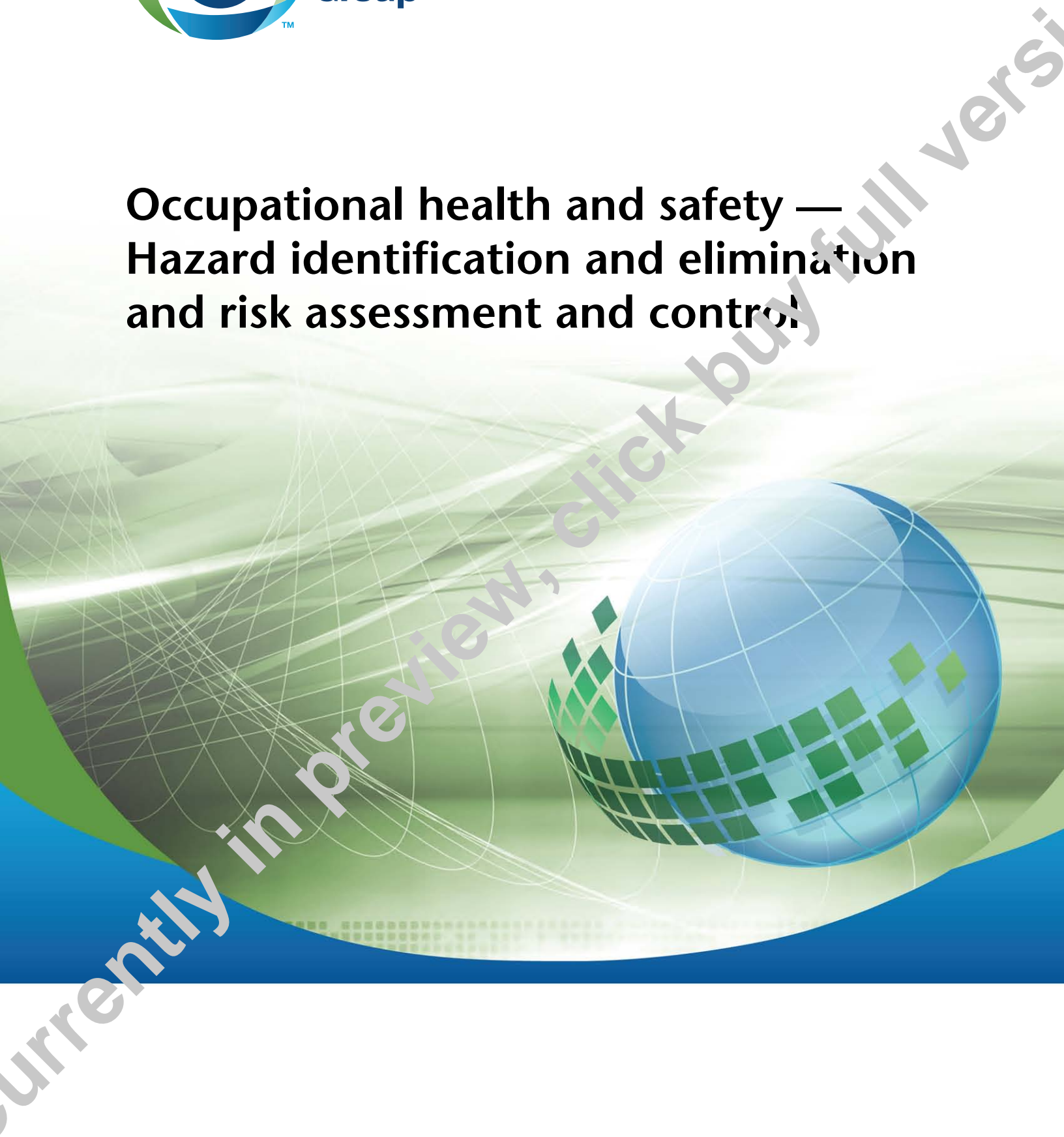




**CSA  
Group**

**Z1002-12**

# **Occupational health and safety — Hazard identification and elimination and risk assessment and control**



# 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 content, 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, 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 print 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 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.



# ***Standards Update Service***

*Z1002-12*

*September 2012*

**Title:** *Occupational health and safety — Hazard identification and elimination and risk assessment and control*

**Pagination:** **67 pages** (ix preliminary and 58 text), each dated **September 2012**

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 **2422020**.

