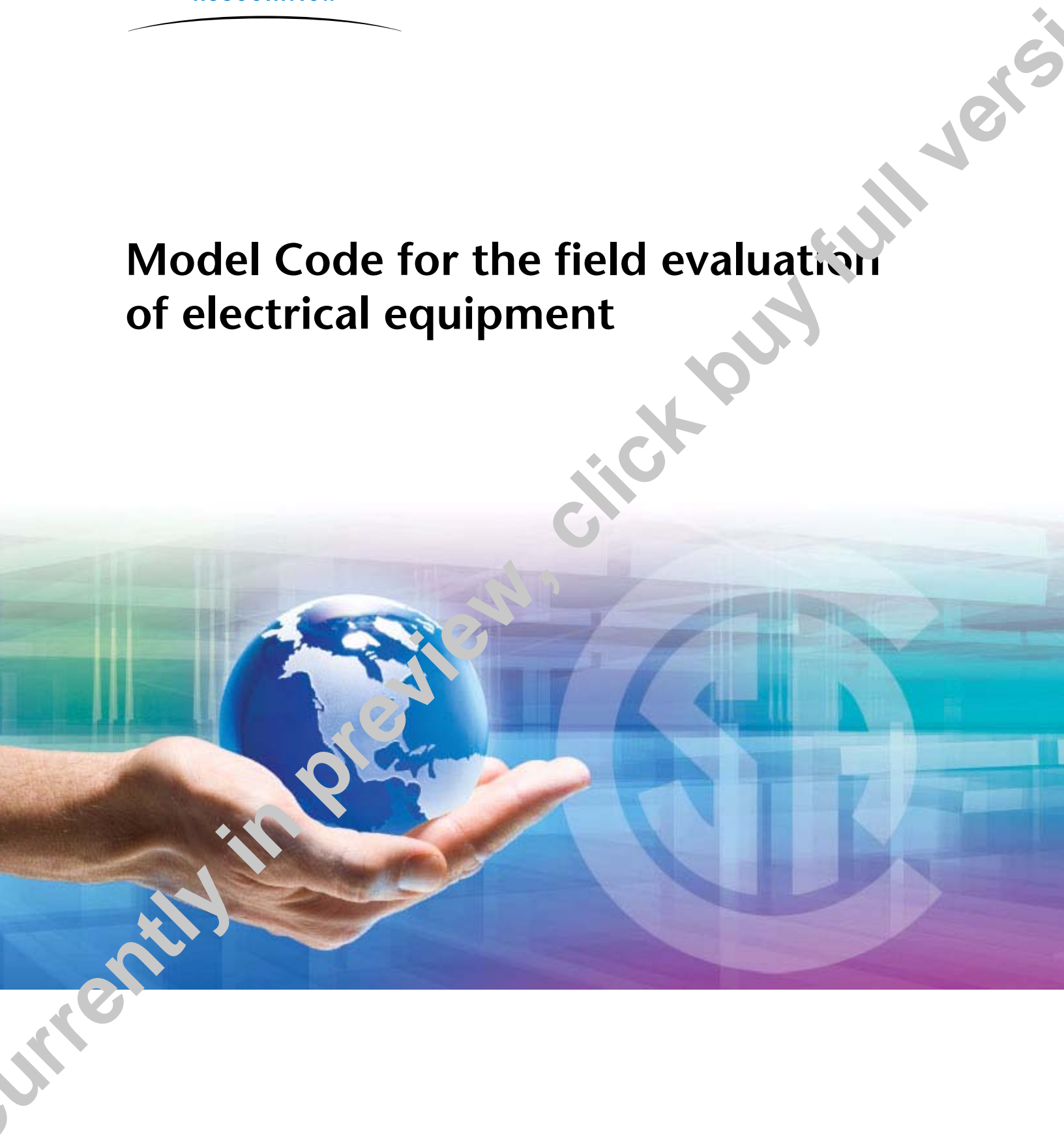


# Model Code for the field evaluation of electrical equipment



# Legal Notice

This document is provided by the Canadian Standards Association (CSA) as a convenience only.

## 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.

## 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 document may be the subject of patent rights. CSA shall not be held responsible for identifying any or all such patent rights. Users of this document are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

## Use of this document

This document is being provided by CSA for informational and non-commercial use only. If you do not agree with any of the terms and conditions contained in this Legal Notice, you may not use this document. Use of this document constitutes your acceptance of the terms and conditions of this Legal Notice.



