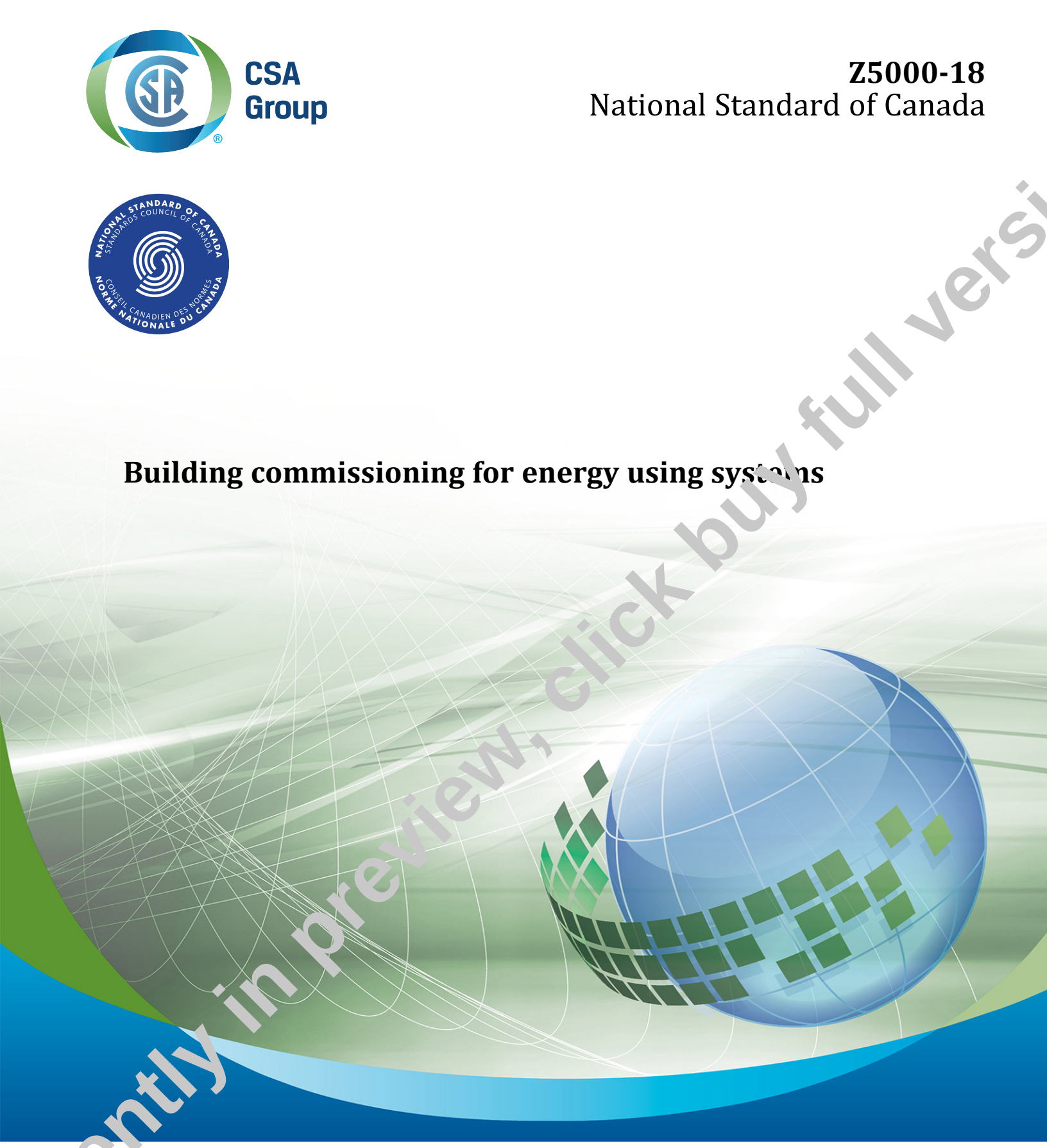
CSA Group

Z5000-18
National Standard of Canada

Building commissioning for energy using systems



Standards Council of Canada
Conseil canadien des normes

Legal Notice for Standards

Canadian Standards Association (operating as "CSA Group") develops standards through a consensus standards development process approved by the Standards Council of Canada. This process brings together volunteers representing varied viewpoints and interests to achieve consensus and develop a standard. Although CSA Group administers the process and establishes rules to promote fairness in achieving consensus, it does not independently test, evaluate, or verify the content of standards.

