

Australian/New Zealand Standard™

**Occupational diving operations**

**Part 1: Standard operational practice**



## **AS/NZS 2299.1:2015**

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee SF-017, Occupational Diving. It was approved on behalf of the Council of Standards Australia on 16 March 2015 and on behalf of the Council of Standards New Zealand on 3 September 2015.

This Standard was published on 21 December 2015.

---

The following are represented on Committee SF-017:

Association of Diving Contractors, New Zealand  
Australian Council of Trade Unions  
Australian Diver Accreditation Scheme  
Australian Diving Contractors Association  
Australian Marine Sciences Association  
Australian Medical Association  
CSIRO Marine and Atmospheric Research  
Department of Defence, Australia  
International Marine Contractors Association  
Maritime Union of Australia  
National Association of Occupational Diver Training Establishments  
National Institute of Water and Atmospheric Research  
New Zealand School of Commercial Diver Training  
NSW Police Force  
Royal New Zealand Navy  
Safe Work Australia  
South Pacific Underwater Medicine Society  
Victoria Police  
Zoo and Aquarium Association

---

### **Keeping Standards up-to-date**

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at [www.saiglobal.com.au](http://www.saiglobal.com.au) or Standards New Zealand web site at [www.standards.co.nz](http://www.standards.co.nz) and looking up the relevant Standard in the online catalogue.

For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

---

Australian/New Zealand Standard™

## Occupational diving operations

### Part 1: Standard operational practice

Originally in Australia in part as AS Z26—1965.  
Previous edition AS/NZS 2299.1:2007.  
Revised and redesignated as AS/NZS 2299.1:2015.

#### **COPYRIGHT**

© Standards Australia Limited/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Australia) or the Copyright Act 1994 (New Zealand).

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, Private Bag 2439, Wellington 6140.

## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee SF-017, Occupational Diving, to supersede AS/NZS 2299.1:2007.

This Standard is the initial Part of a series of Standards for the conduct of occupational diving operations. It is intended for application to all diving operations, however, diving operations in specific sectors of the diving industry for which other Parts in the AS/NZS 2299 series are published may be conducted using either this Standard or the sector-specific Standard. At the time of publication, sector-specific Standards for scientific diving, recreational industry diving and film and photographic diving were published.

The objective of this revision is to clarify and update the Standard and to reflect the requirements of the regulatory authorities. Significant differences from the 2007 edition include the following:

- (a) Revised guidance for the use, calibration and testing of the various pressure gauges used in diving operations.
- (b) A review of the provisions for breathing gas quality, with a specific emphasis on the following:
  - (i) Simplification of determining acceptable water content to avoid risk of condensation or freezing.
  - (ii) Acceptable composition of breathing gases, including gas used for enriched air nitrox (EAN) diving.
  - (iii) A review of the testing and monitoring requirements for breathing gas quality.
- (c) A review of the flange requirements and further considerations for the use of worksite chambers.
- (d) The introduction of a maximum partial pressure of oxygen to be breathed by the diver.
- (e) The addition of a section on the specific requirements for EAN diving, which includes—
  - (i) equipment requirements;
  - (ii) breathing gas supplies for SCUBA and SSBA; and
  - (iii) EAN procedures.
- (f) A minor review of medical requirements.
- (g) A review of the guidance for medical practitioners in Appendix M.
- (h) The removal of reference to specific decompression tables for diving.

Standards Australia has been unable to renew copyright approval for the publication of an extract from the DCIEM tables, and accordingly these have been removed from this version of the document.

