



Designation: D 5130 – 95 (Reapproved 1999)

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

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 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 D-19 on Water³

D 3858 Practice for Open-Channel Flow Measurement of Water by Velocity-Area Method³

2.2 ISO Standards:

ISO 748 Liquid Flow Measurements in Open Channels—Velocity-Area Method⁴

ISO 1070 Liquid Flow Measurements in Open Channels—Slope-Area Method⁴

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

3.2.1 **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:

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

$$\frac{K_T^3}{A_T^2}$$

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.

3.2.2 **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.

3.2.3 **cross sections (numbered consecutively in downstream order)**—representative of a reach of channel and are positioned as nearly as possible at right angles to the direction of flow. They must be defined by coordinates of horizontal distance and ground elevation. Sufficient ground points must be obtained so that straight-line connection of the coordinates will adequately describe the cross-section geometry. If major breaks in the high-water profile are evident, cross sections should be located at the breaks.

3.2.4 **cross-section area (A)**—the area of the water below

¹ This test method is under the jurisdiction of ASTM Committee D-19 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 Footnotes 5, 6, and 7.

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

⁴ Available from American National Standards Institute, 1430 Broadway, NY, NY 10018.