



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

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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 representative cross-sectional characteristics, the water-surface slope, and coefficient of channel roughness as input to gradually-varied flow computations.^{2,3}

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

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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:⁴

D1129 Terminology Relating to Water

D2777 Practice for Determination of Precision and Bias of Applicable Test Methods of Committee D19 on Water

D3858 Test Method for Open-Channel Flow Measurement of Water by Velocity-Area Method

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 Refs (1-3).³

³ The boldface numbers in parentheses refer to a list of references at the end of this standard.

⁴ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

2.2 ISO Standards:⁵

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

ISO 1070 Liquid Flow Measurements in Open Channels—Slope-Area Method

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology **D1129**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 Several of the following terms are illustrated in Fig. 1:

3.2.2 *alpha* (α)—a velocity-head coefficient that represents the ratio of the true velocity head to the velocity head computed on the basis of the mean velocity. It is assumed equal to 1.0 if the cross section is not subdivided. For subdivided sections, α is computed as follows:

$$\alpha = \frac{\sum \left(\frac{k_i^3}{A_i^2} \right)}{\frac{K_T^3}{A_T^2}}$$

where:

K and A = the conveyance and area of the subsection indicated by the subscript i , and
 K_T and A_T = the conveyance and area of the entire cross section.

3.2.3 *conveyance* (K)—a measure of the carrying capacity of a channel and has dimensions 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).

NOTE 1—1.486 = 1.00 SI unit.

3.2.4 *cross sections (numbered consecutively in downstream order)*—representative of a reach of channel and are positioned

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.