AS 3778.3.3—2001
ISO 1070:1992
ISO 1070:1992/Amd.1:1997

Australian Standard™

Measurement of water flow in open channels

Part 3.3: Velocity-area methods—Measurement by slope-area method

[ISO title: Liquid flow measurement in open channels—Slope-area method]

Standards Australia

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Part 3.3: Velocity-area methods—Measurement by slope-area method

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PREFACE

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

The Standard is identical to and is reproduced from ISO 1070:1992, *Liquid flow measurement in open channels—Slope area method.*

This Standard is Part 3.3 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
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
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3778.4.3	Part 4.3:	Round-nose horizontal broad-crested weirs`
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3778.4.5	Part 4.5:	Triangular profile weirs
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3778.4.11	Part 4.11:	End-depth method for estimation of flow in rectangular channels with a free overfall (approximate method)
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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

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References to International Standards should be replaced by references to equivalent Australian Standards, as follows:

Reference to International Standard		*Australian Standard*	
ISO		AS	
772	Liquid flow measurement in open channels—Vocabulary and symbols	3778	Measurement of water flow in open channels
1100	Liquid flow measurement in open channels	3778.1	Part 1: Vocabulary and symbols
1100-1	Part 1: Establishment and operation of a gauging station	3778.2.2	Part 2.2: General—Establishment and operation
1100-2	Part 2: Determination of the stage-discharge relation	3778.2.3	Part 2.3: General—Determination of the stage-discharge relation
748	Liquid flow measurement in open channels—Velocity area methods	3778.3.1	Part 3.1: Velocity area methods—Measurement by current-meters and floats

NOTES

AUSTRALIAN STANDARD

Measurement of water flow in open channels

Part 3.3:
Velocity-area methods—Measurement by slope-area method

1 Scope

This International Standard specifies a method of determining liquid flow in open channels from observations of the surface slope and cross-sectional area of the channel. It is suitable for use under somewhat special conditions when direct measurement of discharge by more accurate methods, such as the velocity-area method, is not possible.

The slope-area method can be used with reasonable accuracy in open channels having stable boundaries, bed and sides (e.g. rock or very cohesive clay), in lined channels and in channels with relatively coarse material. It may also be used in alluvial channels, including channels with overbank flow or non-uniform channel cross-sections, but in these cases the method is subject to large uncertainties owing to the selection of the rugosity coefficient (such as Manning's coefficient n or Chezy's coefficient C).

Generally the method may be used to determine discharge

a) at the time of determining gauge heights from a series of gauges;

b) for a peak flow that left marks on a series of gauges or where peak stages were recorded by a series of gauges;

c) for a peak flow that left high-water marks along the stream banks.

This method is not suitable for use in very large channels, channels with very flat surface slopes and high sediment load or channels having significant curvature.

Although the accuracy of the results given by the slope-area method is less than that of the results given by the velocity-area method, the slope-area method is sometimes the only method that can be used for determining the extreme high-stage end of rating curves in cases where the magnitude of floods is such that other methods of measuring discharge cannot be used.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 772:1988, *Liquid flow measurement in open channels — Vocabulary and symbols.*

ISO 1100-2:1982, *Liquid flow measurement in open channels — Part 2: Determination of the stage-discharge relation.*

ISO 4373:1979, *Measurement of liquid flow in open channels — Water level measuring devices.*

ISO 5168:1978, *Measurement of fluid flow — Estimation of uncertainty of a flow-rate measurement.*

3 Definitions

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

4 Principle of the method of measurement

A measuring reach is chosen for which the mean area of the stream or river cross-section is determined and the surface slope of the flowing water in that reach is measured. The mean velocity is then established by using known empirical formulae which relate the velocity to the hydraulic mean depth, and the surface slope is corrected for the kinetic energy of the flowing water and the charac-

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