



Occupational safety code for diving operations



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 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

CSA Z275.2:20 February 2020

Title: *Occupational safety code for diving operations*

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

- go to store.csagroup.org
- click on **Product Updates**

The **List ID** that you will need to register for updates to this publication is **2427724**.

If you require assistance, please e-mail techsupport@csagroup.org or call 416-747-2233.

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



Standards Council of Canada
Conseil canadien des normes

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

Cette Norme Nationale du Canada est disponible en versions française et anglaise.

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.

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

National Standard of Canada

CSA Z275.2:20
***Occupational safety code for diving
operations***



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



*Published in February 2020 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 store.csagroup.org
or call toll-free 1-800-463-6727 or 416-747-4044.*

*ICS 97.220.40
ISBN 978-1-4883-2633-2*

*© 2020 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 Occupational Diving and Hyperbaric Environments 6

Subcommittee on Diving Operations 11

Preface 15

1 Scope 17

1.1 General 17

1.2 Limitations 17

1.3 Terminology 17

1.4 Units of measurement 18

2 Reference publications 18

3 Definitions 20

4 General requirements 26

4.1 Qualification of diving personnel 26

4.1.1 Medical qualification 26

4.1.2 Training qualifications 27

4.2 Diving records 28

4.2.1 Diver's personal logbook 28

4.2.2 Daily record 29

4.3 General dive procedures 29

4.3.1 Planning of diving operation 29

4.3.2 Supervision 29

4.3.3 Understanding of duties 29

4.3.4 Transportation to the water surface 30

4.3.5 Recovery of an unconscious diver 30

4.3.6 Inspection of equipment in preparation for the dive 30

4.3.7 Standby diver 31

4.3.8 Adherence to planned procedures 31

4.3.9 Identification of work site 31

4.4 Diving hazards 31

4.4.1 General 31

4.4.2 Floating equipment 31

4.4.3 Approach to intakes/water-control structures and penetration 31

4.4.4 Hazardous mechanisms — general 32

4.4.5 Use of explosives 32

4.5 Emergency services and contingency planning 33

4.5.1 General duty 33

4.5.2 Medical standby 33

4.5.3 Backup hyperbaric facilities 33

4.5.4 Emergency procedure — termination of dive 33

4.6 Breathing mixtures 33

4.6.1 General 33

- 4.6.2 Bailout systems 33
- 4.6.3 Bailout quantities 33
- 4.6.4 Purity standards 34
- 4.6.5 Non-standard gases 34
- 4.7 Compressed breathing air composition and purity 34
 - 4.7.1 Air composition 34
 - 4.7.2 Air purity 35
- 4.8 Sampling and analysis of compressed breathing air or gas mixture 35
 - 4.8.1 General 35
 - 4.8.2 Sampling 35
 - 4.8.3 Analysis 36
- 4.9 Purity of oxygen, nitrogen, and helium 38
- 4.10 Purity and sampling of gas mixtures 39

5 Decompression procedures and tables 40

- 5.1 General 40
- 5.2 Hyperbaric chambers (non-saturation) 40
 - 5.2.1 General 40
 - 5.2.2 On-site requirement 40
 - 5.2.3 Access and location 40
 - 5.2.4 Communication 40
 - 5.2.5 Firefighting 40
 - 5.2.6 First aid 41
 - 5.2.7 External chamber check 41
 - 5.2.8 Internal chamber check 42
 - 5.2.9 Control panel 43
- 5.3 Hyperbaric chamber operator 43
- 5.4 Schedule of diving operations 44
- 5.5 Pressure-related illness 44
- 5.6 Air transportation of distressed diver 44
- 5.7 Diving after treatment for a pressure-related illness 44
- 5.8 Diving supervisor's responsibilities 44

6 General equipment requirements 44

- 6.1 Diving equipment 44
 - 6.1.1 Design, performance, and maintenance of equipment 44
 - 6.1.2 Alternative energy sources 45
- 6.2 Gauges and metering equipment 45
 - 6.2.1 Checking of gauges and metering equipment 45
 - 6.2.2 Submersible depth gauges 46
- 6.3 Compressed breathing air system requirements 46
 - 6.3.1 General 46
 - 6.3.2 Air intakes 47
 - 6.3.3 Compressor requirements 47
 - 6.3.4 Air purification elements and purifier moisture monitoring 47
 - 6.3.5 Compressor operator 48
 - 6.3.6 Compressor maintenance cleaning solvents 48
- 6.4 Oxygen installations 49
 - 6.4.1 Hoses 49

