

Measurement of liquid flow in open channels —

Part 1: Glossary of terms

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- Department of the Environment
- Department of the Environment for Northern Ireland
- Institute of Measurement and Control
- Institution of Civil Engineers
- Institution of Water and Environmental Management
- Ministry of Agriculture, Fisheries and Food
- National Rivers Authority
- Water Services Association of England and Wales
- Welsh Office

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- Anglian Water Authority
- Institute of Hydrology
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Foreword

This Part of BS 3680 has been prepared under the direction of the Industrial-process Measurement and Control Standards Policy Committee. It is a revision of BS 3680-1:1983 which is withdrawn.

This Part of BS 3680 is closely related to the draft revision of ISO 772:1978¹⁾.

Whenever possible in this standard, only one term is used for each definition. However, where there are synonymous terms, both terms are given. Alternative terms are given (in medium type) below the preferred term with their status indicated, e.g. “deprecated”. Synonymous and alternative terms are not individually numbered but are included in the index. Terms of more than one word, e.g. “critical depth” are written in a direct style, not as “depth, critical”. The inverted term is included in the index with a reference to the direct term.

Italicized words in the definitions indicate terms that are defined elsewhere in this Part of BS 3680.

Terms are listed alphabetically in the index and are referred to by numbers which are found against the term in the body of this Part of BS 3680. The terms are arranged in a classified order, each term having an individual number in two parts, the first of one digit and the second of two or three. The first digit represents the number of the section (group of terms) and the other two or three digits represent the place the term occupies within that section.

Symbols used in the measurement of liquid flow are given in Appendix A.

NOTE The title of the publication referred to in this standard is listed on the inside back cover.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 60, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ Published by the International Organization for Standardization and available from Sales Department, BSI, Linford Wood, Milton Keynes MK14 6LE.

No.	Term	Definition
Section 1. General terms		
1 01	liquid flow	The movement of a volume of a substance that is neither a solid nor a gas, that is practically incompressible, that offers insignificant resistance to change of shape and that flows freely, e.g. water or water with <i>sediment</i> .
1 02	flow regime	The state of flow in <i>alluvial rivers</i> , characterized by a bed configuration of <i>ripples</i> , <i>dunes</i> (lower regime), plane bed (transition), standing waves, and <i>antidunes</i> (upper regime). NOTE The lower regime flow is sub-critical (see <i>sub-critical flow</i>); the upper regime flow is super-critical (see <i>super-critical flow</i>).
1 03	steady flow	A condition in which the <i>discharge</i> does not change in magnitude with respect to time.
1 04	unsteady flow	A condition in which the <i>discharge</i> changes in magnitude with respect to time.
1 05	uniform flow	The flow, in an <i>open channel</i> , in which the <i>depth</i> and <i>velocity</i> remain constant along the <i>open channel</i> . NOTE For uniform flow, the <i>velocity</i> vector is constant along every stream line. Uniform flow is possible only in an <i>open channel</i> of constant cross section.
1 06	critical flow	The flow in which the <i>specific energy</i> is a minimum for a given <i>discharge</i> ; under this condition the <i>Froude number</i> is equal to unity and small surface disturbances cannot travel upstream.
1 07	sub-critical flow	The flow in an <i>open channel</i> at less than <i>critical velocity</i> , that has a <i>Froude number</i> of less than unity, and in which small surface disturbances can travel upstream.
1 08	super-critical flow	The flow in an <i>open channel</i> at more than <i>critical velocity</i> , that has a <i>Froude number</i> of greater than unity, and in which small surface disturbances cannot travel upstream.
1 09	transverse flow	Flow horizontally perpendicular to the main direction of flow parallel to the axis of the <i>open channel</i> . NOTE 1 Transverse flow is frequently associated with secondary flow. NOTE 2 Transverse flow in <i>open channels</i> with a curved plan form causes super-elevation of the water surface at the outside of the bend.
1 10	stratification of flow	The state of a fluid that consists of two or more layers arranged according to their density, the lightest layer being on top and the heaviest at the bottom.
1 11	critical depth	The <i>depth</i> of flow when <i>critical flow</i> occurs.
1 12	critical velocity	The <i>velocity</i> at <i>critical flow</i> .
1 13	channel	The deep part of a <i>river</i> or other waterway. NOTE The term can be qualified adjectivally to describe a particular type of channel, such as a low-water channel, a main channel, or an artificial channel.
1 14	open channel	The longitudinal boundary surface consisting of the bed and banks or sides within which the liquid flows with a free surface.
1 15	canal	Man-made <i>open channel</i> , usually of regular cross-sectional shape.
1 16	stable channel	An <i>open channel</i> in which the bed and the sides remain sensibly stable over a substantial period of time in the <i>control reach</i> , and in which the scour and deposition during the rising and falling <i>stages</i> are inappreciable.
1 17	unstable channel	An <i>open channel</i> with a <i>control</i> that changes frequently and significantly.

