



**CSA SPE-343:21**

# **Electric vehicle energy management systems**



## Legal Notice

This document is provided by the Canadian Standards Association (operating as “CSA Group”) 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 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.

### 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 document 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 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 Group 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.



# ***Standards Update Service***

***CSA SPE-343:21  
December 2021***

**Title:** *Electric vehicle energy management systems*

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

- go to [www.csagroup.org/store/](http://www.csagroup.org/store/)
- click on **Product Updates**

The **List ID** that you will need to register for updates to this publication is **2429766**.

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

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

*CSA SPE-343:21*  
***Electric vehicle energy management  
systems***



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

*Published in December 2021 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 [www.csagroup.org/store/](http://www.csagroup.org/store/)  
or call toll-free 1-800-463-6727 or 416-747-4044.*

*ISBN 978-1-4883-4046-8*

*© 2021 Canadian Standards Association  
All rights reserved. No part of this publication may be reproduced in any form whatsoever  
without the prior permission of the publisher.*

# Contents

Technical Committee on Industrial Products	3
Subcommittee on Electric Vehicle Energy Management Systems	6
Preface	8
<b>1 Scope</b>	<b>9</b>
<b>2 Reference publications</b>	<b>10</b>
<b>3 Definitions</b>	<b>11</b>
<b>4 General</b>	<b>13</b>
4.1 Construction	13
4.2 Communication/control components	13
4.3 Functional requirements	14
4.3.1 Management of loads	14
4.3.2 Communications	14
4.4 Configuration	15
<b>5 Markings</b>	<b>16</b>
<b>6 Tests</b>	<b>17</b>
6.1 General	17
6.2 Test methods	19
6.2.1 General	19
6.2.2 Test 1 — Multi-port or equivalent	20
6.2.3 Test 2 — Single-tier system with uncontrolled load	23
6.2.4 Test 3 — Multi-tiered system [with townhouse (e.g., 6 units)/condo options (e.g., 60 units)]	27
6.2.5 Test 4 — Loss of communication	29
6.2.6 Test 5 — DCFC	31
6.2.7 Test 6 — Life safety system response (where EVEMS is indicated as being capable of being used in this configuration)	32
<b>7 Instructions</b>	<b>32</b>
7.1 General	32
7.2 Instructions pertaining to risk of fire, electric shock, or injury to persons	33
7.3 Installation instructions	33
7.4 Operating instructions — System manager	36
7.5 User maintenance instructions — User	36
7.6 Moving, transporting, and storage instructions	36

---

Annex A (informative) — Commentary	37
Annex B (informative) — Control approaches	42
Annex C (informative) — Configuration approaches	43

Annex D (informative) — Relationship to CSA C22.2 No.14/UL 508, CSA C22.2 No. 280/UL 2594, and companion engineering standards	44
Annex E (Informative) — Sample single line	45
Annex F (Informative) — Relationship to the CEC Pt. I (CSA C22.1) and NEC (NFPA 70)	47
Annex G (informative) — Sample field installation test principles	49
Annex H (Informative) — Bibliography	51

# Technical Committee on Industrial Products

<b>R. P. de Lhorbe</b>	Schneider Electric Canada, Inc., North Vancouver, British Columbia, Canada <i>Category: Producer Interest</i>	<i>Chair</i>
<b>A. Z. Tsisserev</b>	AES Engineering Ltd., Vancouver, British Columbia, Canada <i>Category: User Interest</i>	<i>Vice-Chair</i>
<b>M. Smith</b>	Kitchener, Ontario, Canada <i>Category: General Interest</i>	<i>Vice-Chair</i>
<b>B. M. Baldwin</b>	Baldwin Services Inc., Saskatoon, Saskatchewan, Canada <i>Category: General Interest</i>	
<b>G. Benjamin</b>	ABB Electrification Canada SRI, Dorval, Québec, Canada <i>Category: Producer Interest</i>	
<b>R. B. Buckler</b>	Guelph, Ontario, Canada	<i>Non-voting</i>
<b>W. J. Burr</b>	Burr and Associates, Campbell River, British Columbia, Canada	<i>Non-voting</i>
<b>G. Chopra</b>	Electro Federation Canada, Toronto, Ontario, Canada	<i>Non-voting</i>
<b>M. T. Cole</b>	Hubbell Canada ULC, Pickering, Ontario, Canada	<i>Non-voting</i>
<b>C. C. Cormier</b>	Alberta Municipal Affairs, Edmonton, Alberta, Canada <i>Category: Regulatory Authority</i>	
<b>R. Dahal</b>	Eaton, Burlington, Ontario, Canada	
<b>S. W. Douglas</b>	QPS Evaluation Services Inc., Toronto, Ontario, Canada <i>Category: General Interest</i>	

