



Municipal Thermal Energy Network Accelerator



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*The New York
Community Trust*
of Westchester

A COLLABORATION BETWEEN:

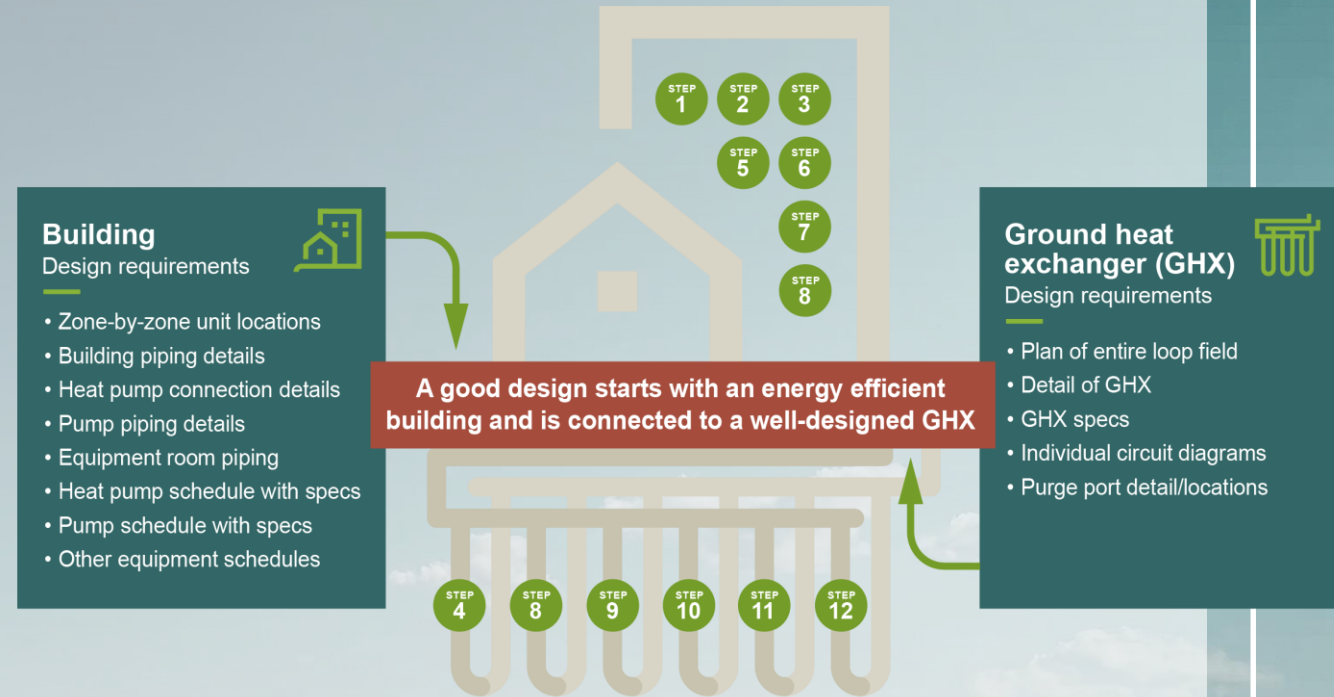


IGSHPA's New Training Curriculum

Background • Available Courses

February 23, 2026

Jeff Hammond, Executive Director, IGSHPA



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Learning Objectives

- Understand a “little bit of history” about IGSHPA and training
- Learn about IGSHPA training courses
- Review the online self-paced modules
- Look at training specific to this project
 - Inspection & Verification
 - Selecting a GSHP Team
- Q & A

A Little Bit of History ...



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A Strong Foundation

- 1974: Oklahoma State Univ. research starts on ground source heat pumps
- 1987: Founding of IGSHPA
- 1988: First GSHP installation manual published (OSU/IGSHPA/NRECA)
- Late 1980s: GSHP training workshops started
- 1996: First IGSHPA design and installation standard
- And much more ...
- 2020: IGSHPA became an independent non-profit



What's New?



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Recent Background

- July 2023 to December 2025 training project ...
 - Hired 3 employees to focus on workforce development/training
 - Contracted with CSA Group for new accredited training and certification program (was completed at the end of 2025)
 - Worked on industry “tools” for technology understanding
- Complete curriculum available January 1, 2026
 - Online self-paced courses
 - Instructor-led courses
 - Certification and certificate programs

Why Change?

- Original IGSHPA courses were developed nearly 40 years ago
- Courses were designed for a wide audience
 - e.g., “grouting” and “ductwork” in the same course
 - As the industry grows, we need job-specific training (next slide)
- Courses were typically 3 days
 - Need to be “smaller bites” for better accessibility
 - Need to be less cost for shorter courses
 - Need to be self-paced online options
- Needs bi-national certification (Canada & U.S.)
- Needs to be based upon C448 Standard