CANADIAN STANDARDS  
ASSOCIATION

# ***CSA Standards Update Service***

*SPE-1000-09*

*September 2009*

**Title:** *Model Code for the field evaluation of electrical equipment*

**Pagination:** **63 pages** (ix preliminary and 54 text), each dated **September 2009**.

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 **2419074**.

If you require assistance, please e-mail [techsupport@csa.ca](mailto:techsupport@csa.ca) or call 416-747-2233.

Visit CSA's policy on privacy at [www.csagroup.org/legal](http://www.csagroup.org/legal) to find out how we protect your personal information.

Currently in preview, click buy full version

*CSA Standard*

*SPE-1000-09*

***Model Code for the field evaluation  
of electrical equipment***



**CANADIAN STANDARDS  
ASSOCIATION**

®Registered trade-mark of Canadian Standards Association

*Published in September 2009 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*

**Visit our Online Store at [www.ShopCSA.ca](http://www.ShopCSA.ca)**



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](http://www.ShopCSA.ca) or call toll free 1-800-463-6727 or 416-747-4044.

ISBN 978-1-55436-782-5

**Technical Editor:** Tim Pope

© Canadian Standards Association — 2009

All rights reserved. No part of this publication may be reproduced in any form whatsoever without the prior permission of the publisher.

# Contents

Canadian Advisory Council on Electrical Safety vi

Task Force on SPE-1000 viii

Preface ix

## 0 Introduction 1

## 1 Scope 1

## 2 Definitions and reference publications 3

2.1 Definitions 3

2.2 Reference publications 8

## 3 General requirements 9

3.1 Compliance with Standards 9

3.2 Safety and protection 10

3.2.1 Electric shock 10

3.2.2 Energy hazards 10

3.2.3 Fire 10

3.2.4 Mechanical and heat hazards 10

3.2.5 Radiation hazards 10

3.3 Materials 11

3.4 Current-carrying parts 11

3.5 Electrical insulation 11

## 4 Construction 11

4.1 Electrical components 11

4.1.1 General 11

4.1.2 Switches and controls (including safety interlock switches) 12

4.1.3 Transformers 12

4.1.4 Motors 13

4.1.5 Cathode ray tubes 13

4.1.6 Receptacles 13

4.1.7 Exposed lamps 14

4.2 Enclosures 14

4.3 Openings in enclosures 15

4.3.1 General 15

4.3.2 Commercial and industrial equipment 15

4.3.3 Hand-held machines, hand-held portions of machines, home appliances, and equipment other than commercial or industrial 15

4.3.4 Reduction of fire hazard over openings in a base 16

4.3.5 Drainage openings 16

4.4 Mechanical assembly 16

4.5 Stability 17

4.6 Interlocks 17

4.7 Cord-connected equipment 18

4.7.1 Power supply cords 18

4.7.2 Strain relief 18

4.7.3 Loading of attachment plugs 19

4.7.4 More than one supply cord 19

4.8	Permanently connected equipment	20
4.9	Supply circuit disconnecting means	21
4.10	Grounding and bonding	22
4.11	Double insulation	23
4.12	Interconnections	23
4.13	Bushings	23
4.14	Internal wiring	24
4.15	Overcurrent, overload, and overtemperature protection devices	24
4.16	Fuses and fuseholders	25
4.17	Motor controls	26
4.18	Equipment containing rechargeable batteries	26
4.19	Multivoltage equipment	27
4.20	Spacings	27
4.20.1	Spacings at field-wiring terminals	27
4.20.2	Spacings at other than field-wiring terminals	27
4.20.3	Spacings in secondary circuits	27
4.21	Lighting equipment	28
4.22	Accessible circuits	29
4.23	Capacitors	29
4.24	Suppressors	30
4.25	Heaters and heating elements	30
4.26	Thermal insulation	30
4.27	Backflow prevention	31
4.28	Refrigerant-containing parts	31
4.29	Carbonating equipment	31
4.30	Water-heating tanks	31
4.31	Protection of water heaters	31
4.32	Direct plug-in equipment	32
4.33	Installed equipment	32

## 5 Marking 32

## 6 Tests 35

6.1	Tests	35
6.1.1	Dielectric voltage withstand	35
6.1.2	Flame	36
6.1.3	Strain relief	37
6.2	Other tests	37
6.2.1	General	37
6.2.2	Input rating	37
6.2.3	Temperature	37
6.2.4	Abnormal tests	37
6.2.5	Leakage current	38
6.2.6	Test for stability	38
6.2.7	Submersible equipment	38
6.2.8	Supporting device test	39
6.2.9	Drop test	39
6.2.10	Impact	39
6.2.11	Startup	39

