



Canadian
GeoExchange
Coalition

Coalition
canadienne
de l'énergie
géothermique

Installers' Course

Burnaby, December 13-15, 2009

BCIT Burnaby
3700 Willingdon Avenue
Burnaby, BC, V5G 3H2

Global Quality GeoExchange™ Program®

The Canadian GeoExchange™ Coalition (CGC) is pleased to present its **Canadian GeoExchange™ Coalition Installers' Course**. The course is offered by one of our qualified trainers.

This training is part of an ongoing market transformation initiative started in 2001 by the CGC and aiming at creating a unified and strong Canadian geexchange industry. This installers' training is one of the six training modules developed by the CGC as part of its **CGC Global Quality Geo-Exchange™ Program®**.

The three-day comprehensive workshop is designed for geexchange developers, architects, manufacturers, distributors, dealers, installers, engineers, plumbers, designers, homeowners, excavators, geologists, contractors involved with HVAC, trenching/drilling, ducting, sheet metal, persons involved with environmental issues or sustainable energy, and individuals who desire a working knowledge of this innovative technology. Representatives from public utilities, private utilities, and rural electric cooperatives can also benefit from this training.

Upon successfully passing the examination, you will receive a CGC Installers' Training Certificate which is the pre-requisite to apply for CGC Accreditation for industry professionals. Installer accreditation will help you open new markets and offer your customers an increased level of confidence knowing their system is installed by a qualified installer knowledgeable of Canadian standards, regulations, and geology.

Instructor — Eric Dickie, BSc., MA

The instructor, Eric Dickie, is President and Director of Delta Geothermal Ltd. Eric has been involved with installations of a variety of geexchange designs – vertical, horizontal, lake or ocean-based, and open loop. He brings that experience to his teaching sessions. The ongoing hands-on projects that Eric keeps active in allow him to provide added credibility and assistance to students when in the teaching mode. Eric is an experienced geexchange trainer and has consistently received positive evaluations.

His past is technically based and includes teaching in the technology education sector, which led him to develop aspects of effective education. His past and present responsibilities allow him to further develop strong problem-solving skills, something that is a necessity in the industry.

His educational background includes a bachelor's degree in math and physics, an education certificate, inter-provincial journeyman's papers in carpentry, a master's degree in educational leadership, and of course his training and ongoing learning to certify him as an instructor in heat management.

As an individual, he believes strongly in the validity of geexchange technologies. He recognizes that one of the potential pitfalls of the industry is a significant increase in demand, leading to unqualified people becoming involved and running the risk of negative development within the industry. He uses his unique set of skills to help move the geexchange industry in a direction that develops trained and accredited geexchange experts, and ultimately leads to the continuation of a successful industry for all.

The Canadian GeoExchange™ Coalition acts as the industry catalyst to unite private and public sector stakeholders, and to expand the market for ground source heat pumps and geexchange™ technology in Canada. As the nexus of information, training, certification, standards and public awareness, our mandate is to work with stakeholders to build the necessary infrastructure to foster the growth of the Canadian geexchange™ industry.

To learn more about the Coalition and its numerous efforts towards a structured market transformation of the Canadian geexchange market, please consult our website at

www.geoexchange.ca



Canadian GeoExchange™ Coalition

Installers' Course

Target audience: Individuals who are involved in the installation of geoechange systems but who will not necessarily be engaged in the design of the system itself. The persons or individuals who should take this course usually belong to a trade or technical profession and are authorized or required by law to perform certain duties on a geoechange site / project. Depending on the province, this person is a driller, an electrician, a plumber, an HVAC or a refrigeration specialist. In some provinces, the installation of a geoechange system may require more than one such individual.

The Coalition offers the following six courses:

- ◆ Canadian GeoExchange™ Coalition Drilling, Well Construction and Loop Installation Course
- ◆ Canadian GeoExchange™ Coalition Installers' Course
- ◆ Canadian GeoExchange™ Coalition Residential Designers' Course
- ◆ Canadian GeoExchange™ Coalition Commercial Designers' Course
- ◆ Canadian GeoExchange™ Coalition Municipal Inspectors' Course
- ◆ Canadian GeoExchange™ Coalition Direct Expansion Course

Please note that the Installers' Course is a pre-requisite to both the residential and the commercial designers' courses. Contact the CGC to inquire about what course(s) best fit your needs.