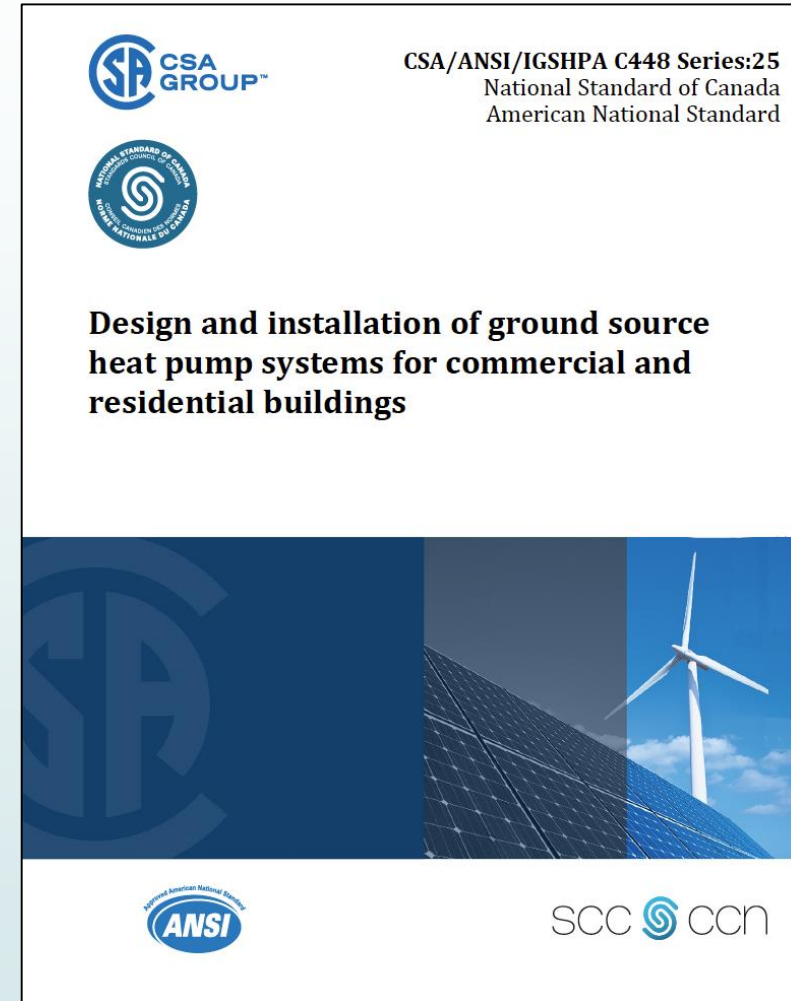
DOE Job Descriptions for GSHP Systems



- 5.1 Geothermal Heat Pump System Engineer / Designer
- 5.2 Geological Formation Thermal Properties Tester
- 5.3 Ground Loop Heat Exchanger Grouter
- 5.4 Ground Loop Heat Exchanger Looper
- 5.5 Vertical Loop Driller
- 5.6 Horizontal Directional Driller
- 5.7 Geothermal Heat Pump System Water Well Driller
- 5.8 Geothermal Heat Pump System Water Well Pump Installer
- 5.9 Geothermal Heat Pump System Installer
- 5.10 Geothermal Heat Pump System Operations/Maintenance Technician
- 5.11 Geothermal Heat Pump System Inspector/Regulator
- 5.12 Geothermal Heat Pump System Commissioning Agent
- 5.13 Geothermal Heat Pump System Project Manager
- 5.14 Geothermal Heat Pump System Trainer

C448 Standard 2025 Edition

- 2025 edition published in May
- **Basis for all new IGSHPA training**
- Many new updates
- Consolidation of redundant clauses
- Nearly 250 pages!
- Significant price discount for IGSHPA members (licensed PDF version)
- 2017 IGSHPA Standards have been sunset → C448 is the new IGSHPA Design & Installation Standard



Why Did IGSHPA Partner with CSA?

- CSA (Canadian Standards Association) is an international SDO (Standards Development Organization) that ...
 - Works with IGSHPA and ANSI on the bi-national (Canada-U.S.) design and installation standard for commercial and residential ground source heat pumps (CSA/ANSI/IGSHPA C448)
 - Develops ANSI accredited curriculum
 - Has bi-national certification programs
 - Has decades of experience with HVAC training programs and certification
 - Has offices throughout the world (Canada, U.S., Europe, Asia, India)
 - Already has contracts with IGSHPA

