **As-Built** book, consisting of initial site survey, final site survey, evidence of system labelling (supply and return fluid lines, loop charging valves, each clearly marked with dates), Material safety data sheets for loop fluids, any manufacturer documentation including owner's guides and manuals, any manufacturer guarantees or warranties for equipment, installing company guarantees, and any relevant photographic documentation;
 - ♦ current service contact information; and
 - ♦ a copy of the *CSA 448 Design and Installation Compliance and Commissioning Report* (Section III of this document).
4. I understand and agree that Certification or CGC Accreditation is not a substitute for my own due diligence regarding the drilling, design and installation of the System, including but not limited to contractor review and oversight, reference verification and credit verification.
5. I understand and agree that CGC's program is not in any way a substitute for the moral, contractual and legal responsibilities of the workers involved with the project.
6. As an express and essential condition for entering into this quality programme agreement, I hereby agree and understand that the CGC shall not in any way be legally or contractually responsible or liable for any claims, demands, suits and costs, including attorneys fees, arising out of drilling, design and installation of the System or any direct or indirect damage or prejudice caused by it.
7. I authorize the CGC to share all required information with the programs from which I am seeking financial or other assistance or support.
8. I authorize CGC personnel or designated representatives of the CGC to physically inspect my System in order to ensure its conformity with codes, standards and other regulations in my municipality or province.
9. To the best of my understanding this system has been installed and designed properly in accordance with all applicable standards, laws and regulations.
10. The geospatial system named in this application is providing heating and cooling satisfactorily, and though I reserve all legal rights regarding future problems, I am at this time satisfied with the work and workmanship conducted, including the professional ethics and all efforts made by the professionals named in this application.

Signed in [city / province]

This [day / month] of [year]

Signature: _____

Please print name

Witness: _____

Please print name



1030 Cherrier, suite 405
Montreal (Quebec) H2L 1H9
Fax: 514-807-8221

DRILLING REPORT

CGC-CERT-E-07/2011

CGC qualified firm number: _____

Operator name: _____

CLIENT INFORMATION

Name: _____

Address: _____

City: _____ Province: _____

Postal Code: _____

DRILLING SPECIFICATIONS

borehole diameter (Ø): _____

method

cable tool ☐ rotary ☐ air rotary ☐
rotary-percussion ☐ other: _____

casing (into overburden)

depth: _____

inside Ø: _____ outside Ø: _____

STATIC WATER LEVEL: _____
specify m or ft

LENGTH
specify m or ft

LITHOLOGY
DESCRIPTION

<div>↓</div>	<input type="checkbox"/> clay <input type="checkbox"/> limestone <input type="checkbox"/> shale
	<input type="checkbox"/> till <input type="checkbox"/> granite <input type="checkbox"/> silt
	<input type="checkbox"/> sand <input type="checkbox"/> gravel <input type="checkbox"/> top soil
	<input type="checkbox"/> other: _____
	<input type="checkbox"/> clay <input type="checkbox"/> limestone <input type="checkbox"/> shale
<div>↓</div>	<input type="checkbox"/> till <input type="checkbox"/> granite <input type="checkbox"/> schiste
	<input type="checkbox"/> sand <input type="checkbox"/> gravel <input type="checkbox"/> top soil
	<input type="checkbox"/> other: _____
	<input type="checkbox"/> clay <input type="checkbox"/> limestone <input type="checkbox"/> shale
	<input type="checkbox"/> till <input type="checkbox"/> granite <input type="checkbox"/> schiste
<div>↓</div>	<input type="checkbox"/> sand <input type="checkbox"/> gravel <input type="checkbox"/> top soil
	<input type="checkbox"/> other: _____
	<input type="checkbox"/> clay <input type="checkbox"/> limestone <input type="checkbox"/> shale
	<input type="checkbox"/> till <input type="checkbox"/> granite <input type="checkbox"/> schiste
	<input type="checkbox"/> sand <input type="checkbox"/> gravel <input type="checkbox"/> top soil
<div>↓</div>	<input type="checkbox"/> other: _____
	<input type="checkbox"/> clay <input type="checkbox"/> limestone <input type="checkbox"/> shale
	<input type="checkbox"/> till <input type="checkbox"/> granite <input type="checkbox"/> schiste
	<input type="checkbox"/> sand <input type="checkbox"/> gravel <input type="checkbox"/> top soil
	<input type="checkbox"/> other: _____

OPEN LOOP SYSTEM (ONLY)

An open loop system without a groundwater rejection well is illegal in some provinces. If it is allowed in a province, a permit must be obtained from the ministry or the municipality regulating this practice to confirm the legality of the installation. A copy of this permit must be attached to the CGC System Certification form.