Disclaimer and exclusion of liability

This document is provided without any representations, warranties, or conditions of any kind, express or implied, including, without limitation, implied warranties or conditions concerning this document's fitness for a particular purpose or use, its merchantability, or its non-infringement of any third party's intellectual property rights. CSA Group does not warrant the accuracy, completeness, or currency of any of the information published in this document. CSA Group makes no representations or warranties regarding this document's compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL CSA GROUP, ITS VOLUNTEERS, MEMBERS, SUBSIDIARIES, OR AFFILIATED COMPANIES, OR THEIR EMPLOYEES, DIRECTORS, OR OFFICERS, BE LIABLE FOR ANY DIRECT, INDIRECT, OR INCIDENTAL DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES, HOWSOEVER CAUSED, INCLUDING BUT NOT LIMITED TO SPECIAL OR CONSEQUENTIAL DAMAGES, LOST REVENUE, BUSINESS INTERRUPTION, LOST OR DAMAGED DATA, OR ANY OTHER COMMERCIAL OR ECONOMIC LOSS, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR ANY OTHER THEORY OF LIABILITY, ARISING OUT OF OR RESULTING FROM ACCESS TO OR POSSESSION OR USE OF THIS DOCUMENT, EVEN IF CSA GROUP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, CSA Group is not undertaking to render professional or other services for or on behalf of any person or entity or to perform any duty owed by any person or entity to another person or entity. The information in this document is directed to those who have the appropriate degree of experience to use and apply its contents, and CSA Group accepts no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

CSA Group is a private not-for-profit company that publishes voluntary standards and related documents. CSA Group has no power, nor does it undertake, to enforce compliance with the contents of the standards or other documents it publishes.

Intellectual property rights and ownership

As between CSA Group and the users of this document (whether it be in printed or electronic form), CSA Group is the owner, or the authorized licensee, of all works contained herein that are protected by copyright, all trade-marks (except as otherwise noted to the contrary), and all inventions and trade secrets that may be contained in this document, whether or not such inventions and trade secrets are protected by patents and applications for patents. Without limitation, the unauthorized use, modification, copying, or disclosure of this document may violate laws that protect CSA Group's and/or others' intellectual property and may give rise to a right in CSA Group and/or others to seek legal redress for such use, modification, copying, or disclosure. To the extent permitted by licence or by law, CSA Group reserves all intellectual property rights in this document.

Patent rights

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. CSA Group shall not be held responsible for identifying any or all such patent rights. Users of this standard are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

Authorized use of this document

This document is being provided by CSA Group for informational and non-commercial use only. The user of this document is authorized to do only the following:

If this document is in electronic form:

- load this document onto a computer for the sole purpose of reviewing it;
- search and browse this document; and
- print this document if it is in PDF format.

Limited copies of this document in printed or paper form may be distributed only to persons who are authorized by CSA Group to have such copies, and only if this Legal Notice appears on each such copy.

In addition, users may not and may not permit others to

- alter this document in any way or remove this Legal Notice from the attached standard;
- sell this document without authorization from CSA Group; or
- make an electronic copy of this document.

If you do not agree with any of the terms and conditions contained in this Legal Notice, you may not load or use this document or make any copies of the contents thereof, and if you do make such copies, you are required to destroy them immediately. Use of this document constitutes your acceptance of the terms and conditions of this Legal Notice.

CSA Group

Standards Update Service

Z5000-18
February 2018

Title: *Building commissioning for energy using systems*

To register for e-mail notification about any updates to this publication
- go to **shop.csa.ca**
- click on **CSA Update Service**

The **List ID** that you will need to register for updates to this publication is **2425[illegible]**

If you require assistance, please e-mail **techsupport@csagroup.org** or call 4[illegible]-747-2233.