Statistics

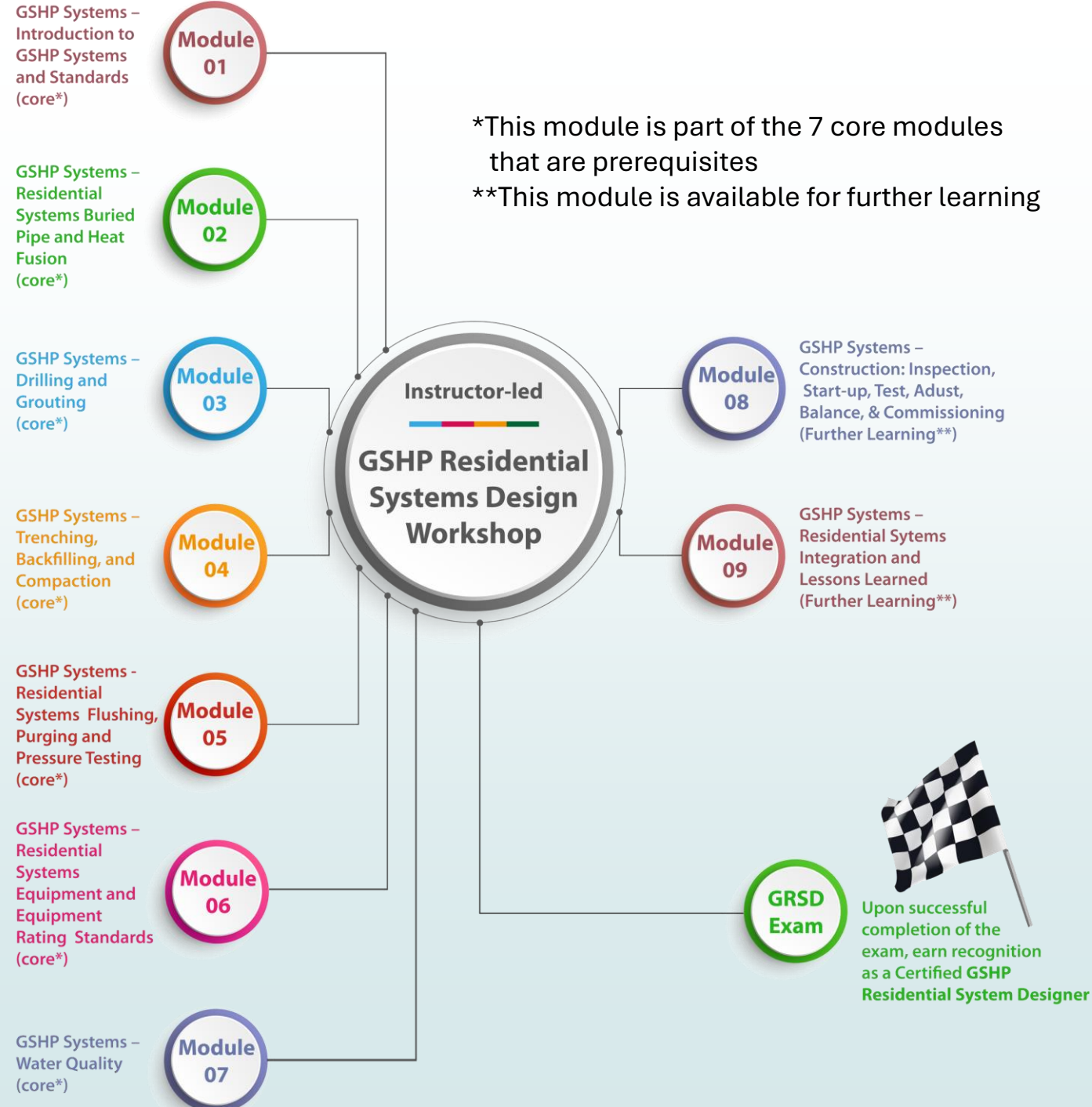
- 17 new ANSI/CSA accredited courses
 - 14 online self-paced modules
 - 2 instructor-led
 - 1 online course
- 3 new IGSHPA developed courses
- 3 new certification programs
- 3 new certificate programs
- 2 new informational courses
- 2 troubleshooting videos



**22 courses /
6 certification
& certificate
programs
completed!**

Residential Designer

- Self-assessment tool helps determine which online modules (if any) are required before attending workshop
- Optional online modules available for further learning
- CSA/IGSHPA online certification exam

