



Standard Test Method for Open Channel Flow Measurement of Water Indirectly by Using Width Contractions¹

This standard is issued under the fixed designation D 5129; 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 computation of discharge (the volume rate of flow) of water in open channels or streams using bridges that cause width contractions as metering devices.²

1.2 This test method produces the maximum discharge for one flow event, usually a specific flood. The computed discharge may be used to help define the high-water portion of a stage-discharge relation.

1.3 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.4 *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 Water³
- D 2777 Practice for Determination of Precision and Bias of Applicable Methods of Committee D19 on Water³
- D 3858 Test Method for Open Channel Flow Measurements of Water by Velocity-Area Method³

2.2 ISO Standard:

- ISO 748 Liquid Flow Measurements in Open Channels—Velocity-Area Measurements⁴

3. Terminology

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

3.2 Definitions of Terms Specific to This Standard:

3.2.1 **alpha (α)**—a velocity-head coefficient that adjusts the velocity head computed on basis of the mean velocity to the true velocity head.

3.2.2 **area (A)**—the area of a cross section, parts of a cross section, or parts of bridges below the water surface. Subscripts indicate specific areas as follows:

- A_i = area of subsection i ,
- A_j = area of piers or piles that is submerged,
- A_1 = area of total cross section 1 (see Fig. 1), and
- A_3 = gross area of section 3.

3.2.3 **conveyance, (K)**—a measure of the carrying capacity of a channel cross section, or parts of a cross section, and has units of cubic feet per second or cubic metres per second. Conveyance is computed as follows:

$$K = \frac{*1.486}{n} AR^{2/3}$$

where:

- n = the Manning roughness coefficient,
- A = the cross-section area, ft²(m²), and
- R = the hydraulic radius, ft (m).

*in SI units = 1.0

The following subscripts refer to specific conveyances for parts of a cross section:

- K_a, K_b = conveyances of parts of the approach section to either side of the projected bottom width of the contracted section (see Fig. 2). K_d is always the smaller of the two,
- K_d = conveyance at the upstream end of the dikes,
- K_i = conveyance of subsection i ,
- K_q = conveyance of the part of the approach section corresponding to the projected bottom-width, and
- K_T = total conveyance of cross section.

3.2.4 **depth (y)**—depth of flow at a cross section. Subscripts denote specific cross section depths as follows:

- y_1 = depth of flow in cross section 1 (approach section), and

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 This test method is similar to methods developed by the U.S. Geological Survey and described in documents referenced in Footnote 5.

³ *Annual Book of ASTM Standards*, Vol 11.01.

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