

Australian Standard[®]

**Measurement of water flow in open
channels**

**Part 1: Hydrometric determinations—
Vocabulary and symbols**

STANDARDS
Australia



This Australian Standard® was prepared by Committee CE-024, Measurement of Water Flow in Open Channels and Closed Conduits. It was approved on behalf of the Council of Standards Australia on 28 May 2008.
This Standard was published on 4 May 2009.

The following are represented on Committee CE-024:

- Australian Industry Group
 - Department of Natural Resources and Water, Qld
 - Institute of Instrumentation, Control and Automation Australia
 - Irrigation Australia
 - National Measurement Institute
 - NSW Department of Commerce
 - University of New South Wales
 - Water and Wastewater Association of Australia
-

This Standard was issued in draft form for comment as DR 08002.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that 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Standards may also be withdrawn.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 that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting www.standards.org.au

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.org.au, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard[®]

**Measurement of water flow in open
channels**

**Part 1: Hydrometric determinations—
Vocabulary and symbols**

Originally as AS 3778.1—2001.
Second edition 2009.

COPYRIGHT

© Standards Australia

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.

Published by Standards Australia GPO Box 476, Sydney, NSW 2001, Australia

ISBN 0 7337 9145 X

PREFACE

This Standard was prepared by the Standards Australia Committee CE-024, Measurement of Water Flow in Open Channels and Closed Conduits.

This Standard is identical with and is reproduced from ISO 772:1996, *Hydrometric determination* and includes Amendment No. 1:2002 and Amendment 2:2004.

The 2001 edition of AS 3778.1 was reviewed by the Committee and it was found to be technically valid. Hence this edition does not include technical alterations to the 2001 edition, however, Amendment No. 1:2002 and Amendment No. 2:2004 have been included. Editorial changes have been made to align with current Standards Australia Policy and, where applicable, the referenced documents have been updated.

This Standard is Part 1 of AS 3778, *Measurement of water flow in open channels*, which is published in parts as follows:

AS

3778	Measurement of water flow in open channels
3778.1	Part 1: Vocabulary and symbols (this Standard)
3778.2	Part 2: General
3778.2.1	Part 2.1: Guidelines for the selection of methods of measurement
3778.2.2	Part 2.2: Establishment and operation of a gauging station
3778.2.3	Part 2.3: Determination of the stage-discharge relation
3778.2.4	Part 2.4: Estimation of uncertainty of a flow rate measurement
3778.2.5	Part 2.5: Guidelines for the selection of flow gauging structures
3778.3	Part 3: Velocity-area method
3778.3.1	Part 3.1: Measurement by current meters and floats
3778.3.2	Part 3.2: Measurement by floating boat method
3778.3.3	Part 3.3: Measurement by velocity-area method
3778.3.4	Part 3.4: Collection and processing of data for determination of errors in measurement
3778.3.5	Part 3.5: Investigation of total error
3778.3.6	Part 3.6: Measurement of flow in tidal channels
3778.3.7	Part 3.7: Measurement by ultrasonic (acoustic) method
3778.3.8	Part 3.8: Electromagnetic method using a full-channel-width coil
3778.4	Part 4: Measurement using flow gauging structures
3778.4.1	Part 4.1: Thin-plate weirs
3778.4.2	Part 4.2: Rectangular broad-crested weirs
3778.4.3	Part 4.3: Round-nose horizontal broad-crested weirs
3778.4.4	Part 4.4: V-shaped broad-crested weirs
3778.4.5	Part 4.5: Triangular profile weirs
3778.4.6	Part 4.6: Flat-V weirs
3778.4.7	Part 4.7: Rectangular, trapezoidal and U-shaped flumes
3778.4.10	Part 4.10: End-depth method for estimation of flow in rectangular channels with a free overfall
3778.4.11	Part 4.11: End-depth method for estimation of flow in rectangular channels with a free overfall (approximate method)
3778.5	Part 5: Dilution method
3778.5.1	Part 5.1: Constant-rate injection method for the measurement of steady flow
3778.5.2	Part 5.2: Integration method for the measurement of steady flow