## Annexes

<b>A</b> (informative)	— Essential requirements of particular CSA <i>Canadian Electrical Code, Part II</i> Standards	50
<b>B</b> (informative)	— Equipment having hazards not fully addressed in this Model Code	52
<b>C</b> (normative)	— Special inspection/field evaluation labels	53
<b>D</b> (informative)	— Reference to Part I Rules	54

**Tables**

- 1** — Dielectric strength test 40
  - 2** — Acceptable perforated metal plates 40
  - 3** — Conditions of use, maximum voltage, and maximum allowable conductor temperature of supply cords 41
  - 4** — Maximum continuous loading of attachment plugs for various configurations 42
  - 5** — Minimum spacings at field-wiring terminals and where separation of uninsulated live parts is not assured 42
  - 6** — Minimum spacings at other than field-wiring terminals and where separation of uninsulated live parts is not assured 43
  - 7** — Maximum allowable temperatures and temperature rises 44
  - 8** — Leakage current limits for cord-connected equipment 45
  - 9** — Leakage current test circuits 45
- 

**Figures**

- 1** — Probe 46
- 2** — Probe — Hand-held machines, hand-held portions of machines, home appliances, and equipment other than commercial or industrial 46
- 3** — Location of extent of barrier 47
- 4** — Direct plug-in equipment 48
- 5** — Leakage current measurement circuits 49

# Canadian Advisory Council on Electrical Safety

<b>S. Paulsen</b>	Department of Public Safety, Fredericton, New Brunswick	<i>Chair</i>
<b>P. McDonald</b>	Department of Municipal Affairs, Edmonton, Alberta	<i>Vice-Chair</i>
<b>M. Anderson</b>	The City of Winnipeg, Winnipeg, Manitoba	
<b>L. Ferchoff</b>	Manitoba Hydro, Winnipeg, Manitoba	
<b>S. Hinde</b>	British Columbia Safety Authority, Nanaimo, British Columbia	
<b>D. Holmes</b>	City of Calgary, Calgary, Alberta	
<b>R. Kelly</b>	Government of Nunavut Community & Government Services, Iqaluit, Nunavut	
<b>T. Kitson</b>	Department of Community and Cultural Affairs and Labour, Charlottetown, Prince Edward Island	
<b>M. Lafferty</b>	Department of Community Services, Whitehorse, Yukon	
<b>D.R.A. MacLeod</b>	Department of Labour and Workforce Development, Halifax, Nova Scotia	
<b>G. Magnien</b>	SaskPower, Regina, Saskatchewan	
<b>P. Marcucci</b>	Electrical Safety Authority, Mississauga, Ontario	
<b>R. Marion</b>	Government of Northwest Territories, Yellowknife, Northwest Territories	
<b>J. Martin</b>	Standards Council of Canada, Ottawa, Ontario	
<b>P. Melloy</b>	Department of Government Services, St. John's, Newfoundland	
<b>G. Montminy</b>	Régie du bâtiment du Québec, Québec, Québec	

**A. Tsisserev**

City of Vancouver,  
Vancouver, British Columbia

**S. Wright**

Health Canada,  
Ottawa, Ontario

**T. Pope**

Canadian Standards Association,  
Mississauga, Ontario

*Project Manager*

# ***Task Force on SPE-1000***

<b>N. Maalouf</b>	QPS Evaluation Services Inc., Toronto, Ontario	<i>Chair</i>
<b>W. Burr</b>	CSA International, Richmond, British Columbia	
<b>D. Heron</b>	Electrical Safety Authority, Worthington, Ontario	
<b>D.R.A. MacLeod</b>	Department of Labour and Workforce Development, Halifax, Nova Scotia	
<b>J. Marshall</b>	CSA International, Toronto, Ontario	
<b>J. Martin</b>	Standards Council of Canada, Ottawa, Ontario	
<b>J. Morrison</b>	QPS Evaluation Services Inc., Toronto, Ontario	
<b>S. Paulsen</b>	Department of Public Safety, Fredericton, New Brunswick	
<b>L. Yang</b>	Underwriters' Laboratories of Canada, Scarborough, Ontario	
<b>T. Pope</b>	Canadian Standards Association, Mississauga, Ontario	<i>Project Manager</i>

The Task Force would like to acknowledge the valuable contributions of R. (Rick) Martin, former Task Force Chair and Member, who passed away during the development of this Model Code.