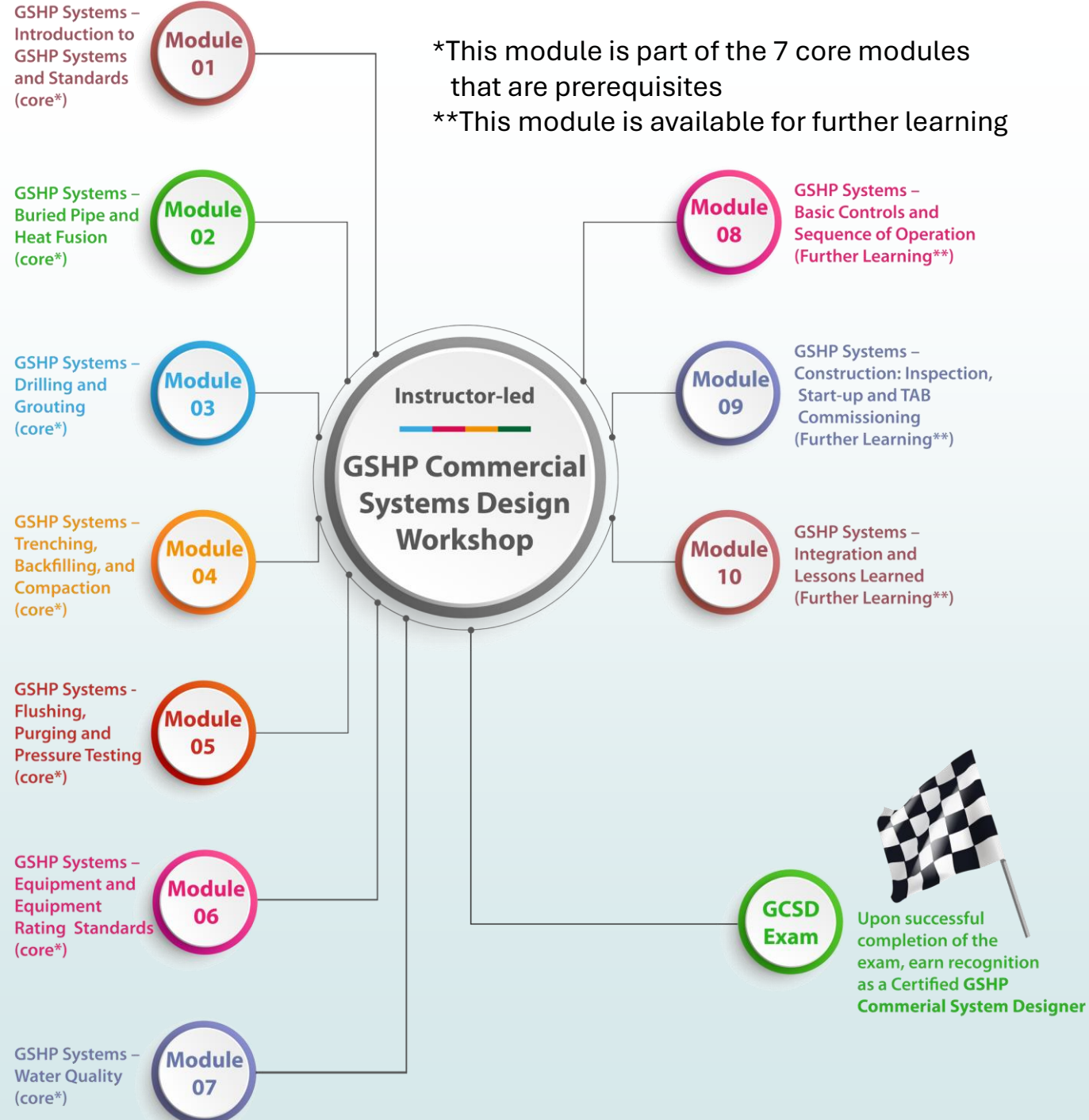




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Commercial Designer

- Self-assessment tool helps determine which online modules (if any) are required before attending workshop
- Optional online modules available for further learning
- CSA/IGSHPA online certification exam



Inspector

- Fully online course
- CSA/IGSHPA online certification exam

(more detail later in the presentation)

GSHP Systems –
Technology,
Terminology,
and Standards
Required for
Inspection

**Module
01**

GSHP Systems –
Installation
Fundamentals
for Inspection
and Verification

**Module
02**

GSHP Systems –
Inspecting
Ground,
Groundwater,
and Surface Water
Heat Exchangers

**Module
03**

GSHP Systems -
Project Delivery
and Inspection
Skills Application

**Module
04**

Online Curriculum

**GSHP System
Verification
and Inspection**

**GSVI
Exam**



Upon successful
completion of the
exam, earn recognition
with a GSVI Certification

GHX Installer

- Five online modules are prerequisites to prepare attendees for two days of intensive training
 - All type of GHXs
- IGSHPA certificate exam

GSHP Systems –
Introduction to
GHX Installer
Course*

Module
01A

GSHP Systems –
Job Safety and
Hazards;
Resources*

Module
01B

GSHP Systems –
Types of Ground
Heat Exchangers
-- Closed Loop*

Module
02A

GSHP Systems -
Types of Ground
Heat Exchangers
-- Groundwater
(open loop)*

Module
02B

GSHP Systems –
Ground Heat
Exchanger
Selection and
Sizing*

Module
03

Instructor-led

**Residential /
Light Commercial
GHX Installer**

GHXI
Exam



Upon successful
completion of the
exam, earn recognition
with a GHX Installer
Certificate

*This module is part of the 5 modules
that are prerequisites

GSHP Residential Installation Technician

- One-day course
- Prerequisite: HVAC experience or technical degree
- 11 instructor-led modules
 - Setting the unit
 - Inside piping
 - Flushing & purging piping
 - Heat transfer fluids overview
 - Tools & testing
 - Well water systems
 - Wiring & controls
 - Domestic hot water
 - Split systems
 - Pre-start review
 - Start up / performance verification



Upon successful completion of the exam, earn recognition with a GRIT Installer Certificate

GSHP Residential Service Technician

- One-day course
- Prerequisite: HVAC experience or technical degree
- 8 instructor-led modules
 - Overview & introduction
 - Waterside service/diagnostics
 - Basic unit troubleshooting
 - ECM blower troubleshooting
 - Refrigeration best practices
 - Refrigeration principles
 - Servicing beyond the unit



