AS 3778.3.1—1990
ISO 748: 1979

Australian Standard®

Measurement of water flow in open channels

Part 3: Velocity-area methods Method 3.1: Measurement by current-meters and floats

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 1999 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

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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 748—1979, *Liquid flow measurement in open channels—Velocity-area methods.*

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 (this Standard)
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
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:	Rectangular, trapezoidal and U-shaped flumes
Method 4.8:	Trapezoidal profile weirs
Method 4.9:	Parshall and Saniiri flumes
Method 4.10:	End-depth method for estimation of flow in rectangular channels with a free overfall
Method 4.11:	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	
1000	SI units and recommendations for the use of their multiples and of certain other units	1000	The international system of units (SI) and its application
31	Quantities, units and symbols	2900	Quantities units and symbols
		3778	Measurement of water flow in open channels

772	Liquid flow measurement in open channels—Vocabulary and symbols
1100/1	Liquid flow measurement in open channels—Part 1: Establishment and operation of a gauging station
1100/2	Liquid flow measurement in open channels—Part 2: Determination of the stage-discharge relation
5168	Measurement of fluid flow—Estimation of uncertainty of a flow-rate measurement
3778.1	Part 1: Vocabulary and symbols
3778.2.2	Part 2.2: General—Establishment and operation of a gauging station
3778.2.3	Part 2.3: General—Determination of the stage-discharge relation
3778.2.4	Part 2.4: General—Estimation of uncertainty of a flow-rate measurement

Measurement of water flow in open channels

Part 3: Velocity-area methods
Method 3.1: Measurement by current-meters and floats

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies methods for determining the velocity and cross-sectional area of water flowing in open channels (with or without ice cover), and or computing the discharge therefrom.

It covers methods of employing current-meters and floats to measure the velocities. Although, in most cases, these measurements are intended to determine the stage-discharge relation by means of readings at several stages, this International Standard deals only with single measurements of the discharge; the continuous recording of discharges over a period of time is covered in ISO 1100.

NOTE — Measurements for the purpose of determining the discharge in efficiency tests of hydraulic turbines are specified in IEC Publication 41, International code for the field acceptance tests of hydraulic turbines.

2 REFERENCES

ISO 31, *Quantities, units and symbols.*

ISO 772, *Liquid flow measurement in open channels — Vocabulary and symbols.*

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units.*

ISO 1088, *Collection of data for determination of errors in measurement of liquid flow by velocity area methods.*

ISO 1100, *Liquid flow measurement in open channels — Establishment and operation of a gauging-station and determination of the stage-discharge relation.*

ISO 2537, *Liquid flow measurement in open channels — Cup-type and propeller-type current meters.*

ISO 3454, *Liquid flow measurement in open channels — Sounding and suspension equipment.*

ISO 3455, *Liquid flow measurement in open channels — Calibration of rotating-element current-meters in straight open tanks.*

ISO 4366, *Liquid flow measurement in open channels — Echo sounders.*

ISO 4373, *Liquid flow measurement in open channels — Water level measuring devices.*

ISO 5168, *Calculation of the uncertainty of a measurement of flowrate.*

ISO/DATA No. 2, *Investigation of the total error in measurement of flow by velocity-area methods.*

3 TERMINOLOGY

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

3.1 frazil ice: Fine spicules or plates of ice suspended in water that are generally formed by supercooling of turbulent water. Frazil ice may float under an ice cover and accumulate as slush.

3.2 rime ice: A white mass of tiny ice crystals or granular ice tufts formed on exposed objects due to atmospheric moisture.

4 UNITS OF MEASUREMENT

The units of measurement used in this International Standard are SI units.

5 PRINCIPLE OF THE METHODS OF MEASUREMENTS

5.1 The principle of these methods consists in measuring flow velocity and cross-sectional area. A measuring site is chosen conforming to the specified requirements; the width, depending on its magnitude, is measured either by means of steel tape or by some other surveying method, and the depth is measured at a number of verticals along the width, sufficient to determine the shape and area of cross-section.

Velocity observations are made at each vertical preferably at the same time as measurement of depth, especially in the case of unstable beds; they are made by any one of the standard methods using current-meters. The principle involved is based on the proportionality between the local flow velocity and the speed of the rotor. Under certain circumstances, velocity observations are also made using surface-floats and velocity rods. The mean velocity is generally computed from the individual observations; however, in certain methods such as the integration method, the mean velocity is obtained directly.

5.2 The discharge is computed either arithmetically or graphically by summing the products of the velocity and corresponding area for a series of observations in a cross-section.