No.	Term	Definition
1 18	tidal channel	An <i>open channel</i> in which the flow is subject to tidal action.
1 19	tidal waterway	One or more <i>tidal channels</i> together with the shallows and the banks or sides by which the water at <i>high water</i> is bounded.
1 20	estuary	A partially-enclosed body of water in the <i>lower reaches</i> of a river which is freely connected with the sea but which receives fresh water supplies from upland drainage areas.
1 21	stream	The liquid flowing in an <i>open channel</i> (see also <i>river</i>).
1 22	current	The <i>liquid flow</i> in a discernable general direction.
1 23	river	The <i>stream</i> of water in a natural <i>open channel</i> .
1 24	alluvial river	A <i>river</i> which flows through alluvium formed from its own deposits. NOTE The <i>sediment</i> carried by an alluvial river, except for the <i>wash load</i> , is similar to that in the bed.
1 25	incised river	1) A <i>river</i> which has cut its <i>channel</i> down through part of the valley floor. 2) A <i>river</i> which has formed its <i>channel</i> by a process of degradation. NOTE The <i>sediment</i> carried by an incised river generally is dissimilar to that in the bed.
1 26	braided river	A <i>river</i> characterized by an extremely wide and shallow <i>open channel</i> in which flow passes through a number of small interlaced <i>channels</i> separated by shoals. NOTE 1 Frequently there is little or no erosion of the main banks. NOTE 2 Generally there is little or no meandering of the main <i>channel</i> but meandering in the minor <i>channels</i> is usual.
1 27	reach	A length of <i>open channel</i> between two defined cross sections.
1 28	meandering channel	A <i>channel</i> following a sinuous path, characterized by curved flow often with bank erosion alternating with shoaling.
1 29	dune	A large bed form having a triangular profile, a gentle upstream slope and a steep downstream slope. NOTE Dunes are formed in tranquil flow and thus are out of phase with any water surface disturbance that they may produce. They travel slowly downstream as sand is moved across their comparatively gentle upstream slopes and deposited on their steeper downstream slopes.
1 30	antidune	A bed form of curved symmetrically-shaped <i>sand</i> wave that may move upstream, remain stationery or move downstream. NOTE Antidunes are curved in train but they are in phase with, and interact strongly with, gravity water surface waves.
1 31	ripple	A small triangular-shaped bed form that is similar to a <i>dune</i> . NOTE Ripples have much smaller and more uniform amplitudes and lengths than <i>dunes</i> . Ripple wavelengths are less than about 0.6 m and wave heights are less than about 0.06 m.
1 32	thalweg	1) A line in plan joining the deepest points of a <i>stream</i> bed, a <i>channel</i> or a valley. 2) The line of greatest <i>depth</i>, and thus the lowest water thread, along the <i>stream channel</i>.
1 33	transition; crossover	The inflexion <i>reach</i> between two meander loops in which the main flow crosses from one side of the <i>channel</i> to the other. NOTE The depth of flow in a transition is usually reduced from normal <i>depth</i> .
1 34	node; nodal point; inflexion point	The point in a <i>transition</i> at which the sinuous path crosses the mean axis of the meander system.