The illustrations for the hand signals shown in Appendix K are reproduced with the permission of PADI.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendices to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

## CONTENTS

	<i>Page</i>
<b>SECTION 1 SCOPE AND GENERAL</b>	
1.1 SCOPE.....	5
1.2 OBJECTIVE.....	5
1.3 APPLICATION.....	5
1.4 NORMATIVE REFERENCES.....	6
1.5 DEFINITIONS.....	6
1.6 RELATIONSHIP WITH LEGISLATION.....	1
1.7 UNITS OF MEASURE.....	9
<b>SECTION 2 PERSONNEL, TRAINING AND RECORDS</b>	
2.1 DIVE SUPERVISOR.....	11
2.2 DIVER.....	12
2.3 DIVER'S ATTENDANT.....	12
2.4 STANDBY DIVER.....	12
2.5 FIRST AID TRAINING FOR DIVE TEAMS.....	13
2.6 RECORDS.....	14
<b>SECTION 3 GENERAL PROCEDURES AND EQUIPMENT</b>	
3.1 ORGANIZATION AND PLANNING.....	16
3.2 SELECTION OF BREATHING APPARATUS.....	17
3.3 SURFACE CONDITIONS.....	17
3.4 IN-WATER CONDITIONS.....	18
3.5 DEPTH OF WATER.....	18
3.6 COMMUNICATIONS.....	18
3.7 WATER TEMPERATURE.....	19
3.8 DIVING EQUIPMENT.....	19
3.9 FIRST AID AND MEDICAL EQUIPMENT.....	20
3.10 DIVE SITE REQUIREMENTS.....	21
3.11 DECOMPRESSION AND DIVE TABLES.....	21
3.12 DIVING BEFORE OR AFTER TRAVEL.....	24
3.13 DIVER'S EQUIPMENT.....	24
3.14 PRESSURE GAUGES.....	31
3.15 PNEUMATIC TOOLS.....	33
<b>SECTION 4 BREATHING GAS QUALITY</b>	
4.1 GENERAL.....	34
4.2 WATER CONTENT.....	34
4.3 TESTING OF LOW PRESSURE AIR FOR WATER CONTENT.....	35
4.4 BREATHING GAS COMPOSITION.....	35
4.5 SYSTEMS FOR ENSURING QUALITY OF BREATHING GAS.....	36
4.6 TESTING.....	37
<b>SECTION 5 COMPRESSION (RECOMPRESSION) CHAMBERS</b>	
5.1 COMPRESSION CHAMBER SUPPORT OF DIVING.....	38
5.2 CHAMBER DESIGN, CONSTRUCTION, FITTINGS AND SERVICES.....	40
5.3 CHAMBER OPERATION.....	43
5.4 MEDICAL EQUIPMENT.....	45
5.5 TRANSFER UNDER PRESSURE (TUP).....	45
5.6 CONTINGENCY PLANNING FOR 'WORST CASE SCENARIO' CHAMBER OPERATIONS.....	46