AS

3778.6	Part 6:	Measuring devices, instruments and equipment
3778.6.1	Part 6.1:	Rotating element current-meters
3778.6.2	Part 6.2:	Direct depth sounding and suspension equipment
3778.6.3	Part 6.3:	Calibration of rotating element current meters in straight open tanks
3778.6.4	Part 6.4:	Echo sounders for water depth measurements
3778.6.5	Part 6.5:	Water level measuring devices
3778.6.6	Part 6.6:	Cableway system for stream gauging
3778.6.7	Part 6.7:	Ultrasonic (acoustic) velocity meters
3778.6.8	Part 6.8:	Position fixing equipment for hydrometric boats
3778.7	Part 7:	Determination of volume of water and water level in lakes and reservoirs

Under arrangements made between Standards Australia and the international Standards bodies, ISO and IEC, as well as certain other Standards organizations, users of this Australian Standard are advised of the following:

- Copyright is vested in Standards Australia.
- The number of this Standard is not reproduced on each page, its identity is shown only on the cover and title pages.
- In the source text 'this standard' should read as 'this Australian Standard'.
- Where the word 'fluid' appears, it should read 'water'.
- A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>	<i>Australian Standard</i>
ISO	AS
3166 Codes for the representation of names of countries and their subdivisions	2632.1 Codes for the representation of names of countries and their subdivisions—Country codes
3454 Liquid flow measurement in open channels—Direct depth sounding and suspension equipment	3778.6.2 Measurement of water flow in open channels—Measuring devices, instruments and equipment—Direct depth sounding and suspension equipment
5168 Measurement of fluid flow—Procedures for the evaluation of uncertainties	3778.2.4 Measurement of water flow in open channels—General—Estimation of uncertainty of a flow rate measurement

The terms 'normative' and 'informative' are used to define the application of the annex to which they apply. A normative annex is an integral part of a standard, whereas an informative annex is only for information and guidance.

CONTENTS

	<i>Page</i>
Scope	1
1 General terms	1
2 Velocity-area methods	22
3 Notches, weirs and flumes	32
4 Dilution methods.....	43
5 Instruments and equipment	50
6 Sediment transport	63
7 Uncertainties in hydrometric determinations	71
Annexes	
A Symbols used in hydrometric determinations	81
B Bibliography	87
Alphabetical index	
English	88
Amendment 1	94
Amendment 2	115

AUSTRALIAN STANDARD

Measurement of water flow in open channels

Part 1: Hydrometric determinations—Vocabulary and symbols

Scope

This International Standard gives terms, definitions and symbols in English and French used in the field of hydrometric determinations.

Structure of the vocabulary

The terminology entries are presented in systematic order, grouped into sections according to particular methods of determination or in relation to particular subjects. Annex A lists the symbols used in this International Standard. Annex B refers the user to ISO 3454 for statistical terminology, and to ISO 5168 for more extensive information about the evaluation of uncertainties. An alphabetical index is included for each of the languages.

The structure of each entry is in accordance with ISO 10241:1992, *International terminology standards — Preparation and layout*. Country codes are in accordance with ISO 3166:1993, *Codes for the representation of names of countries*.

1 General terms

1.1 liquid flow

movement of a volume of a substance that is neither a solid nor a gas, that is practically incompressible, that offers insignificant resistance to change of shape and that flows freely

EXAMPLE — Water or water with sediment

Domaine d'application

La présente Norme internationale donne les termes, définitions et symboles en anglais et en français utilisés dans le domaine des déterminations hydrométriques.

Structure du vocabulaire

Les termes et leurs définitions sont présentés dans l'ordre systématique et sont regroupés en sections suivant la méthode de détermination ou le sujet traité. L'annexe A énumère les symboles utilisés dans la présente norme internationale. Pour ce qui concerne le vocabulaire statistique, l'annexe B renvoie l'utilisateur à l'ISO 3454, et à l'ISO 5168 pour une information plus détaillée pour l'évaluation des incertitudes. Un index alphabétique pour chaque langue est inclus.

La structure de chaque article est en conformité avec l'ISO 10241:1992, *Normes terminologiques internationales — Élaboration et présentation*. Les codes des noms de pays sont en conformité avec l'ISO 3166:1993, *Codes pour la représentation des noms de pays*.

1 Termes généraux

1.1 écoulement mouvement d'un volume de liquide

mouvement d'une substance qui n'est ni un solide ni un gaz, qui est pratiquement incompressible, qui n'offre qu'une résistance insignifiante au changement de forme et qui s'écoule librement

EXEMPLE — Eau ou eau chargée de sédiments.