Visit CSA Group's policy on privacy at **www.csagroup.org/legal** to find out how we protect your personal information.

Canadian Standards Association (operating as "CSA Group"), under whose auspices this National Standard has been produced, was chartered in 1919 and accredited by the Standards Council of Canada to the National Standards system in 1973. It is a not-for-profit, nonstatutory, voluntary membership association engaged in standards development and certification activities.

CSA Group standards reflect a national consensus of producers and users — including manufacturers, consumers, retailers, unions and professional organizations, and governmental agencies. The standards are used widely by industry and commerce and often adopted by municipal, provincial, and federal governments in their regulations, particularly in the fields of health, safety, building and construction, and the environment.

Individuals, companies, and associations across Canada indicate their support for CSA Group's standards development by volunteering their time and skills to Committee work and supporting CSA Group's objectives through sustaining memberships. The more than 7000 committee volunteers and the 2000 sustaining memberships together form CSA Group's total membership from which its Directors are chosen. Sustaining memberships represent a major source of income for CSA Group's standards development activities.

CSA Group offers certification and testing services in support of and as an extension to its standards development activities. To ensure the integrity of its certification process, CSA Group regularly and continually audits and inspects products that bear the CSA Group Mark.

In addition to its head office and laboratory complex in Toronto, CSA Group has regional branch offices in major centres across Canada and inspection and testing agencies in eight countries. Since 1919, CSA Group has developed the necessary expertise to meet its corporate mission: CSA Group is an independent service organization whose mission is to provide an open and effective forum for activities facilitating the exchange of goods and services through the use of standards, certification and related services to meet national and international needs.

For further information on CSA Group services, write to
CSA Group
178 Rexdale Boulevard
Toronto, Ontario, M9W 1R3
Canada

A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at www.scc.ca.

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at www.scc.ca.

Standards Council of Canada
600-55 Metcalfe Street
Ottawa, Ontario, K1P 6L5
Canada

Standards Council of Canada
Conseil canadien des normes

Cette Norme Nationale du Canada n'est disponible qu'en anglais.

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 to judge its suitability for their particular purpose.

National Standard of Canada

Z5000-18

Building commissioning for energy using systems

Prepared by

CSA Group

®A trademark of the Canadian Standards Association, operating as "CSA Group"

Published in February 2018 by CSA Group
A not-for-profit private sector organization
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3

*To purchase standards and related publications, visit our Online Store at **shop.csa.ca***
or call toll-free 1-800-463-6727 or 416-747-4044.

ICS 91.040.01
ISBN 978-1-4883-1161-1

Contents

Technical Committee on Heating, Ventilation, Air-Conditioning, and Refrigeration 5

Subcommittee on Building Commissioning for Energy Using Systems 7

Working Group on Building Envelope 9

Working Group on Vertical/Horizontal Transportation and Electrical Systems 10

Working Group on Mechanical Systems 11

Working Group on Controls, Metering Systems, and System Integration 12

Preface 13

0 Introduction 15

1 Scope 16
1.1 General 16
1.2 Specific systems 17
1.3 Terminology 17

2 Reference publications 17

3 Definitions 19

4 Commissioning process 24
4.1 General 24
4.2 Responsibilities of the commissioning team 24
4.3 Pre-design phase 25
4.3.1 General 25
4.3.2 Commissioning authority
4.3.3 Commissioning plan
4.4 Design phase
4.4.1 General 26
4.4.2 Commissioning team 26
4.4.3 Codes and standards 28
4.5 Pre-construction phase 28
4.5.1 Procurement and project delivery 28
4.5.2 Contract documents and construction administration 28
4.5. Pre-construction meeting 28
4. .4 Pre-construction mock-up testing 28
4.6 Construction phase 28
4.6. General 28
4.6.2 Commissioning team 28
4.6.3 Static verification 29
4.6.4 Start-up 29
4.7 Functional performance testing 30

