CANADIAN STANDARDS ASSOCIATION

C22.3 No. 7-10

Underground systems

Legal Notice for Standards

Canadian Standards Association (CSA) standards are developed 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 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 does not warrant the accuracy, completeness, or currency of any of the information published in this document. CSA makes no representations or warranties regarding this document's compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL CSA, 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 HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, CSA 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 accepts no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

CSA is a private not-for-profit company that publishes voluntary standards and related documents. CSA 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 and the users of this document (whether it be in printed or electronic form), CSA 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's and/or others' intellectual property and may give rise to a right in CSA and/or others to seek legal redress for such use, modification, copying, or disclosure. To the extent permitted by licence or by law, CSA 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 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 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 print or paper form may be distributed only to persons who are authorized by CSA 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; 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 hereof, 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.

CANADIAN STANDARDS ASSOCIATION

CSA Standards Update Service

C22.3 No. 7-10
March 2010

Title: *Underground systems*
Pagination: 75 pages (x preliminary and 65 text), each dated **March 2010**

To register for e-mail notification about any updates to this publication

- go to **www.ShopCSA.ca**
- click on **E-mail Services** under **MY ACCOUNT**
- click on **CSA Standards Update Service**

The **List ID** that you will need to register for updates to this publication is **2420600**.

If you require assistance, please e-mail **techsupport@csa.ca** or call 416-747-2233.

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

CSA Standard

C22.3 No. 7-10
Underground systems

CANADIAN STANDARDS ASSOCIATION®

Published in March 2010 by Canadian Standards Association
A not-for-profit private sector organization
5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6
1-800-463-6727 • 416-747-4044

The Canadian Standards Association (CSA) prints its publications on Rolland Enviro100, which contains 100% recycled post-consumer fibre, is EcoLogo and Processed Chlorine Free certified, and was manufactured using biogas energy.

To purchase CSA Standards and related publications, visit CSA's Online Store at ***www.ShopCSA.ca*** *or call toll-free 1-800-463-6727 or 416-747-4044.*

ISBN 978-1-55491-391-6
Technical Editor: *John O'Neill*

Contents

Technical Committee on Underground Construction

M. Jaffer	ENMAX Power Corporation, Calgary, Alberta	*Chair*
E. Alfonso	TELUS, Vancouver, British Columbia	
M. Bell	Hydro One Networks Inc., Toronto, Ontario	
M. Byrne	Toronto Hydro, Toronto, Ontario	
J. Côté	Hydro-Québec, Montréal, Québec	
S. Cumminger	Bell Aliant, Halifax, Nova Scotia	
M. Ereth	SaskPower Corporation, Regina, Saskatchewan	
S. Faubert	Bell Canada, Belleville, Ontario	
L.H. Gales	Transportation Safety Board of Canada, Gatineau, Québec	
M.S. Gardner	Alberta Municipal Affairs, Edmonton, Alberta	
C. Gartner	Sasktel, Regina, Saskatchewan	*Associate*
G. Girda	Canadian Pacific Rail, Calgary, Alberta	
K. Hamilton	Manitoba Hydro, Winnipeg, Manitoba	
L.J. Hiivala	Toronto, Ontario	
F.L. Kaempffer	BC Hydro, Burnaby, British Columbia	
C. Kafel	Enersource Hydro Mississauga, Mississauga, Ontario	*Associate*
P. Krotky	Automated Solutions International Inc., Cambridge, Ontario	

F.L. Kuchta	Prysmian Power Cables, Lexington, South Carolina	
P. Ling	Terasen Gas, Surrey, British Columbia	
D. McCarthy	Canadian Electricity Association, Ottawa, Ontario	*Associate*
J.A. McFadgen	Nova Scotia Power Inc., Halifax, Nova Scotia	
C.R. Moore	Enbridge Gas Distribution, Toronto, Ontario	
D. Parikh	Hydro One Networks Inc., Toronto, Ontario	*Associate*
P.M. Petriw	Veridian Connections Inc., Ajax, Ontario	
J. Robertson	Electrical Safety Authority, Mississauga, Ontario	
T. Shmyr	EPCOR, Edmonton, Alberta	
R. Stevenson	C.H.R.S. Associates, Oakville, Ontario	
M. Trinh	Hydro-Québec, Montréal, Québec	*Associate*
E.H. Wiebe	Manitoba Hydro, Winnipeg, Manitoba	*Associate*
R. Williams	Hydro Ottawa Limited, Ottawa, Ontario	
J. O'Neill	Canadian Standards Association, Mississauga, Ontario	*Project Manager*