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 [csagroup.org/legal](http://csagroup.org/legal) to find out how we protect your personal information.

Currently in preview, click buy full version

Z1002-12

***Occupational health and safety — Hazard  
identification and elimination and risk  
assessment and control***



**CSA  
Group**

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

*Published in September 2012 by CSA Group  
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 [shop.csa.ca](http://shop.csa.ca)**



CSA Group 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 standards and related publications, visit our Online Store at [shop.csa.ca](http://shop.csa.ca) or call toll-free 1-800-461-6727 or 416-747-4044.

ISSN 1978-1-77139-018-7

© 2012 CSA Group

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 Occupational Hazards and Risks v

Preface *viii*

## **0 Introduction 1**

### **1 Scope 2**

- 1.1 General 2
- 1.2 Applicability 2
- 1.3 Use 2
- 1.4 Terminology 2

## **2 Reference publications 3**

## **3 Definitions 5**

## **4 OHS hazard identification and elimination and risk assessment and control framework 7**

- 4.1 General 7
- 4.2 Development of the framework 9
- 4.3 Elements of the framework 9
  - 4.3.1 Policy 9
  - 4.3.2 Defined roles, responsibilities, and accountabilities 9
  - 4.3.3 Processes 9
  - 4.3.4 Communication 9
  - 4.3.5 Training 10
  - 4.3.6 Resources 10
  - 4.3.7 Monitoring and review 10
  - 4.3.8 Managing change 10
  - 4.3.9 Integration 11

## **5 Preparation for risk assessment 11**

- 5.1 Context 11
  - 5.1.1 General 11
  - 5.1.2 Establishing the risk assessment context 11
- 5.2 Data collection 15
- 5.3 Lifecycle stages 15

## **6 Risk assessment 16**

- 6.1 Risk assessment process 16
- 6.2 Competence 18
- 6.3 Hazard identification 18
  - 6.3.1 General 18
  - 6.3.2 Identification of hazard sources 18
- 6.4 Analysis of hazard sources 18
  - 6.4.1 Elements of hazard source analysis 18
  - 6.4.2 Task identification 19
  - 6.4.3 Hazard elimination 19
- 6.5 Risk analysis 19
  - 6.5.1 General 19
  - 6.5.2 Prioritization 19
  - 6.5.3 Risk analysis inputs 20

- 6.6.4 Risk analysis output 20
- 6.6.5 Preliminary risk analysis 20
- 6.6.6 Determining the need for a detailed risk analysis 21
- 6.6.7 Detailed risk analysis 21
- 6.6.8 Risk evaluation 22
- 6.6.9 Verification and validation of existing controls 22

## **7 Risk control 22**

- 7.1 Hierarchy of risk controls 22
- 7.2 Failure of risk controls 23
- 7.3 Characteristics of risk controls 23
  - 7.3.1 Elimination 23
  - 7.3.2 Substitution 23
  - 7.3.3 Engineering risk controls 23
  - 7.3.4 Risk controls that increase awareness 24
  - 7.3.5 Administrative risk controls 25
  - 7.3.6 Personal protective equipment 25
- 7.4 Introduction of new hazards 26
- 7.5 Verification and validation of risk controls 26
- 7.6 Residual risk 26

## **8 Monitoring and review 26**

- 8.1 General 26
- 8.2 Monitoring 26
- 8.3 Review 27

## **9 Emergency circumstances 27**

## **10 Documentation 27**

### **Annexes**

- A** (informative) — Risk scoring tools 28
- B** (informative) — Hazard identification 44
- C** (informative) — Failure modes of risk controls 53
- D** (informative) — Bibliography 56

---

### **Figures**

- 1** — Risk assessment, risk reduction, and safety management 8
- 2** — Risk transfer between stakeholders 14
- 3** — OHS risk assessment process 17

