



Standard Test Method for Open-Channel Flow Measurement of Water by Velocity-Area Method¹

This standard is issued under the fixed designation D 3858; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the measurement of the volume rate of flow of water in open channels by determining the flow velocity and cross-sectional area and computing the discharge therefrom (Refs (1-7)).²

1.2 The procedures described in this test method are widely used by those responsible for the collection of streamflow data, for example, the U.S. Geological Survey, Bureau of Reclamation, U.S. Army Corps of Engineers, U.S. Department of Agriculture, Water Survey Canada, and many state and provincial agencies. The procedures are generally from internal documents of the above listed agencies, which have become the defacto standards as used in North America.

1.3 This test method covers the use of current meters to measure flow velocities. Discharge measurements may be made to establish isolated single values, or may be made in sets or in a series at various stages or water-level elevations to establish a stage-discharge relation at a site. In either case, the same test method is followed for obtaining field data and computation of discharge.

1.4 Measurements for the purpose of determining the discharge in efficiency tests of hydraulic turbines are specified in International Electrotechnical Commission Publication 41³ for the field acceptance tests of hydraulic turbines, and are not included in this test method.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- D 1129 Terminology Relating to Water⁴
- D 2777 Practice for Determination of Precision and Bias of Applicable Methods of Committee D-19 on Water⁴
- D 4409 Test Method for Velocity Measurements of Water in Open Channels with Rotating Element Current Meters⁴
- D 5089 Test Method for Velocity Measurements of Water in Open Channels with Electromagnetic Current Meters⁴

2.2 ISO Standard:

- ISO 3455 (1976) Calibration of Rotating-Element Current Meters in Straight Open Tanks⁵

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *current meter*—an instrument used to measure, at a point, velocity of flowing water.

3.1.2 *discharge*—the volume of flow of water through a cross section in a unit of time, including any sediment or other solids that may be dissolved in or mixed with the water.

3.1.3 *float*—a buoyant article capable of staying suspended in or resting on the surface of a fluid; often used to mark the thread or trace of a flow line in a stream and to measure the magnitude of the flow velocity along that line.

3.1.4 *stage*—the height of a water surface above an established (or arbitrary) datum plane; also termed *gage height*.

3.2 *Definitions*—For definitions of terms used in this test method, refer to Terminology D 1129.

4. Summary of Test Method

4.1 The principal of this test method consists in effectively and accurately measuring the flow velocity and cross-sectional area of an open channel or stream. The total flow or discharge measurement is the summation of the products of partial areas of the flow cross section and their respective average velocities. The equation representing the computation is:

¹ This test method is under the jurisdiction of ASTM Committee D19 on Water and is the direct responsibility of Subcommittee D19.07 on Sediments, Geomorphology, and Open-Channel Flow.

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² The boldface numbers in parentheses refer to the references listed at the end of this test method.

³ For availability of this publication, contact the International Electrotechnical Commission, 3 rue de Varembe, CH 1211, Geneva 20, Switzerland.

⁴ *Annual Book of ASTM Standards*, Vol 11.01.

⁵ Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

