AS 3778.6.8—1992
ISO 6420:1984
(Reconfirmed 2009)

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Australian Standard®

Measurement of water flow in open channels

Method 6.8: Measuring devices, instruments and equipment—Position fixing equipment for hydrometric boats

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 9 January 1992.
This Standard was published on 16 April 1992.

The following are represented on Committee CE-024:

- The Association of Consulting Engineers of Australia
- Australian Water and Wastewater Association
- Department of Water Resources, N.S.W.
- Engineering and Water Supply Department of South Australia
- Forestry Commission, N.S.W.
- Institute of Instrumentation and Control
- Melbourne Water
- Monash University
- Snowy Mountains Engineering Corporation
- University of New South Wales
- University of Queensland
- Water Authority of Western Australia
- Water Board, Sydney—Illawarra—Blue Mountains
- Water Resources Commission, Queensland

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.

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First published as AS 3778.6.8—1992.
Reconfirmed 2009.

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

ISBN 0 7262 7343 0

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 6420: 1984, *Liquid flow measurement in open channels—Position fixing equipment for hydrometric boats.*

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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*
Method 3.7: *Measurement by ultrasonic (acoustic) method*
Method 3.8: *Electromagnetic method using a full-channel-width coil*

Part 4: *Measurement using flow gauging structures*
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: *Measuring devices*
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* (this Standard)

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

(i) Wherever the words 'International Standard' appear, referring to this Standard, they should be read as 'Australian Standard'.

(ii) Wherever the word 'fluid' appears, it should be read as 'water'.

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

(iv) The references to other publications should be replaced by references to Australian Standards as follows:

Reference to International Standard and other Publication	*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

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CONTENTS

Measurement of water flow in open channels—

Part 6.8:
Measuring devices, instruments and equipment—
Position fixing equipment for hydrometric boats

1 Scope and field of application

This International Standard specifies methods of determining the position of hydrometric boats with respect to known points on the banks of rivers or estuaries.

It applies to conventional surveying techniques and, in recognition of the availability of more sophisticated equipment, describes the principles of operation of currently available electronic positioning equipment. This International Standard does not cover the requirements for position fixing that occur in large scale hydrographic surveys such as those conducted on oceans.

2 Reference

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

3 Definitions

For the purpose of this International Standard, the definitions given in ISO 772 apply.

4 Units of measurement

The units of measurement used in this International Standard are those of the International System of Units (SI). Degrees are used in measurement of plane angles.

5 Requirements for position fixing

The necessity of using position fixing equipment arises in two types of measurements on open channels. First, it is necessary to position a boat on a measuring section in order to conduct the appropriate observations of velocity and depth for a discharge measurement. Second, in the conduct of morphological surveys, position fixing equipment is necessary to determine the positions at which depth observations and bottom samples are obtained. To meet these needs, a high order of accuracy is required.

The requirements for position fixing for stream gauging are shown in figure 1. In this case a measuring section is defined and it is then necessary to determine the distance from an initial point. This distance may be measured directly or calculated by trigonometry. Details of several surveying methods for position fixing, for example the pivot-point method, are given in annex A.

The requirements for position fixing for morphological surveys are shown in figure 2. In this case a base line having a known length is defined and its position is computed by trilateration, by triangulation or by using one angle and a distance. The position of a boat can therefore be determined through use of alignment equipment, equipment that measures angles, equipment that measures distance or by means of a combination of these types of equipment.

6 Alignment equipment

6.1 Targets

The most widely used method of giving line is the use of targets. The size and the type of targets used will depend on the channel width. Two or more targets on each bank are used to give a line. To ensure sufficient accuracy of the line, the spacing between each of the targets should not be less than about 10 % of the channel width.

6.2 Optical devices

Surveying instruments such as levels or theodolites may be used to give line by sighting along the line and using hand signals or radios to inform a boat operator of the boat's position with respect to the line.

Laser-equipped survey instruments may also be used to give line. In this case a target should be mounted on the boat and the boat manoeuvred so that the laser beam remains on the target. The target should be high enough above the water surface to eliminate the possibility of a member of the boat crew looking directly at the laser. If this is not the case; protective eyeglasses should be worn. Since the path of a laser beam in clear air is difficult to see, it is often necessary to use some other means, such as shore targets, to assist in manoeuvring the boat into the path of the laser.

Another optical device that can be used to give line depends on sets of flashing lights configured so that an observer on a boat will see different sequences of flashes if the boat is on either side of the line, and a third sequence of flashes if the boat is exactly on the line.