4.7.1 General *30*
4.7.2 Application *30*
4.7.3 Implementation *30*
4.7.4 Integration testing *30*
4.8 Interim acceptance *31*
4.9 Training and education *32*
4.10 Shop drawings *32*
4.11 Record drawings (as built) *33*
4.12 Manuals *33*
4.12.1 Maintenance and data manuals *33*
4.12.2 System operation manual *33*
4.13 Occupancy and operations phase *33*
4.13.1 Objective *33*
4.13.2 Modifications *33*
4.13.3 Documentation of modifications *34*
4.13.4 Monitoring-based commissioning *34*
4.14 Facility turnover activities *35*
4.15 Final documentation *35*
4.15.1 General *35*
4.15.2 Commissioning manual *35*
4.15.3 Additional commissioning documentation *35*

5 Specific systems *37*
5.1 Building envelope systems *37*
5.1.1 General *37*
5.1.2 System scope *38*
5.1.3 Schematic design review *39*
5.1.4 Design development review *39*
5.1.5 Construction documents *40*
5.1.6 Procurement and project delivery *40*
5.1.7 Contract documents and construction administration *40*
5.1.8 Pre-construction meeting *40*
5.1.9 Pre-construction mock-up testing *40*
5.1.10 Field review and performance testing *41*
5.2 Vertical/horizontal transportation systems *41*
5.2.1 General *41*
5.2.2 Measurement and verification *41*
5.3 Electrical systems *41*
5.3.1 General *41*
5.3.2 Lighting systems commissioning *41*
5.3.3 Static verification *41*
5.3.4 Start-up *42*
5.3.5 Functional performance testing *42*
5.3.6 Metering system functional performance testing *42*
5.3.7 Electrical main distribution systems *42*
5.3.8 Electrical branch distribution systems *42*
5.3.9 Lighting *42*
5.3.10 Approved sequences of operation *43*
5.4 Mechanical systems *46*

5.4.1 General *46*
5.4.2 Scope and documentation *46*
5.4.3 Intent *47*
5.4.4 Static verification *47*
5.4.5 Start-up *47*
5.4.6 Functional performance testing *47*
5.4.7 HVAC systems *47*
5.4.8 Refrigeration *48*
5.4.9 Plumbing and water systems *49*
5.5 Control systems *49*
5.5.1 General and intent *49*
5.5.2 System scope *49*
5.5.3 Start-up *50*
5.5.4 Static verification *50*
5.5.5 Functional performance testing *51*
5.5.6 Dynamic performance testing *52*
5.5.7 Approved sequences of operation *52*
5.6 Metering system commissioning *53*
5.6.1 General *53*
5.6.2 Static verification *53*
5.6.3 Functional performance testing *53*
5.6.4 Required metering *54*
5.6.5 Metering system commissioning. *54*
5.6.6 Functional performance testing *54*
5.6.7 Electrical energy *54*
5.6.8 Gas and liquid fuel supply energy *54*
5.6.9 District energy *55*
5.6.10 Site-generated renewable energy *55*
5.6.11 End-use metering *55*
5.6.12 HVAC system energy use *55*
5.6.13 Lighting system energy use *55*
5.6.14 Plug load system energy use *55*
5.6.15 Meters *55*
5.6.16 Data acquisition system *56*
5.6.17 Energy display *56*
5.6.18 Meter commissioning and calibration *56*
5.7 System integration *56*
5.7.1 General *56*
5.7.2 Intent *56*
5.7.3 System scope *56*
5.7.4 Static verification and start-up *57*
5.7.5 Integrated functional performance testing *57*
5.7.6 Retesting *57*
5.7.7 Unsatisfactory results *57*

Annex A (Informative) — General guidelines *60*
Annex B (Informative) — Building envelope systems guidelines *64*
Annex C (Informative) — Vertical and horizontal transportation systems guidelines *69*
Annex D (Informative) — Electrical systems guidelines *71*

Annex E (Informative) — Mechanical systems guidelines *72*
Annex F (Informative) — Control systems and integration guidelines *76*
Annex G (Informative) — Cost benefits of metering *79*
Annex H (Informative) — Owners checklist — Performance data sheets *87*
Annex I (Informative) — Bibliography *104*