- 6.4.2 Flow velocity 49
- 6.4.3 Valves 49
- 6.4.4 Oxygen storage area 49
- 6.5 Design and testing of pressure vessels 49
- 6.6 Compressed breathing air pipelines 50
- 6.7 Lifeline systems 51
- 6.8 Communications 51
- 6.9 Additional diver's equipment requirements 52
- 6.10 Surface diving base equipment 52
- 6.11 Diver launch and recovery 53
- 6.12 Diving stages 53
- 6.13 Wet bells 54
- 6.14 Remotely operated vehicles ROVs and diving operations 54
- 6.15 Alarms 55

7 SCUBA diving 55

- 7.1 General 55
- 7.2 Maximum depth 56
- 7.3 Emergencies 56
- 7.4 Communications 56
- 7.5 Minimum crew 56
- 7.6 Diving team roles 57
- 7.7 Standby diver 58
- 7.8 Diving equipment 58
 - 7.8.1 Divers 58
 - 7.8.2 Standby SCUBA equipment 58
- 7.9 Sledding 58
 - 7.9.1 General 58
 - 7.9.2 Boat captain or pilot 58

8 Surface-supplied diving 59

- 8.1 General requirements 59
 - 8.1.1 General 59
 - 8.1.2 Work restrictions 59
 - 8.1.3 Surface-supplied offshore gas and oil diving 59
- 8.2 Crew 60
 - 8.2.1 Minimum crew 60
 - 8.2.2 Diver's tender 60
 - 8.2.3 Standby diver 60
- 8.3 Equipment requirements 60
 - 8.3.1 General 60
 - 8.3.2 Air lines 60
 - 8.3.3 Bailout system 61
 - 8.3.4 Non-return valves 61
 - 8.3.5 Diving recovery harness 61
 - 8.3.6 Umbilicals 61
 - 8.3.7 Diving support equipment 62
 - 8.3.8 Dive control 62
 - 8.3.9 Communications 63

8.3.10	Testing and compliance declaration of diving recovery harness	63
8.3.11	Diver heating system	63
8.4	Liveboating	65
8.4.1	General	65
8.4.2	Boat captain	65
9	Deep diving	65
9.1	Scope	65
9.2	Offshore diving	66
9.3	Surface-supplied mixed-gas (SSMG) diving	66
9.3.1	Application	66
9.3.2	Use of breathing mixtures	66
9.3.3	SSMG diving for operations other than offshore gas and oil operations	67
9.3.4	SSMG diving for offshore gas and oil operations	69
9.4	Submersible compression chamber (SCC)/saturation diving systems	69
9.4.1	General	69
9.4.2	Types of saturation diving systems	70
9.4.3	General system safety	70
9.4.4	SCC/saturation system components	71
9.4.5	Submersible compression chambers (SCCs)	72
9.4.6	SCC/Saturation breathing mixtures	74
9.4.7	SCC/Saturation breathing gas heating	74
9.4.8	Reserve gas supplies	74
9.4.9	Emergency gas supplies	74
9.4.10	Diving team restrictions and working hours for saturation diving	75
9.4.11	Crew	76
9.5	Hyperbaric evacuation unit (HEU) and life support package (LSP)	77
9.5.1	Availability of an HEU and an LSP	77
9.5.2	Hyperbaric evacuation	77
10	One-atmosphere diving	78
10.1	Atmospheric diving suits (ADS)	79
10.2	Design requirements	79
10.3	Required equipment	79
10.4	Backup (standby) vehicles	80
10.5	Life-support system	80
10.6	ADS handling systems	80
10.7	Risk assessment and contingency plan	80
10.8	Crew (minimum crew size)	81
11	Diving in contaminated environments	81
11.1	Application	81
11.2	Qualification	81
11.3	Identification and planning	81
11.4	SCUBA diving	82
11.5	Surface-supplied diving	82
11.6	Contaminated water diving (CWD) categories	82
11.7	Minimum standards of protection for personnel	82
11.8	Minimum crew	83

11.9	Thermal hazards	83
11.10	Decompression	83
11.11	Equipment	83
11.12	Work and support areas	84
11.13	Medical requirements and emergency procedures	84
11.13.1	General	84
11.13.2	Preventive measures	85
11.13.3	Emergencies	85
11.13.4	Treatment and surveillance	85

12 Nitrox diving 86

12.1	General	86
12.2	Safety considerations	86
12.3	Risk assessment	86
12.4	Oxygen toxicity	86
12.5	Maximum ppO ₂	86
12.6	Safe handling of gases	86
12.7	Sampling	87
12.8	Nitrox storage area	87
12.8.1	Storage area	87
12.8.2	Nitrox storage cylinders	87
12.9	Air to be mixed or used with nitrox	87
12.10	Gas supplies for surface-supplied diving	87
12.11	Surface-supplied standby diver gas supply	87
12.12	Bail-out bottle contents for surface-supplied diving	87
12.13	Bail-out bottle contents for SCUBA diving	88
12.14	Cleaning	88
12.15	Equipment general	88
12.15.1	General	88
12.15.2	Analyzers	88
12.15.3	Oils, lubricants, and reactive substances	88
12.15.4	Compressors and filtration systems	89
12.15.5	Labelling of nitrox cylinders	89
12.15.6	Firefighting equipment	89