Pre-requisite: None **Duration:** 3 full days + examination **Cost:** CAN\$ 995.00 + applicable taxes

Outcome: Upon passing the examination with success, the trainee will receive a **CGC Training Certificate**. The successful trainee can then apply for CGC installer accreditation. In addition to training, installer accreditation also requires the appropriate credentials in the province/territory where the individual is to perform his/her work as well as field experience and/or the appropriate supervision from an experienced installer. Please refer to the CGC Accreditation and Certification Program for further details

Training Overview

I: Introduction

Geothermal Energy
 Geothermal – A Definition
 The Geoechange Concept
 Geoechange Systems
 Fundamentals of Geoechange Systems
 Course Specifications
 Geoechange Means an Integrated Approach
 Installers & Project Management
 Steps to Installing a Geoechange System

II: Site & Building Evaluation

Heat Loss / Heat Gain Basics
 Site Survey Worksheet
 Review of Existing Geotechnical Records

III: Choosing an Appropriate Heat Pump

Heat Pump sizing and Selection
 Caution and Notes
 Domestic Hot Water Preheating
 Other Applications
 Further Reading

IV: Soil and Rock Properties and Classification for Canada

Classifying Soil and Rock Properties

V: Configuring the Ground Heat Exchanger

Deciding on Open or Closed Loop
 What Is Groundwater?
 Site Survey – Hydrogeological Investigation
 Site Survey – Test Well Specification
 Site Survey – Commercial Installation Consideration
 Site Survey – Sampling and Testing
 Site Survey – Test Well Reporting
 Site Survey – Water Quality
 Production Well Development – Open Loop
 Production Well Completion – Open Loop
 Underground Piping – Open Loop
 Rejection Well Considerations
 Other Installation Considerations
 Deciding on Horizontal or Vertical Heat Exchanger – Closed Loop
 Horizontal Trench Length and Configuration – Closed Loop
 Vertical Heat Exchanger Length and Configuration – Closed Loop
 Drilling and Trenching Equipment
 Installing the Heat Exchangers
 Grouting and Backfilling
 Trenching and Excavation – Closed Loop
 Trenching and Excavation
 Laying Runouts in Trenches
 Assembly and Installation of the HX – Lake Loop

Assembly and Installation of the HX
 Floating the Ballasted Assembly into Position
 Flushing and Purging
 Charging the Heat Exchanger
 Selecting Antifreeze and Concentration
 Calculating Flow Rate and Pressure Loss
 Building Penetration / HX Installation
 Further Reading

VI: Considering and Dealing with Distribution Systems

Mechanical Room Connection
 Locating and Connecting the Heat Pump Unit
 Connecting the GHX to the Heat Pump(s)
 Radiant Floor Heating with Water-to-Water Heat Pumps
 Water-to-Water Systems
 Air System Design Basics
 Further Reading

VII: Commission and Post-Installation

Pressure Drop Test & Calculations
 Residential: Pre-Start-Up Checks
 Residential: Heat Pump Start-Up
 Residential: Heating Performance Check
 Residential: Final Steps of Installation – “As-Built” Book
 Residential: “As-Built” Book – Final Site Report
 Residential: “As-Built” Book – Post Installation Checklist
 Residential: “As-Built” Book – Labels
 Residential: “As-Built” Book – General Documentation
 Residential: “As-Built” Book – Owner Documentation
 Residential: “As-Built” Book – Summary
 Residential: Heating Performance Check – Review
 Residential: Heating Performance Check
 Commercial: Pre-Start-Up Checks
 Commercial: Heat Pump Start-Up
 Commercial: Training Facility Maintenance Staff
 Commercial: Preparing the O & M Manual
 Commercial: Turnover
 Troubleshooting
 Troubleshooting GSHP Systems – Heat Pump Unit
 Troubleshooting GSHP Systems – Ground Heat Exchanger
 Commercial: Testing and Verification

VIII: Project Economics & Benefits of Geoechange Technology

Economics and Benefits
 Warranty
 Winning the Job
 Earning Money from the Job

IX: Annex

Supplementary Materials



The CGC Global Quality GeoExchange™ Program®

A step by step program schematic from training and accreditation of individuals, qualification of firms and system certification

STEP 1—TRAINING

- ◆ Training is required for all **individuals** directly involved in the design or installation of a geoechange system.
- ◆ There are **six distinct** training courses available in Canada:
 - ⇒ Training for drillers: **Canadian GeoExchange™ Coalition Drilling, Well Construction and Loop Installation Course**
 - ⇒ Training for installers: **Canadian GeoExchange™ Coalition Installers' Course**
 - ⇒ Training for residential designers: **Canadian GeoExchange™ Coalition Residential Designers' Course**
 - ⇒ Training for commercial designers: **Canadian GeoExchange™ Coalition Commercial Designers' Course**
 - ⇒ Training for municipal inspectors: **Canadian GeoExchange™ Coalition Municipal Inspectors' Course**
 - ⇒ Training for DX installers: **Canadian GeoExchange™ Coalition Direct Expansion Course**
- ◆ Courses details are available on CGC website at www.geo-exchange.ca