# Technical Committee on Occupational Hazards and Risks

|                     |  |                   |
|---------------------|--|-------------------|
| <b>T. Doyle</b>     | Industrial Safety Integration,<br>Fergus, Ontario  | <i>Chair</i>      |
| <b>W. Chedore</b>   | Canadian Association of University Teachers,<br>Hamilton, Ontario                            | <i>Vice-Chair</i> |
| <b>E. Alp</b>       | Alp & Associates Inc.,<br>Richmond Hill, Ontario   |                   |
| <b>J. Bennie</b>    | Public Service Alliance of Canada,<br>Ottawa, Ontario  |                   |
| <b>G. Bourque</b>   | Commission de la santé et de la sécurité du<br>travail du Québec,<br>Montréal, Québec        |                   |
| <b>P. Brewer</b>    | WorkSafeNB/Travail sécuritaire NB,<br>Saint John, New Brunswick                              |                   |
| <b>L. Burk</b>      | Pilz Automation Safety LP,<br>Canton, Michigan, USA  | <i>Associate</i>  |
| <b>P. Casey</b>     | Workplace Safety and Insurance Board,<br>Toronto, Ontario                                    | <i>Associate</i>  |
| <b>Y. Chinniah</b>  | École Polytechnique de Montréal,<br>Montréal, Québec   |                   |
| <b>G. Dominguez</b> | Pilz Automation Safety LP,<br>Canton, Michigan, USA  | <i>Associate</i>  |
| <b>T. D'Souza</b>   | Workplace Safety and Insurance Board,<br>Toronto, Ontario                                    | <i>Associate</i>  |
| <b>V. Gagner</b>    | Safety Health Risk & Environmental Consulting<br>Services Inc. (SHREC),<br>Penatham, Ontario |                   |
| <b>E. Garritaro</b> | Infrastructure Health and Safety Association,<br>Toronto, Ontario                            | <i>Associate</i>  |
| <b>D. Gibson</b>    | Canadian Tire Corporation Limited,<br>Brampton, Ontario                                      |                   |
| <b>J. Grogan</b>    | Canadian Auto Workers,<br>Toronto, Ontario   |                   |

|                      |   |                  |
|----------------------|---|------------------|
| <b>G. Green</b>      | Nova Scotia Department of Labour and Workforce Development,<br>Halifax, Nova Scotia | <i>Associate</i> |
| <b>M. Greensides</b> | Norampac Inc.,<br>Mississauga, Ontario  | <i>Associate</i> |
| <b>R. Grikinis</b>   | Liberty International Canada,<br>Toronto, Ontario                                   |                  |
| <b>M. Harnett</b>    | WorkSMART Ergonomics Ltd.,<br>Vancouver, British Columbia                           |                  |
| <b>J. Hill</b>       | The Hill Engineering Group Inc.,<br>Brantford, Ontario                              | <i>Associate</i> |
| <b>G. Jackson</b>    | Ontario Power Generation Inc.,<br>Pickering, Ontario                                |                  |
| <b>D. Johnston</b>   | Toronto Hydro — Electric System Limited,<br>Toronto, Ontario                        |                  |
| <b>A. Lim</b>        | Workers Compensation Board of B.C.,<br>Vancouver, British Columbia                  |                  |
| <b>C. Lockhart</b>   | Nova Scotia Liquor Corporation,<br>Halifax, Nova Scotia                             |                  |
| <b>S. MacKinnon</b>  | Memorial University,<br>St. John's, Newfoundland and Labrador                       | <i>Associate</i> |
| <b>G. Mansour</b>    | Ontario Ministry of Labour,<br>Toronto, Ontario                                     |                  |
| <b>D. Nix</b>        | Compliance InSight Consulting Inc.,<br>Kitchener, Ontario                           |                  |
| <b>T. Norton</b>     | Absolute Engineering Solutions Inc.,<br>Kitchener, Ontario                          | <i>Associate</i> |
| <b>S. O'Donoghue</b> | The Centava Hospital,<br>Ottawa, Ontario  | <i>Associate</i> |
| <b>F. Ovanessian</b> | Workplace Safety and Prevention Services,<br>Mississauga, Ontario                   |                  |
| <b>R. Pleasance</b>  | Sobeys Points West,<br>Edmonton, Alberta  |                  |
| <b>D. Pleasance</b>  | Schneider Electric Canada Inc.,<br>Mississauga, Ontario                             |                  |
| <b>C. Rodgers</b>    | Nova Scotia Department of Labour and Advanced Education,<br>Halifax, Nova Scotia    |                  |