Technical Committee on Heating, Ventilation, Air-Conditioning, and Refrigeration

A. Carrier	Hydro-Québec, Montréal, Québec *Category: User Interest/Regulatory Authority*	*Chair*
T.K. Lau	BC Hydro, Vancouver, British Columbia *Category: User Interest/Regulatory Authority*	*Vice Chair*
G. Butt	Emerson Electric Canada Limited, Markham, Ontario	*Non-voting*
J. Choy	Ontario Ministry of Energy, Toronto, Ontario	*Non-voting*
D. Chu	Independent Electricity System Operator (IESO), Toronto, Ontario	*Non-voting*
R. Cochrane	Natural Resources Canada, Ottawa, Ontario	*Non-voting*
G.E. Cooke	Air Solutions Incorporated, Cambridge, Ontario *Category: Producer Interest*	
B. Crossman	Caneta Research Inc./Caneta Energy, Mississauga, Ontario *Category: General Interest*	
P.F. Edwards	Peter Edwards Co., Mississauga, Ontario *Category: General Interest*	
P. Feinbergs	Airia Brands Inc., London, Ontario *Category: Producer Interest*	
G.R. Hamer	BC Hydro, Burnaby, British Columbia	*Non-voting*

G.D. Henriques	Henriques Consulting, Richmond, British Columbia	*Non-voting*
J.K. Hodge	Toronto, Ontario *Category: General Interest*	
C. Kahramanoglu	Ontario Ministry of Municipal Affairs and Housing, Toronto, Ontario *Category: General Interest*	
S. Krsikapa	Ontario Ministry of Energy, Toronto, Ontario *Category: User Interest/Regulatory Authority*	
C.K. Lee	Heating, Refrigeration and Air Conditioning Institute of Canada, Mississauga, Ontario	*Non-voting*
C. Li	Hydro One Networks Inc., Toronto, Ontario	*Non-voting*
R. Lord	Carrier Corporation, Murfreesboro, Tennessee, USA *Category: Producer Interest*	
M. Suami	Natural Resources Canada, Ottawa, Ontario *Category: User Interest/Regulatory Authority*	
T. Wong	CSA Group, Toronto, Ontario	*Project Manager*

Subcommittee on Building Commissioning for Energy Using Systems

D. Bartel	Winnipeg, Manitoba	*Chair*
T.K. Lau	BC Hydro, Vancouver, British Columbia	*Vice-Chair*
R. Boulay	Natural Resources Canada, Ottawa, Ontario	
B. Crawford	CES Engineering Ltd., Burnaby, British Columbia	
P. Enright	City of Vancouver, Vancouver, British Columbia	
M. Gatensby	Architectural Institute of BC, Vancouver, British Columbia	
E. Guest	Manitoba Hydro, Winnipeg, Manitoba	
L. Horvath	Quantum Lighting Inc., Coquitlam, British Columbia	
A. Kartes	Halifax, Nova Scotia	
K.D. Knight	Red River College, Winnipeg, Ontario	
P. Martineau	Hydro-Quebec – Distribution, Montréal, Québec	
A. Mohareb	Building and Safety Standards Branch, Province of BC, Victoria, British Columbia	
A. Sunderji	Independent Electricity System Operator (IESO), Toronto, Ontario	

C. Suvagau	BC Hydro, Burnaby, British Columbia	
M. Hopkins	CSA Group, Toronto, Ontario	*Project Manager*
T. Wong	CSA Group, Toronto, Ontario	*Project Manager*

Working Group on Building Envelope

K. Knight	Red River College, Winnipeg, Manitoba	*Lead*
D. Bartel	Winnipeg, Manitoba	
R. Boulay	Natural Resources Canada, Ottawa, Ontario	
B. Coughlin	RDH Building Science Inc, Vancouver, British Columbia	
G. Finch	RDH Building Science Inc, Vancouver, British Columbia	
M. Gatensby	Architectural Institute of BC, Vancouver, British Columbia	
A. Mohareb	Building and Safety Standards Branch, Province of BC, Vancouver, British Columbia	
M. Nemeth	Bright Buildings, Saskatoon, Saskatchewan	
T. Wong	CSA Group, Toronto, Ontario	*Project Manager*