**GRST
Exam**

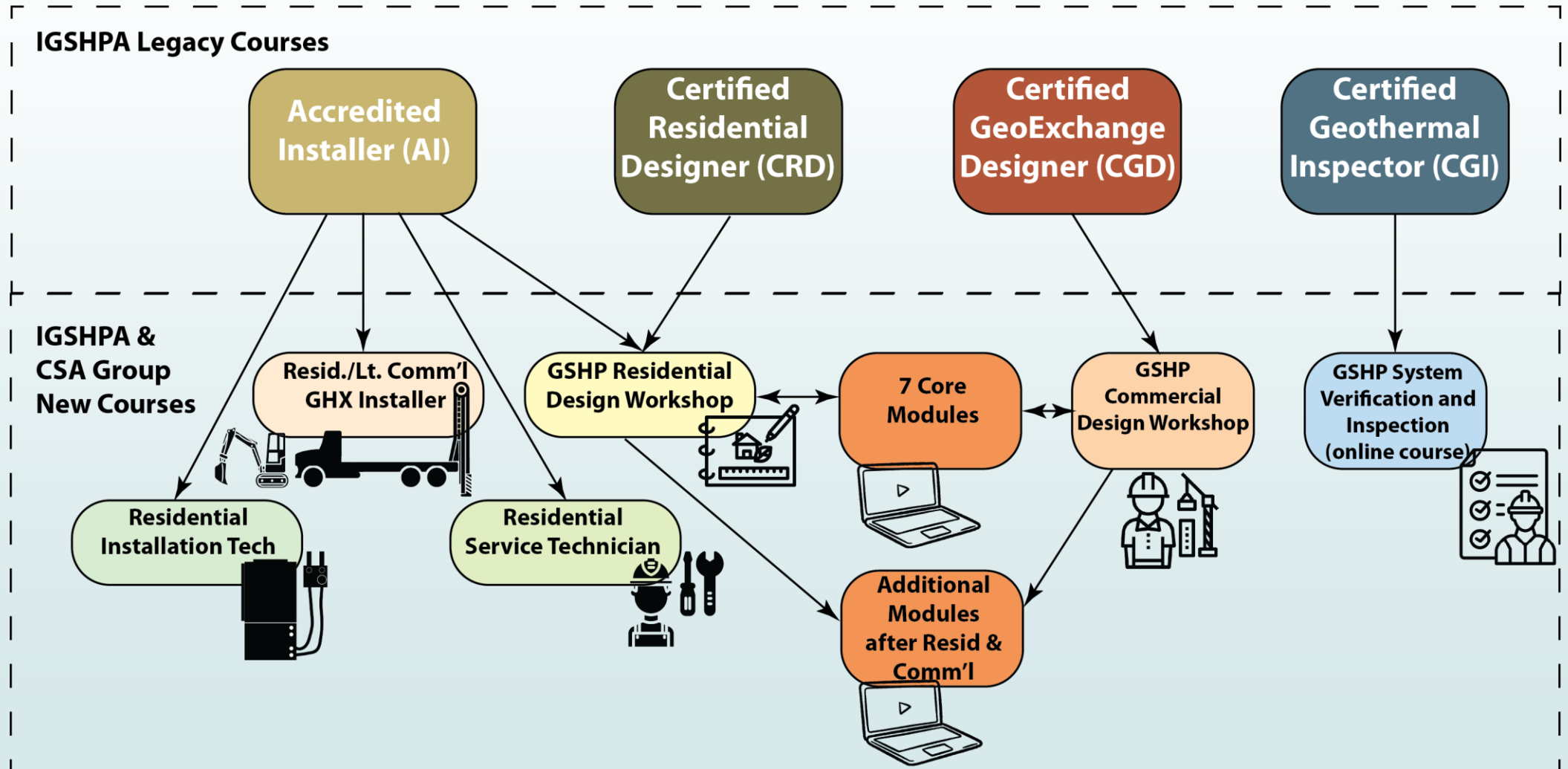


Upon successful completion of the exam, earn recognition with a GRST Service Technician Certificate

Other New IGSHPA Courses

- Selecting a Ground Source Heat Pump Team (more later)
- Geo 101 for electric utilities – complete
- Service Technician for trade school curriculum (in the works)
- Installation Technician for trade school curriculum (in the works)
- Driller training
 - Working with Geothermal Drillers Association, National Ground Water Association, Fleming College, Labor Unions, and other stakeholders

Legacy Course Transition



What If I Want to Upgrade to the New Certifications/Certificates?

IGSHPA upgrade Paths from Legacy Certifications/Certificates, effective January 1, 2026						
Legacy Courses	Eligible to take exam without taking the course -- NOTE 1					
	GRSD ²	GCSD ³	GSVI ⁴	GRIT ⁵	GRST ⁶	GHXI ⁷
Accredited Installer (AI)	X			X	X	X
Certified GeoExchange Designer (CGD)		X				
Certified Residential Geothermal Designer (CRD)	X					
Certified Geothermal Inspector (CGI)			X			

NOTES:

1. Must have a current (i.e., not expired) certification/certificate. Contact IGSHPA for a 25% discount coupon (current IGSHPA members only).
2. GSHP Residential System Designer certification (\$450 exam fee through CSA Group)
3. GSHP Commercial System Designer certification (\$450 exam fee through CSA Group)
4. GSHP System Verification and Inspection certification (\$450 exam fee through CSA Group)
5. GSHP Residential Installer Technician certificate (\$100 exam fee through IGSHPA)
6. GSHP Residential Service Technician certificate (\$100 exam fee through IGSHPA)
7. Ground Heat Exchanger Installer certificate (\$100 exam fee through IGSHPA)

IMPORTANT NOTE: All of the new training is based upon the CSA/ANSI/IGSHPA C448:25 Series *Design and Installation Standard for Commercial and Residential GSHP Applications*. It is highly recommended that you purchase the standard and become familiar with it before starting the exam. IGSHPA members can purchase a licensed PDF at a substantial discount on the IGSHPA Standards page at igshpa.org.

Look at Training Specific to this Project



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GSHP System Verification & Inspection (GSVI)

- One of two types of individuals
 - Inspector working for city/county, experienced with building or piping inspections
 - Project manager, construction manager, or individual familiar with overseeing design and installation on behalf of owner
 - Architect/engineering firm (engineer of record)
 - General contractor
 - Third party consultant

GSHP System Verification & Inspection (GSVI)

- Target Audience
 - Inspectors / Regulators / AHJs
 - Project Managers
 - Construction Professionals, including:
 - Construction Inspectors
 - Construction Managers
 - Commissioning Agents
 - Contractors (General, Mechanical, HVAC)
 - Utilities and Government Employees
 - Professional Engineers (Mechanical, Civil, Geological)



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Online Course

- Fully online
- 4 modules
 - 1 to 2.5 hours each
- Interactive interface
- Videos
- Quizzes
- Tips



Interactive Interface

- “Learn more” buttons
- Ability to scroll back to review lesson material

Shipping, storage, and installation of pipe

On-site storage and material cleanliness

CSA/ANSI/IGSHPA C448.0, Clauses 5.5.1 and 5.5.2



Select each "+" to learn more.