In addition to the members of the Technical Committee, the following have made a valuable contribution to the development of this Standard:

M. Congdon	Canadian Pacific Rail, Calgary, Alberta
J. Petras	Toronto Hydro, Toronto, Ontario
H.L. Sam	Canadian Electricity Association, Montréal, Québec

G. Sarich Terasen Gas,
Burnaby, British Columbia

D. Shonaman Saint John Energy,
Saint John, New Brunswick

F. Szto Toronto Hydro,
Toronto, Ontario

Preface

This is the fourth edition of CSA C22.3 No. 7, *Underground systems*, one of a series of Standards issued under the *Canadian Electrical Code, Part III*. It supersedes the previous editions published in 2006, 1994, and 1986.

This edition includes the following major changes:

(a) the definitions have been updated;
(b) resources for the design of underground supply systems ≥69 kV are identified in an informative annex (Annex A);
(c) criteria have been developed related to the separation of underground supply and communication systems from light rail systems;
(d) criteria related to railway crossings and longitudinal cable installations along railway rights-of-way have been refined;
(e) requirements for submarine cable installations are included;
(f) grounding requirements are specified;
(g) design considerations related to seismic events are specified;
(h) the overall structure of the Standard and many existing requirements of the Standard have been updated. Informative statements now appear as notes rather than in the main text of various clauses;
(i) requirements related to clearances, separations, and depth of burial are presented in several tables; and
(j) an informative annex on directional boring (Annex E) is provided.

This Standard was prepared by the Technical Committee on Underground Construction, under the jurisdiction of the Strategic Steering Committee on Power Engineering and Electromagnetic Compatibility, and has been formally approved by the Technical Committee. It will be submitted to the Standards Council of Canada for approval as a National Standard of Canada.

March 2010

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 publication 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 publication.*

(4) *CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.*

(5) *All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.*

Requests for interpretation should

(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) be phrased where possible to permit a specific "yes" or "no" answer.

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are published in CSA's periodical* Info Update*, which is available on the CSA Web site at www.csa.ca.*

C22.3 No. 7-10
Underground systems

1 Scope

1.1
This Standard applies to the lines and equipment associated with underground electric supply and communication systems located entirely outside buildings and fenced supply stations.

See CAN/CSA-C22.3 No. 61936-1 for installations within fenced or indoor supply stations.

1.2
Existing installations, including maintenance replacements, additions, and alterations, meeting the original designs that currently comply with prior editions of this Standard need not be modified to comply with this edition of the Standard, except as might be required for safety reasons by the authority having jurisdiction.

1.3
This Standard, which forms part of the *Canadian Electrical Code, Part III*, covers the requirements for construction of underground systems and includes electric supply and communication circuits that are installed alone, in joint use, or in proximity to each other or other facilities, and that

(a) cross each other or other facilities;
(b) cross under railways or highways; or
(c) run under ground likely to be traversed by vehicles or pedestrians.

1.4
The requirements of this Standard do not constitute complete construction specifications but stipulate the minimum design requirements with regard to

(a) safety to persons;
(b) continuity of service; and
(c) protection of property.

1.5
The selection, design, and installation of supply transmission cables (≥69 kV) are not addressed in this Standard.

1.6
Conditions not covered by this Standard are governed by equivalent Standards in common use or by the authority having jurisdiction.

1.7
In some cases, requirements are written for specific types of construction. This does not preclude the use of other types of construction arising out of continuing advancements in the field provided that engineering representatives can demonstrate the safety and suitability of these alternatives.

1.8
The use of terms such as “where practical” is not intended to provide an opportunity for not meeting the minimum requirements of this Standard. When an alternative is not specified, the engineering solution that most closely approximates the preferred method is to be used.