<b>T. S. Driscoll</b>	OBIEC Consulting Ltd., Calgary, Alberta, Canada <i>Category: User Interest</i>	
<b>J. H. Dymond</b>	Peterborough, Ontario, Canada	<i>Non-voting</i>
<b>V. V. Gagachev</b>	Eaton, Burlington, Ontario, Canada <i>Category: Producer Interest</i>	
<b>N. Hanna</b>	Electrical Safety Authority, Mississauga, Ontario, Canada	<i>Non-voting</i>
<b>R. Leduc</b>	Marex Canada Limited, Calgary, Alberta, Canada <i>Category: User Interest</i>	
<b>A. Leslie</b>	Curtiss Wright Controls, Stratford, Ontario, Canada	<i>Non-voting</i>
<b>M. Lusk</b>	CSA Group, Charlotte, North Carolina, USA <i>Category: General Interest</i>	
<b>D. Mascarenhas</b>	Brampton, Ontario, Canada <i>Category: General Interest</i>	
<b>S. Mercier</b>	Régie du bâtiment du Québec, Montréal, Québec, Canada <i>Category: Regulatory Authority</i>	
<b>M. Pilato</b>	Technical Safety BC, Kelowna, British Columbia, Canada <i>Category: Regulatory Authority</i>	
<b>S. Rasaratnam</b>	Schneider Electric, Edmonton, Alberta, Canada	<i>Non-voting</i>
<b>L. G. Silecky</b>	Silecky Consulting Ltd., Mississauga, Ontario, Canada <i>Category: Producer Interest</i>	
<b>T. Simmons</b>	British Columbia Institute of Technology, Burnaby, British Columbia, Canada <i>Category: User Interest</i>	

---

<b>D. Sohm</b>	Independent Electricity System Operator, Mississauga, Ontario, Canada	<i>Non-voting</i>
<b>P. Vemireddy</b>	Hero TCG GmbH, Stephanskirchen, Germany	<i>Non-voting</i>
<b>G. Wagner</b>	Stockdales, Saskatoon, Saskatchewan, Canada <i>Category: Producer Interest</i>	
<b>C. J. Workman</b>	Eaton Industries (Canada) Company, Burlington, Ontario, Canada	<i>Non-voting</i>
<b>R. Yousef</b>	Electrical Safety Authority, Mississauga, Ontario, Canada <i>Category: Regulatory Authority</i>	
<b>U. Khan</b>	CSA Group, Toronto, Ontario, Canada	<i>Project Manager</i>

# ***Subcommittee on Electric Vehicle Energy Management Systems***

<b>M. P. Voll</b>	Stantec Consulting Ltd., Waterloo, Ontario, Canada	<i>Chair</i>
<b>A. Rezaei-Zare</b>	York University, Toronto, Ontario, Canada	<i>Vice-Chair</i>
<b>B. Aggarwal</b>	Coquitlam, British Columbia, Canada	
<b>K. Carmichael</b>	British Columbia Institute of Technology, Burnaby, British Columbia, Canada	
<b>D. Chandler</b>	AES Engineering, Vancouver, British Columbia, Canada	
<b>K. C. Cheong</b>	MKC Engineering Corp., Vancouver, British Columbia, Canada	
<b>G. Chopra</b>	Electro Federation Canada, Toronto, Ontario, Canada	
<b>D. Corbeil</b>	RVE — Electric Vehicle Association of Quebec, Laval, Québec, Canada	
<b>J. Côté</b>	Hydro-Québec, Distribution, Montréal, Québec, Canada	
<b>M. Daigle</b>	Addenergie technologies Inc., Québec, Québec, Canada	
<b>G. Durocher</b>	Technical Safety BC, Kelowna, British Columbia, Canada	
<b>G. Eldridge</b>	ChargePoint, Inc., Campbell, California, USA	
<b>H. Fayaz</b>	Stantec Consulting Ltd., Markham, Ontario, Canada	