Shipping and on-site storage	+
Keeping material clean	+
Design specifications	+

Why proper pipe storage matters

Imagine flushing and purging pipes only to find HDPE shavings, screws, coupons, cell phones, water bottles, or even snack wrappers! These items have all been found in real situations causing serious issues and



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Videos



Quizzes

- Check comprehension of material along the way
- Instant feedback on progress
- Preparation for graded quiz (micro-credential)
- 
- Preparation for certification exam

The following specification is provided on a set of drawings for a small commercial building GHX that is constructed of two circuits of four U-bend assemblies. The U-bend assemblies are 1-1/4-in DR-11 and the field header is 2-in DR-11.

7. GROUND LOOP TESTING
A. ALL FUSION JOINTS AND LOOP LENGTHS SHALL BE VISUALLY CHECKED TO VERIFY THAT NO LEAKS HAVE OCCURRED DUE TO FUSION JOINING OR SHIPPING DAMAGE.
B. ALL LOOPS SHALL BE PRESSURE TESTED BEFORE INSTALLATION, AND ALL HORIZONTAL COMPONENTS OF THE GROUND HEAT EXCHANGER SHALL BE PRESSURE TESTED PRIOR TO BACKFILLING.
C. EACH SUPPLY AND RETURN CIRCUIT SHALL BE FLUSHED AND PURGED IN THE FORWARD AND REVERSE DIRECTIONS WITH WATER AT A MINIMUM VELOCITY OF 2 FT./SEC. (0.6096 M/SEC.) THROUGH EACH PIPING SECTION. FLOW MUST BE MAINTAINED FOR A MINIMUM OF 15 MINUTES IN EACH DIRECTION TO REMOVE ALL DEBRIS AND AIR. TO VERIFY THAT ALL AIR IS REMOVED FROM THE SYSTEM, THE RETURN WATER VALVE TO THE TANK SHALL BE CLOSED. A CHANGE IN THE LEVEL OF FLUID IN THE PURGE PUMP TANK DURING PRESSURIZATION INDICATES AIR STILL TRAPPED IN THE SYSTEM. THE HEAT EXCHANGER SYSTEM PURGING SYSTEM SHALL BE COMPLETED SEPARATELY FROM THE BUILDING SYSTEM. A PUMP CAPABLE OF 50 GPM AT 51 FEET OF HEAD THROUGH ONE CIRCUIT AT A TIME SHALL BE USED TO FLUSH THE SYSTEM (EXCLUDING LOSSES FROM FLUSH/PURGE EQUIPMENT EXTERNAL TO THE PIPING SYSTEM).

What is the required flushing flow rate for a single 1-1/4-in U-bend assembly?

- ☐ 5.7 gpm (21.6 L/min)
- ☐ 9.0 gpm (34.1 L/min)
- ☐ 11.8 gpm (44.7 L/min)
- ☐ 18.5 gpm (70.0 L/min)

SUBMIT

Tips

- Throughout the modules



Access to a copy of CSA/ANSI/IGSHPA C448 Series is required to successfully complete this course. It is an essential part of a GSHP system inspection.

CSA Group Store

[CLICK TO ACCESS](#)

IGSHPA Standards Store

IGSHPA members can purchase CSA/ANSI/IGSHPA C448 Series at a discounted price.

[CLICK TO ACCESS](#)

GSHP System Verification & Inspection (GSVI)

- Module 1: GSHP Systems - Technology, Terminology, and Standards Required for Inspection -- *Learning Objectives*
 - Define terminology associated with GSHP systems.
 - Identify typical roles involved in a GSHP system construction project, and their key responsibilities.
 - Identify requirements of the CSA/ANSI/IGSHPA C448:25 Series of Standards, *Design and installation of ground source heat pump systems for commercial and residential buildings* applicable to a given scenario.
 - Locate and explain the role of federal, state, provincial, and local codes and standards as they relate to the design and installation of ground heat exchangers (GHXs).
 - Explain federal, state, provincial, and local codes and standards as they relate to the building mechanical system.

GSHP System Verification & Inspection (GSVI)

- Module 2: GSHP Systems - Installation Fundamentals for Inspection and Verification -- *Learning Objectives*
 - Explain the difference between piping materials permitted to construct a ground heat exchanger (GHX) and other piping materials that may be installed on a project site.
 - Identify typical errors made during construction that require correction prior to backfilling or submerging a GHX.
 - Explain the importance of grouting vertically and horizontally drilled boreholes correctly, and the impact of incorrect grouting.
 - Identify proper grouting materials for the ground heat exchanger design and installation.
 - Reference and apply the guidance of CSA/ANSI/IGSHPA C448 related to trenching, backfilling, and compaction to each installation.
 - Locate and comply with local requirements for relevant safety and health authorities and regulatory bodies relative to trenching and drilling.
 - Inspect the installation of pipe location tapes, wires, or devices as required by the ground heat exchanger design.
 - Explain the major steps for integrating outside and interior piping systems at system start-up, including flushing of the interior piping system.
 - Describe the correct steps in the ground heat exchanger pressure testing process and provide guidance when tests do not pass.

GSHP System Verification & Inspection (GSVI)

- Module 3: GSHP Systems - Inspecting Ground, Groundwater, and Surface Water Heat Exchangers --
Learning Objectives
 - Identify the type of ground, groundwater, or surface water heat exchanger on a set of construction documents and site observation and determine which sections of the Standard apply.
 - Explain major inspection points, including when they occur in the construction process, relevant to a specific project.
 - Identify installations or materials that are not in compliance with CSA/ANSI/IGSHPA C448 Series.
 - Propose steps to resolve compliance issues for ground, ground water, and surface water heat exchangers.