SECTION 6	SPECIFIC REQUIREMENTS FOR SSBA DIVING OPERATIONS	
6.1	GENERAL.....	48
6.2	PERSONNEL REQUIRED.....	48
6.3	RATE OF ASCENT.....	49
6.4	EQUIPMENT .....	49
6.5	COMPRESSED BREATHING GAS SUPPLY.....	50
6.6	AIR COMPRESSOR SYSTEMS.....	53
6.7	CYLINDER GAS SYSTEMS.....	55
6.8	HOOKAH.....	55
SECTION 7	SPECIFIC REQUIREMENTS FOR SCUBA DIVING OPERATIONS	
7.1	GENERAL.....	55
7.2	RESTRICTED USE OF SCUBA.....	56
7.3	PERSONNEL REQUIRED.....	57
7.4	EQUIPMENT .....	58
7.5	LIFELINES AND FLOAT LINES.....	59
SECTION 8	SPECIFIC REQUIREMENTS FOR EAN DIVING OPERATIONS	
8.1	GENERAL.....	61
8.2	OXYGEN-COMPATIBLE AIR.....	61
8.3	EQUIPMENT .....	61
8.4	EAN BREATHING GAS SUPPLY FOR SSBA.....	62
8.5	SELECTING AN EAN MIX.....	64
8.6	PREPARATION OF EAN MIXTURES .....	64
8.7	COMPRESSORS FOR EAN .....	66
8.8	METHODS AND RECORDING OF GAS ANALYSIS .....	66
SECTION 9	ACCIDENT REPORTING	
9.1	ACCIDENT REPORT .....	67
9.2	INVESTIGATION OF ACCIDENTS AND INCIDENTS .....	67
SECTION 10	MEDICAL REQUIREMENTS	
10.1	INTRODUCTION .....	68
10.2	MEDICAL ASSESSMENT .....	68
APPENDICES		
A	LIST OF REGULATORY AUTHORITIES.....	70
B	EXAMPLE OF DIVER'S RECORD OF DIVE .....	73
C	EXAMPLE OF EMPLOYER'S RECORD OF DIVING OPERATION.....	74
D	HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL .....	76
E	CONTENTS OF DIVING OPERATIONS MANUAL.....	85
F	TREATMENT FOR DECOMPRESSION ILLNESS.....	88
G	GUIDELINES REGARDING EXPOSURE TO ALTITUDE FOLLOWING DIVING.....	93
H	TYPICAL COMPRESSION CHAMBER MEDICAL KIT .....	94
I	FEMALE NATO N1079 FLANGE.....	97
J	LIFELINE SIGNALS .....	99
K	HAND SIGNALS FOR SCUBA DIVING OPERATIONS.....	102
L	DIVING MEDICAL EXAMINATION FORMS.....	104
M	GUIDANCE FOR MEDICAL PRACTITIONERS .....	111
N	MEDICAL PRACTITIONERS WITH TRAINING IN DIVING MEDICINE .....	119
BIBLIOGRAPHY	.....	122

## STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

### Australian/New Zealand Standard Occupational diving operations

#### Part 1: Standard operational practice

## SECTION 1 SCOPE AND GENERAL

### 1.1 SCOPE

This Standard provides organizational and logistical requirements for the conduct of occupational diving operations, including the use of compressed gas supply apparatus, and specific requirements for the use of surface-supplied breathing apparatus (SSBA) and self-contained underwater breathing apparatus (SCUBA) in occupational underwater operations at depths not exceeding 50 m (165 ft).

### 1.2 OBJECTIVE

The objective of this Standard is to provide persons engaged in, or connected with, occupational diving with a set of requirements to promote uniformity of practice in relation to health and safety.

### 1.3 APPLICATION

This Standard applies to persons directly involved in occupational diving operations and industries either employing those persons or supplying equipment for use in connection with occupational diving operations. This Standard provides requirements for diving activity using air or enriched air nitrox (EAN) mixtures at depths not exceeding 50 m.

Other Parts of the AS/NZS 2299 series have been prepared to provide specific requirements for particular types of diving, such as scientific diving and diving in the film and photographic sectors. These other parts of the AS/NZS 2299 series are intended to be read in conjunction with the relevant requirements of this Standard.

In addition, this Standard is intended to act as a useful resource to guide organizational, logistical and safety-related aspects of all occupational diving activities, including those that fall outside the stated scope of this Standard.

If diving operations beyond the scope of this Standard are to be undertaken, then additional training and procedures will be necessary to ensure the safety and competency of the dive team.

This Standard may be used for guidance for diving activities in liquids other than water and for diving with non-standard breathing apparatus systems, such as hookah or rebreather units, subject to the appropriate additional training and procedures.

This Standard does not apply to the conduct or teaching of recreational diving, although the guidance on medical fitness for occupational diving is relevant.

This Standard does not apply to non-diving work in pressurized atmospheres, such as in tunnels or caissons, or in hyperbaric treatment facilities in hospitals, which are covered by AS 4774.1 and AS 4774.2 respectively.

#### NOTES:

- 1 Recreational industry diving is covered by AS/NZS 2299.3.
- 2 For recreational diving, the relevant regulatory authority needs to be consulted. A list of relevant regulatory authorities is given in Appendix A.