Working Group on Vertical/Horizontal Transportation and Electrical Systems

C. Suvagau	BC Hydro, Vancouver, British Columbia	*Lead*
D. Bartel	Winnipeg, Manitoba	
R. Boulay	Natural Resources Canada, Ottawa, Ontario	
B. Crawford	CES Engineering Ltd., Vancouver, British Columbia	
D. Green	Quantum Lighting, Vancouver, British Columbia	
T. Lau	BC Hydro, Vancouver, British Columbia	
M. Hopkins	CSA Group, Toronto, Ontario	*Project Manager*

Working Group on Mechanical Systems

E. Guest	Manitoba Hydro, Winnipeg, Manitoba	*Lead*
D. Bartel	Winnipeg, Manitoba	
R. Boulay	Natural Resources Canada, Ottawa, Ontario	
B. Crawford	CES Engineering Ltd., Vancouver, British Columbia	
P. Enright	City of Vancouver, Vancouver, British Columbia	
A. Jones	AJA Inc, Vancouver, British Columbia	
A. Kartes	Halifax, Nova Scotia	
M. Nemeth	Bright Buildings, Saskatoon, Saskatchewan	
H. Tailor	Tailored Sustainable Solutions, Vancouver, British Columbia	
B. White	SES Consulting, Vancouver, British Columbia	
T. Wong	CSA Group, Toronto, Ontario	*Project Manager*

Working Group on Controls, Metering Systems, and System Integration

B. Crawford	CES Engineering Ltd., Vancouver, British Columbia	*Lead*
D. Bartel	Winnipeg, Manitoba	
P. Enright	City of Vancouver, Vancouver, British Columbia	
E. Guest	Manitoba Hydro, Winnipeg, Manitoba	
A. Jones	AJA Inc, Vancouver, British Columbia	
A. Kartes	Halifax, Nova Scotia	
T. Lau	BC Hydro, Vancouver, British Columbia	
A. Sunderji	Independent Electricity System Operator, Toronto, Ontario	
H. Tailor	Tailored Sustainable Solutions, Vancouver, British Columbia	
B. White	SES Consulting, Vancouver, British Columbia	
M. Hopkins	CSA Group, Toronto, Ontario	*Project Manager*

Preface

This is the first edition of CSA Z5000, *Building commissioning for energy using systems*.

This Standard provides guidelines for the commissioning of metering and monitoring systems for building energy use through the building envelope, mechanical and electrical equipment, and domestic water uses. It applies to new construction of Part 3 Buildings defined by the *National Building Code of Canada*. The commissioning process and concepts contained in this Standard are based on CSA Z320 and CSA Z8001.

The purpose of this Standard is to provide consistent protocols for designing, constructing, and commissioning building system energy use monitoring plans. Where requirements of this Standard generally refers to energy, it is inferred that both the building envelope and domestic water systems are included in the effort to improve energy and resource usage.

With the publication in 2011 of CSA Z320, *Building commissioning*, the Technical Committee agreed to use CSA Z320 as the basis for a new standard. This Standard includes some of the CSA Z320 content, as well as additional requirements and guidance specific to requirements for monitoring building systems. It applies to new construction and to additions to existing buildings or facilities.

CSA Group acknowledges that the development of this Standard was made possible, in part, by the financial support of BC Hydro, Manitoba Hydro, and Hydro Québec.

This Standard was prepared by the Subcommittee on Building Commissioning for Energy Using Systems, under the jurisdiction of the Technical Committee on Heating, Ventilation, Air-Conditioning, and Refrigeration, and the Strategic Steering Committee on Performance, Energy Efficiency, and Renewables, and has been formally approved by the Technical Committee.

This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

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*** *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****.*
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*** *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.*

Z5000-18
Building commissioning for energy using systems

0 Introduction

0.1

The intent of this Standard is to provide a comprehensive, integrated, consistent, and managed process to monitor building energy and domestic water use through the commissioning of the monitoring system. The commissioning process includes documenting the actual performance of an occupied building and its energy using systems in order to compare the predicted energy/water use to the actual energy/water consumed, as per the basis of design (BOD) and owner's project requirements (OPR).