GSHP System Verification & Inspection (GSVI)

- Module 4: GSHP Systems - Project Delivery and Inspection Skills Application -- *Learning Objectives*
 - Confirm that installations are in conformance with CSA/ANSI/IGSHPA C448 Series:25
 - Explain the importance of current, clear, and concise specifications applicable to each unique project.
 - Examine engineering drawings, reference sections, and project specifications
 - Verify that proper materials and processes are used for the ground heat exchanger (GHX) design and installation.
 - Identify the points of inspection for all pipe, grout, and U-bend assemblies during construction of a GHX.
 - Recognize typical errors made during construction that require correction prior to commissioning a GSHP system.
 - Apply mechanical system construction principles to the installation and commissioning of GSHPs.
 - Review the GSHP start-up sheet or test, adjust, and balance report to confirm that ground loop pump(s), GSHP units and related accessories are operating according to the designer's specification and manufacturer's performance data catalog values.

GSVI Exam

- Equipment selection
 - Verify that GSHP installed equipment meets specifications
- Ground Heat Exchanger (GHX) installation review
 - Verify piping material(s) and fusion methods for conformance
 - Verify grouting type and material sampling
 - Verify drilling and borehole logs
 - Verify that installation provides component for proper flushing
 - Verify that vertical, horizontal, or surface water closed loop installation complies with CSA/ANSI/IGSHPA C448
 - Verify that groundwater installation complies with CSA/ANSI/IGSHPA C448

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GSVI Exam (con'd)

- Above ground and interior piping
 - Verify that type of piping, fittings, required support, valves for proper flushing, and spacing comply with CSA/ANSI/IGSHPA C448
- Flushing, pressure testing, water quality
 - Verify that test report complies with CSA/ANSI/IGSHPA C448
 - Verify that system was commissioned correctly and all valves are in the operational position
 - Verify that heat transfer fluid meets CSA/ANSI/IGSHPA C448 requirements
 - Verify that flushing apparatus and process comply with CSA/ANSI/IGSHPA C448
 - Verify that system pressures are in range of design specifications and material ratings

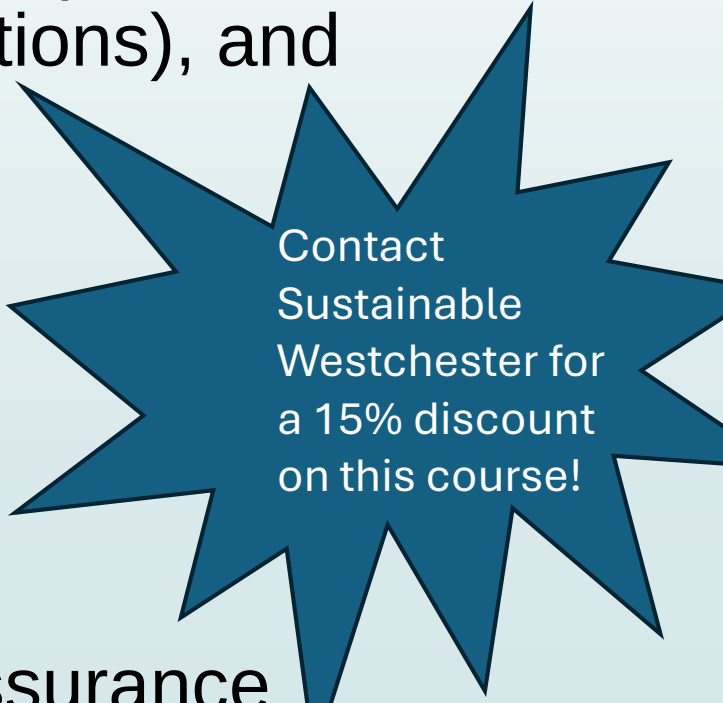
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GSVI Exam (con'd)

- Construction documents / construction support
 - Review ability for follow up with AHJ non-compliance report
 - Verify ability to demonstrate knowledge of required items to be included in inspection and verification report
 - Verify ability to demonstrate delivery documentation, including operation and maintenance manuals per CSA/ANSI/IGSHPA C448

Selecting a Ground Source Heat Pump Team

- Self-paced online course or virtual instructor-led
- Topics include:
 - RFI (Request for Information), RFP (Request for Proposal), RFQ (Request for Qualifications), and Project Information
 - Selecting a Mechanical Engineer
 - Preliminary GHX Site Planning
 - Thermal Conductivity Testing
 - Equipment Sizing and Controls
 - GHX Installation and Coordination
 - Contract Administration and Quality Assurance



Contact
Sustainable
Westchester for
a 15% discount
on this course!

Resources

- Information is online at igshpa.org
 - Click on “Training” menu
 - Training catalog and pricing
 - Course descriptions
 - Links to CSA and IGSHPA pages for registering
- CSA courses are also on the CSA Store at www.csastore.org/store
- Contact IGSHPA at info@igshpa.org or 217-212-2112

Helpful Tip: *Without a copy of the C448 standard, it's VERY difficult to pass the exams since all new courses are based upon the standard. Take advantage of the IGSHPA member discount on the licensed PDF of C448!*