|                         |   |                        |
|-------------------------|---|------------------------|
| <b>J. Salmon</b>        | A.R. Milne Industrial Electric Ltd.,<br>Waterloo, Ontario                             |                        |
| <b>B. Saravanabawan</b> | Human Resources and Skills Development Canada,<br>Ottawa, Ontario                     |                        |
| <b>S. Scrimgeour</b>    | Énergie NB Power,<br>Fredericton, New Brunswick                                       |                        |
| <b>L. Smith</b>         | Canada Bread Company Limited,<br>Toronto, Ontario                                     | <i>Associate</i>       |
| <b>L. Stoffman</b>      | United Food and Commercial Workers Local 1518,<br>Vancouver, British Columbia         |                        |
| <b>M. Szabo</b>         | Municipal Health and Safety Association,<br>Mississauga, Ontario                      | <i>Associate</i>       |
| <b>F. Tomei</b>         | Vaughan, Ontario  | <i>Associate</i>       |
| <b>J. Traer</b>         | Workplace Safety North,<br>Belleville, Ontario  |                        |
| <b>T. Uahinui</b>       | Toyota Engineering & Manufacturing North<br>America, Inc.,<br>Erlanger, Kentucky, USA | <i>Associate</i>       |
| <b>B. Warrack</b>       | Workers Compensation Board of Manitoba,<br>Winnipeg, Manitoba                         |                        |
| <b>T. Winters</b>       | Canadian Union of Public Employees,<br>Ottawa, Ontario                                |                        |
| <b>J. Wright</b>        | Acute Environmental & Safety Services Inc.,<br>Waterloo, Ontario                      |                        |
| <b>E. Rankin</b>        | CSA Group,<br>Mississauga, Ontario  | <i>Project Manager</i> |

*In addition to the members listed above, the Technical Committee acknowledges the valuable contribution of Barry Doyle, Canadian Union of Public Employees, a member of the Technical Committee who passed away on December 18<sup>th</sup>, 2008.*

# Preface

This is the first edition of CSA Z1002, *Occupational health and safety — Hazard identification and elimination and risk assessment and control*.

This Standard is part of the CSA Z1000 series of occupational health and safety management Standards. This Standard describes methods that can be used to identify hazards, eliminate hazards, and analyze the risk associated with hazards that cannot be eliminated. It also provides guidance on the application of risk control measures, monitoring of residual risk, and continual improvement to reduce the risk as better risk control measures become available.

The information presented in this Standard is suitable for use in all sectors and applications. Other Standards that address risk assessment and control methodologies for specific sectors and/or applications might exist. The information in this Standard should be used with those Standards and tailored to meet their specific needs.

This Standard was developed to address the need for common terminology and processes that can apply to all types of occupational health and safety (OHS) hazards and risks. It was the intent of the Technical Committee to harmonize this Standard, where possible and appropriate, with international Standards. This Standard was developed using ISO 14121-1:2007, *Safety of machinery — Risk assessment — Part 1: Principles*, and ISO/TR 14121-2:2007, *Safety of machinery — Risk assessment — Part 2: Practical guidance and examples of methods*, as the seed documents. It aligns with the following national Standards to enable integration with other governance and management systems:

- (a) CAN/CSA-ISO 31000-10, *Risk management — Principles and guidelines*;
- (b) CAN/CSA-ISO/IEC 31010-10, *Risk management — Risk assessment techniques*; and
- (c) CAN/CSA-Z1000-06, *Occupational health and safety management*.

There are over one hundred models for risk assessment. The terms used for risk assessment, and their interpretation, vary across disciplines, applications, and jurisdictions. These models and terms are often used by organizations to prioritize which actions will be taken, if any. The application of these models and terms is highly dependent on the perspective from which risk is viewed (who are making decisions, which parameters and tools they are using, and for what reasons).

It is generally recognized that the effects of worker fatalities, injuries, and illnesses on our society and our economy are substantial. This Standard focuses on effectively reducing risk rather than tolerating or accepting risk. After diligent review of legislation, standards, guidelines, and other documentation, the Technical Committee agreed that tolerating and accepting risks that can be eliminated or effectively reduced is not acceptable from a societal or economic point of view. The Technical Committee agreed to take a fundamental approach to risk assessment that focuses on prevention of harm and protection of workers and can be applied to any type of OHS risk at any stage in the lifecycle of a product, process, or service.