STEP 2—APPLICATION FOR INDIVIDUALS ACCREDITATION

- ◆ CGC **training certificates or equivalent are required** to apply for accreditation.
- ◆ Please **read carefully** the accreditation application forms (a different application form is available for drillers, installers, residential designers and for commercial designers) for all the rules and conditions pertaining to accreditation
- ◆ For training equivalency and recognition of experience in the geoechange industry, please **read carefully** the **CGC Clarification Statement on CGC Global Quality GeoExchange™ Program®** AND the Installer Training Equivalency Criteria for Accreditation Under the **Global Quality GeoExchange™ Program®** as issued on May 30th, 2007.
- ◆ Every individual interested in participating in CGC Global Quality GeoExchange™ Program® **MUST** apply for accreditation.

STEP 3—APPLICATION FOR COMPANY QUALIFICATION

- ◆ Companies/contractors, hiring CGC accredited individuals for drilling, installation or design, either as full time employees or as subcontractors, must be qualified under the **CGC Global Quality GeoExchange™ Program®**. For most of the companies/contractors, this will only be a simple formality.
- ◆ However, company qualification is an important step to ensure **quality installation** and **consumer protection**:
 - ⇒ It allows the CGC to verify the credentials of the companies/contractors who will ultimately provide the consumers with a guarantee on their geoechange system.
 - ⇒ It will allow the CGC to screen out of the **CGC Global Quality GeoExchange™ Program®** companies/contractors that have been found guilty of various professional malpractice and/or breach of CGC Code of Conduct.
 - ⇒ Etc.
- ◆ Qualification of companies will allow CGC to recognize the highest quality of workmanship, and highest ethical standard and screen out mushroom companies only interested in short terms gains and benefits.
- ◆ Company/contractor qualification is also an important step in the CGC management of the consumer complaint mechanism.

STEP 4—APPLICATION FOR SYSTEM CERTIFICATION

- ◆ A **CGC Certified GeoExchange™ System** is a geoechange system on which CGC accredited drillers, installers and designers have been involved.
- ◆ A **CGC Certified GeoExchange™ System** is a geoechange system that follows C-448-02 at a minimum.
- ◆ A **CGC Certified GeoExchange™ System** is a geoechange system that fully satisfies all relevant municipal, provincial and federal regulations.
- ◆ A **CGC Certified GeoExchange™ System** is a geoechange systems that meets CGC Certification Guidelines.
- ◆ A **CGC Certified GeoExchange™ System** is the condition to access utilities programs, as well as provincial and federal grants programs if and when available.



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Registrations received after December 1st will have a \$100 late booking surcharge and attendees will pick up their course materials at the course rather than having them shipped directly

Section 1—Registration Details

MR MS FIRST NAME _____ LAST NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

DELIVERY ADDRESS _____
(IF DIFFERENT FROM ABOVE)

CITY _____

PROVINCE / STATE _____ POSTAL CODE / ZIP CODE _____

E-MAIL _____

PHONE _____ FAX _____

BACKGROUND (position, experience, interest) _____

How did you hear about this course? _____

Do you have allergies to any foods? _____

Section 2—Payment Details

Please use this registration form as your invoice

Course registration fee is CAN\$ 995.00 + applicable taxes (before December 1st)

Newfoundland, New Brunswick, Nova Scotia : \$ 1,124.35 — Québec: \$ 1,123.11 — All Other Provinces: \$ 1,044.75 — USA: \$995

Registration fee includes an extensive reference manual which reflects Canadian codes, standards and regulations, Canadian geological conditions and temperatures, a copy of the current CSA 448 Standard, 380 + Power Points for in-class training, other relevant documentation and an examination fee.

Please note that the delivery of this training session is offered by GeoExchangeBC. All correspondence regarding the delivery of this course should be addressed directly to GeoExchangeBC.

CHEQUE ENCLOSED

Cheques should be made to the order of GeoExchangeBC

Please mail this registration form with your payment to:

Upon reception of payment, final course details will be sent to registered participants.

GeoExchangeBC:

Please send registration form to the attention of Kim Savage at GeoExchangeBC. You may also address your questions and inquiries to:

**12035 56th Avenue
Surrey, BC V3X 2W9**

**Kim Savage at 604-596-0696
admin@geoexchangebc.com**