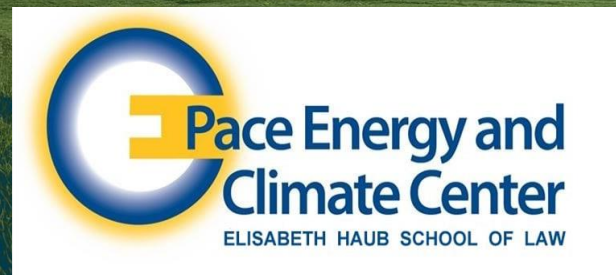
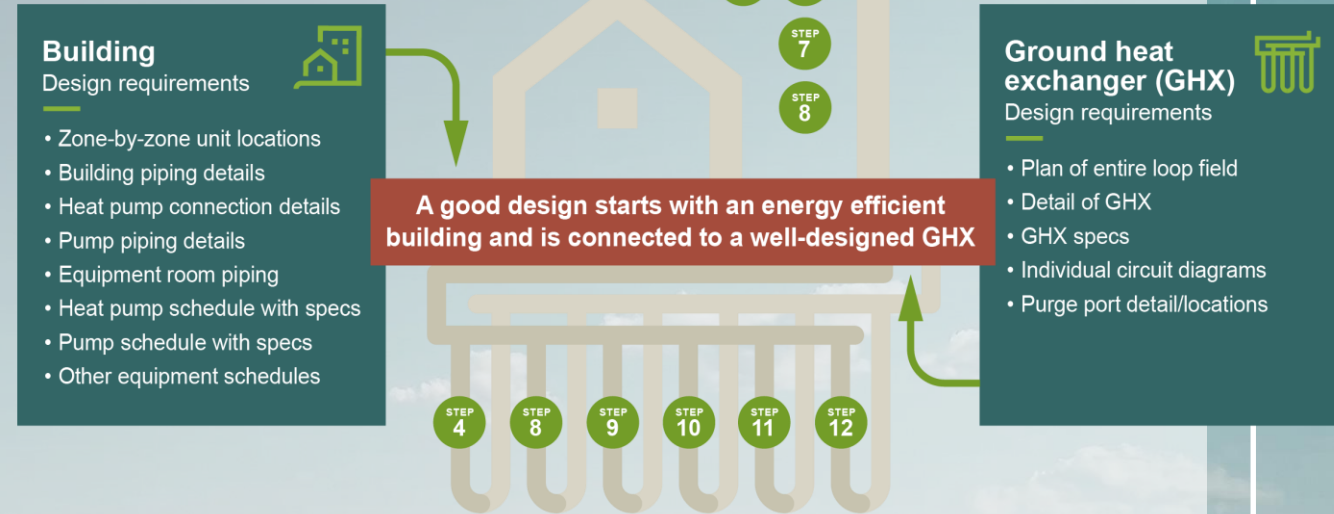
Questions???

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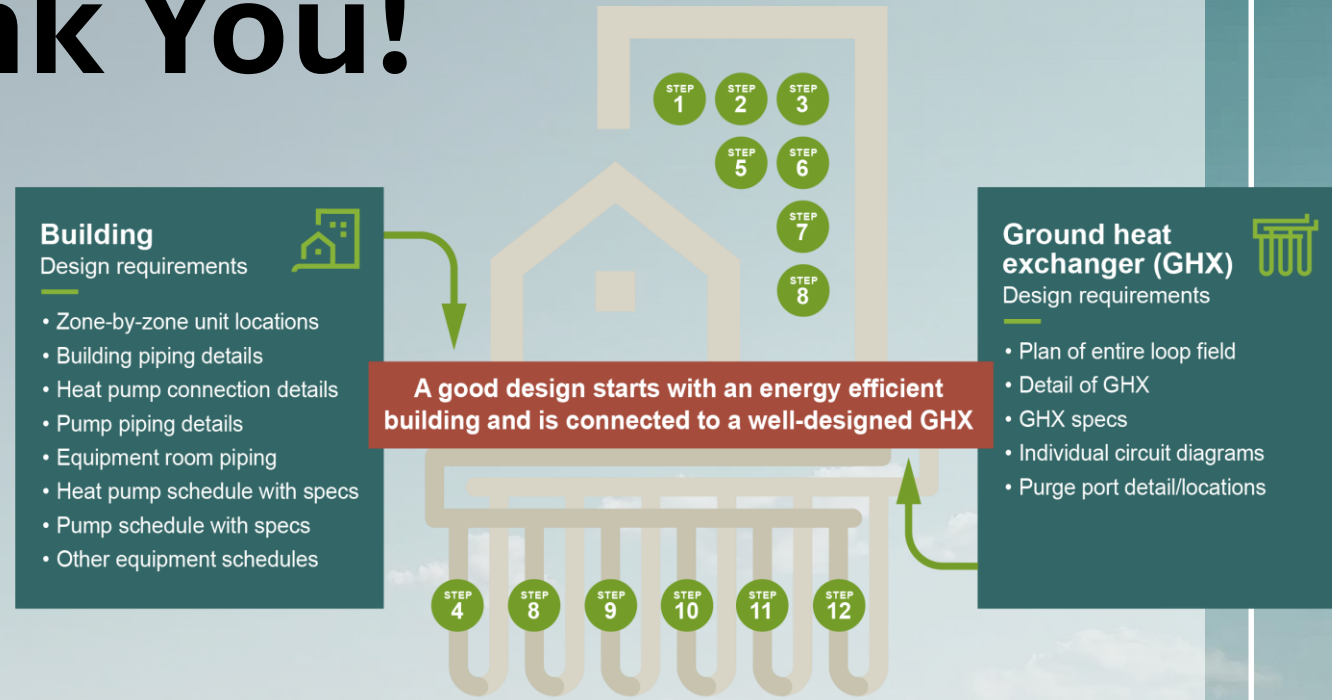
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