The focus on hazard identification and elimination and effective control of risks from hazards that cannot be eliminated is the keystone of this Standard. Eliminating a hazard eliminates risks associated with that hazard. Not all hazards can be eliminated. There will be some level of risk where hazards remain. This Standard requires application of the hierarchy of risk controls throughout the lifecycle of a product, process, or service to effectively control the risk so that workers are protected from harm. This Standard also requires ongoing actions to ensure the continuing effectiveness of the applied controls.

This Standard was developed with support from federal, provincial, and territorial OHS government agencies.

This Standard was prepared by the Technical Committee on Occupational Hazards and Risks, under the jurisdiction of the Strategic Steering Committee on Occupational Health and Safety, 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 periodic review, and 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.*



# Z1002-12

## ***Occupational health and safety — Hazard identification and elimination and risk assessment and control***

### **0 Introduction**

#### **0.1**

This Standard specifies program requirements for the identification and elimination of occupational health and safety (OHS) hazards and for assessment and control of risks associated with remaining hazards that cannot be eliminated. Numerous CSA Standards address the need for hazard or risk assessment. CAN/CSA-Z1000 sets out requirements for hazard and risk identification and assessment as well as preventive and protective measures. This Standard may be used with CAN/CSA-Z1000 or other OHS management systems, or on its own in the absence of a formal OHS management system. This Standard is also intended to provide direction on identification and elimination of OHS hazards and assessment and control of their associated risks for all other CSA OHS Standards.

#### **0.2**

The purpose of this Standard is to enable an organization to use hazard identification and risk assessment processes to prevent occupational fatalities, injuries, and illnesses and/or reduce the severity of harm related to occupational activities and work environments through hazard elimination and risk controls.

Improvement of injury prevention strategies is possible by proactively identifying hazards, hazard elimination (where practicable), use of appropriate risk assessment techniques, and implementation of risk control strategies.

#### **0.3**

This Standard recognizes the importance of management commitment, leadership, worker participation, and continuous improvement.

#### **0.4**

This Standard was developed by the Technical Committee using the following principles:

- (a) hazard and risk are not synonymous;
- (b) where hazards exist, risk exists;
- (c) risk is a function of the severity of harm and the likelihood of the occurrence of that harm;
- (d) where hazards are eliminated, risk is eliminated; and
- (e) where hazards exist, risk controls are required.

#### **0.5**

This Standard focuses on

- (a) identification of hazards and the risk factors that can contribute to the occurrence of injury or illness;
- (b) assessment of risks and contributing factors; and
- (c) determination of means to eliminate hazards and effectively control risks associated with hazards that cannot be eliminated.

## 0.6

Risk assessment attempts to answer the following fundamental questions:

- (a) What can happen and under what circumstances?
- (b) What are the possible consequences?
- (c) How likely are the possible consequences to occur?
- (d) Has an effective level of risk reduction been achieved or is further risk reduction required?

## 0.7

This Standard reflects current good practice in selection and utilization of risk assessment techniques. It does not preclude the use of new or evolving concepts as long as they are at least as effective as the techniques described in this Standard.

This Standard is general in nature so that it can be used as guidance on risk assessment across many industries and types of products, processes, and services. It is possible that more-specific Standards exist that establish risk assessment processes for particular applications. Where such Standards are in harmony with this Standard, they may be considered to meet the requirements of this Standard.

# 1 Scope

## 1.1 General

This Standard specifies requirements for the identification of OHS hazards, their elimination where practical, and assessment and control of risks associated with remaining hazards.

## 1.2 Applicability

This Standard is applicable to organizations of any size or type and can be applied at all stages in the lifecycle of a product, process, or service.

## 1.3 Use

This Standard is intended to be used by all stakeholders, e.g., those who are responsible for

- (a) evaluating an organization's practices in assessing OHS risk;
- (b) ensuring that an organization eliminates OHS hazards and controls risk associated with remaining hazards that cannot be eliminated;
- (c) organizational efforts to eliminate OHS hazards and control risk associated with a specific area or activity; and
- (d) development of standards, guides, procedures, and codes of practice that in whole or in part set out how hazards are to be eliminated and risks controlled within the specific context of their documents.

## 1.4 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 (nonmandatory) to define their application.