This Standard does not set minimum efficiency levels for commercial buildings, rather it allows users to reconcile and verify the in-operation performance to that which is required by the OPR, voluntary green building programs, or the legislated energy efficiency required by local authorities.

The intended users of this Standard include professionals designing and commissioning new buildings, building owners, metering and monitoring design contractors, building automation system vendors, and stakeholders who have an interest in building performance or related quality assurance (i.e., regulators and authorities having jurisdiction).

Building energy using systems to be monitored include

a) architectural systems (building envelope);
b) vertical and horizontal transportation systems;
c) electrical systems (including lighting and plug loads);
d) mechanical systems (HVAC, and refrigeration);
e) domestic hot and cold water; and
f) control systems and integration (building automation system (BAS), energy management control systems, lighting control systems).

0.2

The Technical Committee has developed this Standard with the intent to guide the commissioning process so that it includes commissioning the individual energy/water monitoring system components and progresses to commissioning building energy using systems for validation of building energy performance of the occupied building as a whole. While this Standard has been developed by a group of experts in building performance, it will inevitably generate constructive feedback as user experience is gained. As this occurs, the process will be revised and updated to reflect user input.

This Standard has been developed to assist the commissioning team in the preparation and implementation of a commissioning plan which addresses the design, installation, and analysis of energy-monitoring systems through

a) the owners project requirements;
b) the monitoring based commissioning plan;
c) the metering and monitoring systems;
d) the prediction of commercial building energy and water usage; and

e) the validation and transparency of actual building energy and water usage after construction.

0.3

With the standardized, consistent building performance protocols presented here, a firm basis is provided to assess claims of a building's energy and water use.

When referencing this Standard, the following questions need to be answered (i.e., issues considered) when developing the owner's project requirements and commissioning plan:

a) Will the owner be monitoring the buildings energy consumption so that systems can be optimized after occupancy?
b) Which energy using systems are important for the owner to be able to track over the years? What minimum level of monitoring will be needed to comply with the local legislation?
c) What level of expertise will be needed to analyze the data? How will the data be used?
d) What is the skill set needed to design, install and commission the energy and performance monitoring systems?

The additional costs of such an effort and resources required are provided in Annex H.

1 Scope

1.1 General

1.1.1

This Standard provides guidelines for the commissioning of buildings and all energy and domestic water related building systems. It applies to new construction only for Part 3 buildings, as specified in the *National Building Code of Canada* (NBC). It does not apply to equipment and systems installed by the owner or others after building completion.

1.1.2

This Standard is intended to assist the commissioning team in the preparation and implementation of a commissioning plan. This plan specifies commissioning requirements for building systems that affect energy and domestic water usage, and includes, but is not limited to, descriptions of the following:

a) the commissioning process;
b) the resources required to complete commissioning;
c) the responsibilities of the commissioning team;
d) the sequence and integration of commissioning activities;
e) the functional testing of energy-related building systems;
f) monitoring-based commissioning; and
g) analyzing and providing data to assist in determining compliance with local energy efficiency regulations.

1.1.3

This Standard is intended to be complementary to CSA Z320, with additions as appropriate to address the special requirements for verifying energy performance during the commissioning of buildings.

1.2 Specific systems

1.2.1

The systems covered in this Standard are classified as

a) architectural and building enclosures;
b) vertical and horizontal transportation;
c) electrical and lighting;
d) mechanical;
e) controls and building automation;
f) energy monitoring-metering; and
g) water using systems.

1.2.2

This Standard does not apply to

a) fire pumps;
b) smoke pressurization fans;
c) fire alarm and detection systems;
d) other life safety systems that operate only during testing or emergencies; and
e) equipment or systems exempt from the *National Energy Code of Canada for Buildings* (NECB).

1.3 Terminology

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.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

2 Reference publications

This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below:

CSA Group

CAN/CSA-A440-00/A440.1-00 (R2005)
Windows/User selection guide to CSA standard CAN/CSA-A440-00

CAN/CSA-Z320-11
Building commissioning

CAN/CSA-Z8001-13
Commissioning of health care facilities