Annex A (informative)	— Guidelines for selection, installation, maintenance, and cleaning of compressor/purification-type breathing air systems	104
Annex B (informative)	— Recommended analytical procedures for the analysis of compressed breathing air	117
Annex C (informative)	— Sample collection for compressed breathing air analysis	119
Annex D (informative)	— Moisture content in compressed breathing air at typical user pressures	124
Annex E (informative)	— Medical assessment of divers	127
Annex F (informative)	— Diver's medical assessment forms	130
Annex G (informative)	— Example of diving log	140
Annex H (informative)	— Example of diving log (deep diving)	141
Annex I (informative)	— Example hazardous substance data sheet	146
Annex J (informative)	— Guidelines for penetration diving	147
Annex K (informative)	— Diver rescue procedures	149
Annex L (informative)	— Listing of regulatory authorities for occupational diving operations	151

Preface

This is the seventh edition of CSA Z275.2, *Occupational safety code for diving operations*. It supersedes the previous editions published in 2015, 2011, 2004, 1992, 1982, and 1974. It is part of a series of Standards on diving and caisson systems covering hyperbaric facilities, occupational diving, and construction work in compressed air environments.

The significant changes to this edition include the following:

- a) new provisions for SCUBA diving, combining “restricted” and “unrestricted” categories into one “occupational SCUBA” category;
- b) clarification of crew size requirements for SCUBA diving, including a new requirement to conduct a dive site risk assessment in order to determine appropriate crew size (Clause [7.5](#));
- c) incorporation of updated crew size requirements for surface-supplied diving (Clause [8.2](#)) as published in the 2018 Amendment to Z275.2-15;
- d) expanded references to IMCA guidelines for offshore diving (Clauses [9.2](#) and [9.3](#));
- e) clarification of requirements for four categories of contaminated diving (Clause [11](#) and Table [8](#));
- f) provision of further guidance on nitrox diving, along with new definitions (Clause [12](#)); and
- g) addition of a new Annex ([K](#)) on “diver rescue methods”.

This Standard has also been harmonized with regulations, standards, guidelines, and codes developed by the Canadian Oil and Gas Lands Administration (COGLA), the Oil and Gas Producers (OGP), the International Marine Contractors Association (IMCA), and NORSOK.

This Standard is not intended to supersede the requirements of applicable occupational safety and health regulations. Criteria in this Standard have been written in a manner that allows the user to comply both with the Standard and applicable legislated requirements throughout Canada.

This Standard is not intended for use as a diving or procedure manual. It is designed to be inflexible in those matters that experience has shown to be critical to the safety of the diver, and yet flexible in those areas where the responsibility and considered judgment of operators provide the highest degree of safety in specialized operations.

Specific exposure tables and decompression schedules are not included in this Standard in view of the fact that a number of well-tested and authoritative tables are available for use by divers and for adoption by the regulatory authorities.

CSA Group acknowledges that the development of this Standard was made possible, in part, by the financial support of the Canadian government departments responsible for occupational health and safety for the development of this edition, the Diver Certification Board of Canada, the Canadian Association of Diving Contractors, and several commercial diving companies.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Subcommittee on Diving Operations, under the jurisdiction of the Technical Committee on Occupational Diving and Hyperbaric Environments and the Strategic Steering Committee on Occupational Health and Safety, 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.*

CSA Z275.2:20

Occupational safety code for diving operations

1 Scope

1.1 General

1.1.1

This Standard applies to occupational diving operations conducted in connection with all types of work and employment, and describes the requirements for occupational safety.

Note: *It is recognized that certain underwater tasks might require specialized standards of practice and/or operational techniques that differ from the requirements of this Standard yet may be acceptable to the authority having jurisdiction. Users should consult applicable provincial and federal occupational safety and health regulations to determine whether they impose safety requirements additional to or more stringent than those of this Standard.*

1.1.2

This Standard addresses equipment requirements and operational procedures for the following diving systems:

- a) SCUBA diving systems (see Clause [7](#));
- b) surface-supplied diving systems (see Clauses [8](#) and [9](#));
- c) deep diving systems (see Clause [9](#));
- d) one-atmosphere diving systems (see Clause [10](#)); and
- e) diving in contaminated environments (see Clause [11](#)).

1.2 Limitations

1.2.1

This Standard does not apply to scientific diving as defined in Clause [3](#).

1.2.2

This Standard does not apply to diving operations performed solely for sport or recreation.

1.2.3

This Standard does not include work techniques associated with underwater diving operations.

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.