☐ groundwater supply well ☐ groundwater rejection well

well pumping capacity: _____ GPH well rejection capacity: _____ GPH

*Note: In compliance with CSA C448-02, the pumping capacity and the rejection capacity must be 1.5 times greater than the heat pump flow rate. (1 GPM = 60 GPH)

CLOSED LOOP SYSTEM (ONLY)

number of borehole(s) drilled: _____

If all boreholes have the same depth and the same geology, only one Drilling Report is required. If the geology and/or the depth is different between each borehole, a Drilling Report is required for each.

Tremie-grouting of entire vertical borehole from bottom to top ?

YES ☐

NO ☐

bentonite mixture name: _____

quantity per borehole: _____ lbs water per borehole: _____ gallons

silica sand per borehole: _____ lbs global conductivity: _____ Btu/(hr-ft-°F)

VERTICAL BOREHOLE

depth per borehole: _____

Note: For vertical borehole, the depth and the length is the same.

DIAGONAL BOREHOLE

length per borehole: _____

depth per borehole: _____

angle (°): _____

HDPE PIPES

pipe designation code: PE _____ pipe copper type: _____

pipe series number: SDR- _____ pipe nominal vapor Ø: _____

pipe nominal Ø: _____ pipe nominal liquid Ø: _____

COPPER PIPES

DRILLER SIGNATURE: _____

DATE: _____

HORIZONTAL LOOP and POND LOOP REPORT



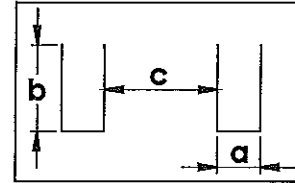
Coalition
canadienne
de l'énergie
géothermique

① Soil Type or Pond Loop

soil composition → soil water saturation

pond loop ☐ ☐ wet
☐ damp
☐ dry

_____ % sand
 _____ % gravel
 _____ % silt
 _____ % loam
 _____ % clay



② Dimensions**

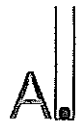
(see drawing top right)

trench(es) width (a): _____ inches total trench(es) length: _____ ft.
 trench(es) height (b): _____ ft. total pipe(s) length: _____ ft.
 distance between trenches*(c): _____ ft. number of trench(es): _____

* Only if more than one trench

** For pond loop installation, just fill the information about the "total pipe(s) length"

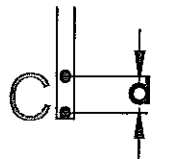
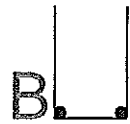
③ Configurations



Which configurations* is installed (A to P): _____
 * If none, do the configuration drawing on this report including the dimensions

distance between pipes* (d): _____
 * Except for configurations: A; B; D; F; I; L.

slinky pitch* (e): _____
 * Only for configurations O and P.

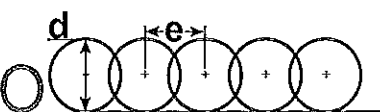
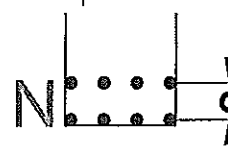
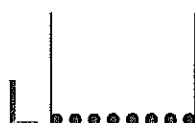
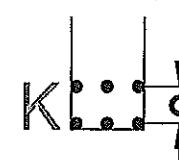
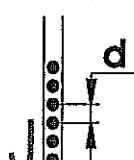
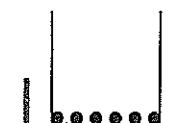
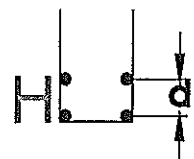
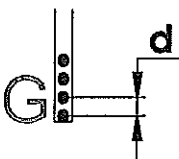
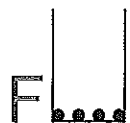
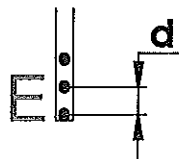
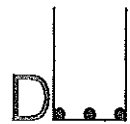


④ HDPE Pipe Specifications

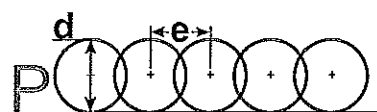
nominal Pipes Diameter: _____"

pipe designation code: PE _____

pipe serie number: SDR- _____



vertical slinky - against the wall of the trench



horizontal slinky - flat on the ground or on the bottom of the lake