# Preface

This is the third edition of CSA SPE-1000, *Model code for the field evaluation of electrical equipment*. It supersedes the previous editions published in 1999 and 1994.

This Model Code is based upon guidelines for special inspections. These guidelines have been in effect for over 30 years with a good safety record. The Canadian Advisory Council on Electrical Safety strongly supports the continuation of special inspections of electrical equipment and products, with the stipulation that the requirements be formally published.

The field evaluation is intended to be offered by an inspection body accredited by the Standards Council of Canada (SCC). The service provides the means for evaluating electrical equipment and products on location and, if found to conform to the requirements of this Model Code, such electrical equipment and products may be marked with a field evaluation label.

It is always within the purview of the authority having jurisdiction (AHJ) in whose jurisdiction the Model Code is applied to add technical or administrative stipulations or deviations to the Model Code as deemed necessary.

Typically, the AHJs base their official acceptance of electrical equipment and products upon a certification by an SCC-accredited certification body that the equipment conforms to the applicable standards. The certification body bases its certification upon testing and evaluation of a representative sample of the equipment as manufactured to the relevant equipment standard (known as type or prototype testing). Certification is granted if the sample of the tested electrical equipment or product is found to be in conformance and a follow-up inspection program is put in place to ensure continued conformance.

This Model Code does not deal with type (or prototype) testing of equipment as practised in a regular certification program. The object of the Model Code is to facilitate a safety evaluation of equipment to essential safety considerations, which do not include evaluation of the efficacy or performance of products.

This Model Code addresses minimum construction, marking, and test requirements that are consistent with maintaining the level of safety for electrical equipment and products so as not to present an undue hazard (as defined in this Model Code) to persons or property. It is not the purpose of these requirements to address the performance of electrical equipment and products, or their quality.

This edition of the Model Code has been prepared by the Task Force on SPE-1000, which is appointed by, and accountable to, the Canadian Advisory Council on Electrical Safety (CACES), in response to requests for changes from various stakeholders.

September 2009

## 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 Model Code is stated in its Scope, it is important to note that it remains the responsibility of the users of the Model Code to judge its suitability for their particular purpose.
- (3) All enquiries regarding this Model Code should be addressed to Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.



# *SPE-1000-09*

# ***Model Code for the field evaluation of electrical equipment***

## **0 Introduction**

### **0.1**

Field evaluation of equipment in accordance with this Model Code should be undertaken only by fully qualified and competent persons. These persons should be experienced in conducting field evaluation and field testing of electrical and electronic equipment to Canadian safety requirements or other requirements acceptable to the authority having jurisdiction (AHJ).

Because field evaluation of electrical equipment and products is conducted to the requirements of this Model Code, it is not equivalent to an evaluation in support of certification, which is conducted to the requirements of the applicable standard. Consequently, equipment and products that are field evaluated and labelled cannot be considered as certified.

When used in conjunction with the requirements of the *Canadian Electrical Code, Part I*, this Model Code addresses the minimum requirements for equipment as they pertain to electrical safety. Where other authorities have jurisdiction, they must be consulted by the equipment owner or the owner's agent as to conformance to legislation. This legislation may be either federal, provincial, or municipal.

This Model Code addresses the essential construction, marking, and test requirements that equipment must meet before it can be labelled. It allows for the evaluation of electrical equipment and products, with the objective of minimizing the risk of degrading the safety of the equipment through the procedures used in the field evaluation. Where the required tests involve procedures deemed to present a risk to the safety of the particular equipment, such tests may be carried out on a separate representative sample supplied for the sole purpose of testing. Alternatively, other means may be taken to determine conformance, such as the evaluation of relevant test data presented in support of an application for field evaluation.

The requirements of this Model Code have been accepted by the AHJs.

## **1 Scope**

### **1.1**

#### **1.1.1**

This Model Code provides marking and test/construction requirements for the field evaluation of electrical equipment by an inspection body, where certification of that equipment is impracticable or otherwise unavailable.

#### **1.1.2**

Field-evaluated equipment found to be in conformity with the requirements of this Model Code is considered to be acceptable to the AHJ.

#### **1.1.3**

Notwithstanding the requirements of [Clauses 1.1.1](#) and [1.1.2](#), field evaluation is not intended to serve as a substitute for certification.