---

<b>M. Grenier</b>	ABB-Thomas & Betts, St-Jean-Sur-Richelieu, Québec, Canada	
<b>C. Harrison</b>	Far Field Associates LLC, Seattle, Washington, Canada	
<b>V. Lu</b>	AES Engineering Ltd., Vancouver, British Columbia, Canada	
<b>T. Martin</b>	SWTCH Energy Inc., Toronto, Ontario, Canada	
<b>A. Parre</b>	STM, Québec, Québec, Canada	
<b>E. Pike</b>	California Public Utilities Commission, San Francisco, California, USA	
<b>A. Ramesh</b>	Eaton Corporation, Milton, Ontario, Canada	
<b>K. L. Rodel</b>	Pontypool, Ontario, Canada	
<b>M. Schuler</b>	IBX datasystems Ltd., West Vancouver, British Columbia, Canada	
<b>J. W. Smith</b>	Southern California Edison Electric Vehicle Technical Center, Pomona, California, USA	
<b>J. B. Sullivan</b>	Technical Safety BC, Comox, British Columbia, Canada	
<b>J. E. Tarchinski</b>	General Motors Company, Warren, Michigan, USA	
<b>U. Waqas</b>	Energy+ Inc., Cambridge, Ontario, Canada	
<b>M. Zhang</b>	Powertech Labs Inc., Vancouver, British Columbia, Canada	
<b>U. Khan</b>	CSA Group, Toronto, Ontario, Canada	<i>Project Manager</i>

# Preface

This is the first edition of CSA SPE-343, *Electric vehicle energy management systems*.

This publication covers the design, manufacture, and testing of electrical equipment that comprises or forms a part of an electric vehicle energy management system. This SPE covers only the aspects of an electrical vehicle energy management system (EVEMS) which are not included in the other standards applicable to the equipment that comprise an EVEMS.

CSA Group acknowledges that the development of this Standard was made possible, in part, by the financial support of Natural Resources Canada.

This publication was reviewed by the CSA Subcommittee on Electrical Vehicle Energy Management Systems, under the jurisdiction of the CSA Technical Committee on Industrial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety.

## Application of this publication

Where reference is made to a specific number of specimens to be tested, the specified number is to be considered a minimum quantity.

### 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 publication is stated in its scope, it is important to note that it remains the responsibility of the users of the publication to judge its suitability for their particular purpose.*
- 3) *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) *designation (number);*
  - b) *relevant clause, table, and/or figure number;*
  - c) *wording of the proposed change; and*
  - d) *rationale for the change.*

# CSA SPE-343:21

## ***Electric vehicle energy management systems***

### **1 Scope**

#### **1.1**

This publication applies to the design, construction, and testing of electrical equipment that comprises or forms part of an electric vehicle energy management system (EVEMS) (see Annexes [A](#), [B](#), [C](#), [D](#), and [E](#)) in accordance with the use of demand factor sub-rules of CSA C22.1, *Canadian Electrical Code, Part I* (“CEC Pt. I”) or NFPA 70, *National Electrical Code* (“NEC”) to reduce the calculated load contribution of electric vehicle supply equipment (EVSE) controlled by an EVEMS.

#### **1.2**

This publication applies only to the aspects of EVEMS equipment specific to them that ensure they can perform the required EVEMS functionality related to demand factor (see Annexes [A](#) and [D](#)). Equipment such as EVSE, that can optionally perform EVEMS functionality, requires listing to the EVSE standard(s) noted under Clause [2](#), as determined by the certification body and this publication. Equipment such as conduit, wire, cable, over-currents, current transformers, etc. do not require testing to this publication.

#### **1.3**

This publication applies to all aspects of controlling EVSE loads through the process of activating or suspending, increasing, or decreasing electric power to the electric vehicle supply equipment loads and/or monitoring or calculating electric currents (power) loads in a consumer service, distribution equipment, feeders, or branch circuits.

#### **1.4**

This publication applies to the EVEMS equipment intended to be evaluated as a product that is configurable during and after installation, and which consists of any of the following:

- a) current (or power) monitoring device(s);
- b) communications equipment;
- c) controller(s);
- d) timer(s);
- e) compatible EVSE; and
- f) other applicable device(s).

See the commentary in Annex [A](#).

#### **1.5**

In this publication, “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 publication.