AS 3778.3.6—1990
ISO 2425: 1974

Australian Standard®

Measurement of water flow in open channels

Part 3: Velocity-area methods Method 3.6: Measurement of flow in tidal channels

This Australian Standard was prepared by Committee CE/24, Measurement of Water Flow in Open Channels and Closed Conduits. It was approved on behalf of the Council of Standards Australia on 9 April 1990 and published on 10 December 1990.

The following interests are represented on Committee CE/24:

Association of Consulting Engineers of Australia

Australian Water and Wastewater Association

Board of Works, Melbourne

Department of Water Resources, NSW

Engineering and Water Supply Department of South Australia

Forestry Commission, NSW

Institute of Instrumentation and Control

Monash University

Public Works Department, NSW

Snowy Mountains Engineering Corporation

University of New South Wales

University of Queensland

Water Authority of Western Australia

Water Board, Sydney

Water Resources Commission, Queensland

Australian Standard®

Measurement of water flow in open channels

Part 3: Velocity-area methods Method 3.6: Measurement of flow in tidal channels

First published as AS 3778.3.6—1990.

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

ISBN 0 7262 6300 1

PREFACE

This Standard was prepared by the Standards Australia Committee on Measurement of Water Flow in Open Channels and Closed Conduits. It is identical with and has been reproduced from ISO 2425—1974/Amendment 1—1982, *Measurement of flow in tidal channels*.

This Standard is one of a series which deals with methods of measurement of water flow in open channels. The series when complete will consist of the following parts:

Part 1: Vocabulary and symbols
Part 2.1: General— Guidelines for the selection of methods of measurement
Part 2.2: General— Establishment and operation of a gauging station
Part 2.3: General— Determination of the stage-discharge relation
Part 2.4: General— Estimation of uncertainty of a flow-rate measurement
Part 2.5: General— Guidelines for the selection of flow gauging structures
Part 3: Velocity-area methods—
Method 3.1: Measurement by current meters and floats
Method 3.2: Measurement by moving-boat method
Method 3.3: Measurement by slope-area method
Method 3.4: Collection and processing of data for determination of errors in measurement
Method 3.5: Investigation of total error
Method 3.6: Measurement of flow in tidal channels (this Standard)
Method 3.7: Measurement by ultrasonic (acoustic) method
Method 3.8: Electromagnetic method using a full-channel-width coil
Part 4: Measurement structure methods—
Method 4.1: Thin-plate weirs
Method 4.2: Rectangular broad-crested weirs
Method 4.3: Round-nose horizontal broad-crested weirs
Method 4.4: V-shaped broad-crested weirs
Method 4.5: Triangular profile weirs
Method 4.6: Flat-V weirs
Method 4.7: Flumes
Method 4.8: Trapezoidal profile weirs for free discharge
Method 4.9: End-depth method for estimation of flow in rectangular channels with a free overfall
Method 4.10: End-depth method for estimation of flow in non-rectangular channels with a free overfall (approximate method)
Part 5 Dilution methods—
Method 5.1: Constant-rate injection method for the measurement of steady flow
Method 5.2: Integration method for the measurement of steady flow
Part 6.1: Measuring devices, instruments and equipment—Rotating element current-meters
Part 6.2: Measuring devices, instruments and equipment—Direct depth sounding and suspension equipment
Part 6.3: Measuring devices, instruments and equipment—Calibration of rotating element current-meters in straight open tanks
Part 6.4: Measuring devices, instruments and equipment—Echo sounders for water depth measurements
Part 6.5: Measuring devices, instruments and equipment—Water level measuring devices
Part 6.6: Measuring devices, instruments and equipment—Cableway system for stream gauging
Part 6.7: Measuring devices, instruments and equipment—Ultrasonic (acoustic) velocity meters
Part 6.8: Measuring devices, instruments and equipment—Position fixing equipment for hydrometric boats

For the purposes of this Australian Standard, the ISO text should be modified as follows:

(a) Wherever the words ‘International Standard’ appear, referring to this Standard, they should be read as ‘Australian Standard’.

