
**Measurement of liquid flow in open
channels — General guidelines for
selection of method**

*Mesure de débit des liquides dans les canaux découverts — Lignes
directrices générales pour la sélection de la méthode*



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 main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 8363, which is a Technical Report of type 2, was prepared by Technical Committee ISO/TC 113, *Hydrometric measurements*, Subcommittee SC 1, *Velocity area methods*.

This document is being issued in the type 2 Technical Report series of publications (according to subclause G.6.2.2 of part 1 of the IEC/ISO Directives) as a "prospective standard for provisional application" in the field of hydrometric measurements because there is an urgent need for guidance on how standards in this field should be used to meet an identified need.

This document is not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ISO Central Secretariat.

A review of this type 2 Technical Report will be carried out not later than three years after its publication with the options of: extension for another three years; conversion into an International Standard; or withdrawal.

This first edition cancels and replaces the first edition of ISO 8363:1986, which has been technically revised.

Annex A of this Technical Report is for information only.

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Measurement of liquid flow in open channels — General guidelines for selection of method

1 Scope

This Technical Report gives general guidelines for the selection of a suitable method for measurements of liquid flow in open channels. More specific guidelines are contained in International Standards relevant to each method.

2 Methods of measurement

Methods which are suitable for measurements of liquid flow in open channels and which form the subjects of International Standards¹⁾ are as follows:

- 1) Velocity-area method by wading.
- 2) Velocity-area method from a bridge.
- 3) Velocity-area method using a cableway.
- 4) Velocity-area method using a static boat.
- 5) Velocity-area method using a moving boat.
- 6) Velocity-area method using floats.
- 7) Slope-area method.
- 8) Ultrasonic method.
- 9) Electromagnetic method.
- 10) Dilution method with a chemical tracer.
- 11) Dilution method with a radioactive tracer.
- 12) Dilution method with a fluorescent tracer.
- 13) Cubature method.
- 14) Thin-plate weirs (sharp crest, V-notch).
- 15) Thin-plate weirs (sharp crest, rectangular, with suppressed side contractions).
- 16) Thin-plate weirs (sharp crest, rectangular, with side contractions).

1) See annex A for a list of these International Standards.

- 17) Weirs (broad-crested with sharp upstream edge).
- 18) Weirs (broad-crested with rounded upstream edge).
- 19) Weirs (triangular profile).
- 20) Weirs (streamlined triangular profile).
- 21) Weirs (triangular profile, flat-V).
- 22) Weirs (V-shaped, broad-crested).
- 23) Weirs (trapezoidal profile).
- 24) Flumes (rectangular-throated).
- 25) Flumes (trapezoidal-throated).
- 26) Flumes (U-shaped throat).
- 27) Flumes (Parshall and SANIIRI).
- 28) Free overfalls, end-depth method (rectangular and non-rectangular channels).

3 Principles of measurement

3.1 Velocity-area methods

3.1.1 Methods using stationary meters

The cross-section of an open channel is divided into several segments. The width of each segment and the depth and mean velocity at a vertical in each segment are measured. The total discharge through the cross-section is then the sum of the products of velocity, width and depth of each segment.

3.1.2 Moving boat method

The moving boat method is a modification of the velocity-area method using a stationary current meter. A current meter is suspended from a boat at a constant depth below the water surface while the boat crosses the river on a chosen transit line. During the crossing, the current meter reading, depth, distance from bank and time of observation are recorded at intervals. The velocities near the surface are adjusted to give the mean velocity perpendicular to the transit line at each position across the channel. The total discharge through the channel at the transit line is the sum of the products of the mean velocity, width and depth of each segment in which a velocity was recorded.

3.1.3 Method using floats

When measurements using current meters are not feasible, the velocity can be estimated by noting the time taken for a float to travel a known distance.

3.1.4 Ultrasonic method

The velocity of sound in water is measured by simultaneously transmitting pulses in both directions through the water from transducers located in the bank on each side of the river. Alternatively, the two transducers can be on the same bank with a reflector or transponder on the other. The transducers are located so that the pulses in one direction travel against the flow and in the other direction with the flow. The difference between the velocities of the ultrasonic waves is related to the speed of the flowing water at the elevation of the transducers. This velocity can be related to the average velocity of flow over the whole cross-section, and by relating the cross-sectional area and water level, the discharge may be deduced from measurements of water velocity and stage.