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Measurement of water flow in open channels

Part 3.3: Velocity-area methods — Measurement by slope-area method (ISO 1070:2018, IDT)

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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, to supersede AS 3778.3.3:2001.

The objective of this document is to specify a method of determining discharge in open channels from observations of the surface slope and cross-sectional area of the channel.

It is applicable to use under special conditions when direct measurement of discharge by typically more accurate methods, such as the velocity-area method, is not possible. Generally, the method can be used to determine discharge —

(a) for a peak flow that left high-water marks along the stream banks;

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

(c) for flow observed at the time of determining gauge heights from a series of gauges.

The method is commonly used to undertake the extension of stage discharge relationships above the highest gauged flows.

It does not apply to determining discharges in tidal reaches.

This document is identical with, and has been reproduced from, ISO 1070:2018, *Hydrometry — Slope-area method*.

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Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms "normative" and "informative" are used in Standards to define the application of the appendices or annexes to which they apply. A "normative" appendix or annex is an integral part of a Standard, whereas an "informative" appendix or annex is only for information and guidance.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 113, *Hydrometry*.

This third edition cancels and replaces the second edition (ISO 1070:1992), which has been technically revised. It also incorporates the amendment ISO 1070:1992/Amd.1:1997. The main changes compared to the previous edition are as follows:

— the document has been reorganized to first present two-section computations followed by multiple reach computations;

— a third governing formula has been added;

— three annexes have been added.

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Introduction

The slope–area method is an indirect method of determining discharge in open channels when direct measurement of the flow is not possible because of the timing of the flow or because the site is too hazardous for direct measurement techniques. The method is usually used to document the discharge of a flood and to extend the stage–discharge rating of a stream flow gauging station above direct measurements of discharge. The method can also be used at locations where bridge, cableway or boat measurements are not possible. Water discharge is computed using flow resistance formulae based on channel characteristics, water-surface profiles, and a roughness or friction coefficient.

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Part 3.3: Velocity-area methods — Measurement by slope-area method (ISO 1070:2018, IDT)

1 Scope

This document specifies a method of determining discharge in open channels from observations of the surface slope and cross-sectional area of the channel.

It is applicable to use under special conditions when direct measurement of discharge by typically more accurate methods, such as the velocity-area method, is not possible. Generally, the method can be used to determine discharge

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

b) for a peak flow that left marks on a series of water-level gauges or where peak stages were recorded by that series of gauges, and

c) for flow observed at the time of determining gauge heights from a series of gauges.

The method is commonly used to undertake the extension of stage–discharge relationships above the highest gauged flows.

It does not apply to determining discharges in tidal reaches.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 772, *Hydrometry — Vocabulary and symbols*

ISO 4373, *Hydrometry — Water-level measuring devices*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 772 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

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 using known empirical formulae that relate the velocity to the hydraulic radius. The surface slope is corrected to account for the kinetic energy of the flowing water and the characteristics of the bed and bed material. The discharge is computed as the product of the mean velocity and the mean area of the stream cross section.

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