(b) Wherever the word ‘fluid’ appears, it should be read as ‘water’.

(c) Substitute a point (.) for a comma (,) as a decimal marker.

(d) The references to other publications should be replaced by references to Australian Standards.

Reference to International Standard		*Australian Standard*	
ISO		AS	
		3778	Measurement of water flow in open channels
772	Liquid flow measurement in open channels—Vocabulary and symbols	3778.1	Part 1: Vocabulary and symbols

748	Liquid flow measurement in open channels — Velocity-area methods	3778.3.1	Part 3: Velocity-area methods — Method 3.1: Measurement by current meters and floats
4369	Liquid flow measurement in open channels — The moving-boat method	3778.3.2	Part 3: Velocity-area methods — Method 3.2: Measurement by moving-boat method
6416	Liquid flow measurement in open channels — Measurement of discharge by the ultrasonic (acoustic) method	3778.3.7	Part 3: Velocity-area methods — Method 3.7: Measurement by ultrasonic (acoustic) method

Measurement of water flow in open channels

Part 3: Velocity-area methods
Method 3.6: Measurement of flow in tidal channels

0 INTRODUCTION

This International Standard provides information about the measurement of liquid flow in tidal channels, which poses problems additional to those encountered in uni-directional streams. Two different methods used generally for measuring tidal flow are covered by this International Standard

a) direct measurement of flow by the measurement of velocities and cross-sectional areas, and

b) cubature methods.

For various reasons, direct measurements of velocity in tidal channels are more liable to large errors than are those made under conditions of uni-directional flow.

An important feature of this International Standard is clause 10, dealing with errors in tidal flow measurement, both in the direct measurements (10.1) and in methods of measurement by cubature (10.2).

Annexes are included to illustrate examples and applications of the two basic equations which are to be used with the cubature method.

1 SCOPE AND FIELD OF APPLICATION

This International Standard, which forms a supplement to ISO 748, specifies the methods of measurement of velocities in tidal channels to be applied in order to draw the total discharge curve and to compute the ebb and flood volumes. It also specifies the alternative method of cubature.

2 REFERENCES

ISO 4369, *Liquid flow measurement in open channels — The moving-boat method*.

ISO 6416, *Liquid flow measurement in open channels — Measurement of discharge by the ultrasonic (acoustic) method*.

ISO 6418, *Liquid flow measurement in open channels — Ultrasonic (acoustic) velocity meters*.

3 TERMINOLOGY

For the purposes of this International Standard, in addition to the definitions given in ISO 772, the following definitions shall apply.

3.1 cubature: A numerical technique of computing discharges in a tidal channel at a cross-section from the rates of change in volume of water up to the tidal limit, with algebraic allowance for the fresh water discharges entering the channel.

3.2 density current: The phenomen of gravity flow of a liquid relative to another liquid, or of relative flow within a liquid medium due to difference in density.

NOTE — The salt-water wedge is a specific case of density current when stratification occurs between identifiable flow masses (see 3.7).

3.3 ebb-tide: The occurrence of falling water surface of a tide.

3.4 ebb-current: The seaward movement of water along a tidal channel.

3.5 flood-tide: The occurrence of rising water surface of a tide.

3.6 flood-current: The landward movement of water along a tidal channel.

3.7 salt-water wedge: The wedge-like intrusion of a large mass of salt water flowing in from the sea under the fresh water in a tidal waterway, where mixing by turbulence is inappreciable.

3.8 estuary: A partially enclosed body of water in the lower reaches of a river which is freely connected with the sea and which may generally receive fresh water supplies from upland drainage areas.

3.9 tide: The periodic rise and fall of the water due principally to the gravitational attraction of the sun and moon.

3.10 tidal channel (tidal waterway): The channel in which the flow is subject to tidal action.

NOTE — A tidal waterway consists of one or more tidal channels together with the shallows and the banks or sides by which the flow at high water is bounded.

3.11 tidal prism: The volume of water that flows into a tidal channel and out again during a complete tide, with the movement of the tide, excluding any upland discharges.