



**ANSI/CSA/IGSHPA C448 Series-16**  
*(reaffirmed 2021)*

# **Design and installation of ground source heat pump systems for commercial and residential buildings**



Endorsed by



International Ground Source Heat Pump Association

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## Δ Preface

**Note:** In the designation for this Standard, and for all of its parts, “ANSI/CSA C448” has been changed to “ANSI/CSA/IGSHPA C448”. This change applies to all references throughout this Series.

This is the first edition of the binational ANSI/CSA/IGSHPA C448 Series, *Design and installation of ground source heat pump systems for commercial and residential buildings*. It supersedes the previous editions published in 2013 and 2002 under the title, *Design and installation of earth energy systems*.

The ANSI/CSA/IGSHPA C448 Series now consists of the following parts:

- a) ANSI/CSA/IGSHPA C448.0, *Design and installation of ground source heat pump systems — Generic applications for all systems*;
- b) ANSI/CSA/IGSHPA C448.1, *Design and installation of ground source heat pump systems for commercial and institutional buildings*;
- c) ANSI/CSA/IGSHPA C448.2, *Design and installation of ground source heat pump systems for residential and other small buildings*;
- d) ANSI/CSA/IGSHPA C448.3, *Installation of vertical configured closed-loop ground source heat pump systems*;
- e) ANSI/CSA/IGSHPA C448.4, *Installation of horizontal configured closed-loop ground source heat pump systems*;
- f) ANSI/CSA/IGSHPA C448.5, *Installation of surface water (including submerged exchangers) heat pump systems*;
- g) ANSI/CSA/IGSHPA C448.6, *Installation of open-loop systems ground water heat pump systems*;
- h) ANSI/CSA/IGSHPA C448.7, *Installation of standing column well heat pump systems*; and
- i) ANSI/CSA/IGSHPA C448.8, *Installation of direct expansion heat pump systems*.

ANSI/CSA/IGSHPA C448.0 contains requirements applicable to any system within the scope of the ANSI/CSA/IGSHPA C448 Series. ANSI/CSA/IGSHPA C448.2 has alternative requirements for houses and small buildings. For systems within the scope of ANSI/CSA/IGSHPA C448.2, either ANSI/CSA/IGSHPA C448.1 or ANSI/CSA/IGSHPA C448.2 may be followed. Underground thermal energy storage systems formerly, contained within previous editions of this Standard under CSA C448.3, has been removed with UTS-specific information distributed among amended, distributed among, and included within ANSI/CSA/IGSHPA C448.0 and ANSI/CSA/IGSHPA C448.1, where appropriate. This edition introduces requirements for standing column well systems.

CSA Group gratefully acknowledges the National Ground Water Association, Westerville, Ohio, USA for its permission to use material from ANSI/NGWA-01-14 (*Water Well Construction Standard*); and the International Ground Source Heat Pump Association, Stillwater, Oklahoma, USA for its permission to use material from the IGSHPA *Closed-loop/geothermal heat pump systems design and installation standards* (2013 edition).

This Standard was prepared by the following Subcommittees and Task Forces:

- Generic Clauses Subcommittee;
- Piping Task Force;
- Equipment Task Force;
- Residential Subcommittee;
- Vertical Closed-Loop Ground Heat Exchangers Subcommittee;
- Horizontal Closed-Loop Ground Heat Exchangers Subcommittee; and
- Direct Expansion Subcommittee

under the jurisdiction of the Technical Committee on Earth Energy Systems and the Strategic Steering Committee on Performance, Energy Efficiency, and Renewables, and has been formally approved by the Technical Committee.

**Notes:**

- 1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
- 2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
- 3) *This Standard was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as “substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity”. It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
- 4) *To submit a request for interpretation of this Standard, please send the following information to [inquiries@csagroup.org](mailto:inquiries@csagroup.org) and include “Request for interpretation” in the subject line:*
  - a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
  - b) *provide an explanation of circumstances surrounding the actual field condition; and*
  - c) *where possible, phrase the request in such a way that a specific “yes” or “no” answer will address the issue.*

*Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are available on the Current Standards Activities page at [standardsactivities.csa.ca](http://standardsactivities.csa.ca).*
- 5) *This Standard is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to [inquiries@csagroup.org](mailto:inquiries@csagroup.org) and include “Proposal for change” in the subject line:*
  - a) *Standard designation (number);*
  - b) *relevant clause, table, and/or figure number;*
  - c) *wording of the proposed change; and*
  - d) *rationale for the change.*

# *ANSI/CSA/IGSHPA C448.0-16*

## *Design and installation of ground source heat pump systems — Generic applications for all systems*



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# ***ANSI/CSA/IGSHPA C448.0-16***

## ***Design and installation of ground source heat pump systems — Generic applications for all systems***

### **1 Scope**

#### **1.1**

This Standard applies to

- a) direct expansion ground source heat pumps for systems using ground heat exchangers as a thermal source or sink for heating and/or cooling, with or without a supplementary heating source; and
- b) unitary single package or split system liquid source and ground source heat pumps for all systems using groundwater, submerged heat exchangers, or ground heat exchangers as a thermal source or sink for heating and/or cooling, with or without a supplementary heating source.

#### **1.2**

This Standard also applies to thermal energy storage systems.

#### **1.3**

This Standard applies to new and retrofit installations.

#### **1.4**

This Standard covers minimum requirements for equipment and material selection, site survey, system design, installation, testing and verification, documentation, and commissioning and decommissioning.

#### **1.5**

This Standard applies to standing column well ground source heat pump systems.

#### **1.6**

The values given in SI units are the units of record for the purposes of this Standard. The values given in parentheses are for information and comparison only.

#### **1.7**

In this Standard, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; and “may” is used to express an option or that which is permissible within the limits of the standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.