No.	Term	Definition
		NOTE In a meandering stable <i>channel</i> the node migrates downstream with the meander loops. Migration can be prevented by the creation of a natural or artificial obstruction in the channel.
1 35	discharge	The volume of liquid flowing through a cross section in unit time. NOTE This term is not synonymous with flow.
1 36	unit discharge; discharge per unit width	<i>Discharge</i> through a unit width of a section at a given vertical.
1 37	specific discharge	1) The <i>discharge</i> per unit area of catchment. 2) The <i>discharge</i> corresponding to a specific stage or to a specific <i>gauge</i> height.
1 38	stream gauging	All of the operations necessary for the measurement of <i>discharge</i> .
1 39	discharge measurement	The operation of measuring the <i>discharge</i> of liquid in an <i>open channel</i> .
1 40	gauge	The device installed at the <i>gauging station</i> for measuring the level of the surface of the liquid relative to a datum.
1 41	velocity (V)	The <i>speed of flow</i> past a point in a specified direction.
1 42	speed (of flow)	The ratio of the distance covered by a body of water, moving in a specified direction, to the time taken to cover that distance.
1 43	left bank	The bank to the left of an observer looking downstream.
1 44	right bank	The bank to the right of an observer looking downstream.
1 45	invert	The lowest part of the cross section of a natural or an artificial <i>channel</i> .
1 46	bed slope; bottom slope (s)	The difference in elevation of the bed per unit horizontal distance measured in the direction of flow. NOTE This is usually mathematically positive downwards in the direction of flow.
1 47	bed profile	The shape of the bed in a <i>vertical</i> plane. NOTE This shape of the bed may be considered longitudinally or transversely; this should be stated.
1 48	side-slope (m)	The ratio of the horizontal to the <i>vertical</i> components of the slope.
1 49	surface slope (S)	The difference in elevation of the surface of the <i>stream</i> per unit horizontal distance, measured in the direction of flow.
1 50	surface drawdown	The local lowering of the water surface in an <i>approach channel</i> , caused by the acceleration of the flow passing over an obstacle or through a <i>control</i> .
1 51	fall	The difference in elevation of the water surface between the extremities of a defined <i>reach</i> at a given instant of time, e.g. as recorded at a <i>twin-gauge station</i> .
1 52	top width	The <i>width</i> of an <i>open channel</i> measured across the <i>stream</i> at the water surface.
1 53	wetted perimeter (P_w)	1) The length of wetted contact between a <i>stream</i> of flowing water and its containing <i>open channel</i> , at a cross section, measured in a direction normal to the flow. 2) The wetted boundary of an <i>open channel</i> at a specified section.
1 54	cross section of a stream	The section normal to the mean direction of flow bounded by the free surface and <i>wetted perimeter</i> of the <i>stream</i> .
1 55	gauging section; measuring section	The section in which <i>discharge</i> measurements are taken.

No.	Term	Definition
1 56	measuring reach	A <i>reach</i> of <i>open channel</i> selected for measurement of hydraulic parameters.
1 57	converging reach	A <i>reach</i> in which the cross section gradually decreases in the direction of flow.
1 58	expanding reach	A <i>reach</i> in which the cross section gradually increases in the direction of flow.
1 59	flood mark; trash line	The trace of any kind left on the banks or obstacles or flood plain by a flood. NOTE 1 The flood mark may be used to determine the highest level attained by the water surface during the flood. NOTE 2 See also <i>crest stage gauge</i> .
1 60	normal velocity distribution	The <i>velocity</i> distribution in a straight <i>open channel</i> of uniform cross section which is of sufficient length to develop uniform, resistance-controlled flow.
1 61	surface velocity	The <i>velocity</i> of a liquid at its surface at a given point.
1 62	mean velocity depth	The <i>depth</i> below the surface at which the mean <i>velocity</i> on a <i>vertical</i> occurs.
1 63	mean velocity at a cross section	The <i>velocity</i> at a given <i>cross section of a stream</i> , obtained by dividing the <i>discharge</i> by the cross-sectional area of the <i>stream</i> at that section.
1 64	mean velocity of a reach	The <i>velocity</i> calculated by dividing the <i>discharge</i> by the reach average cross-sectional area of the <i>stream</i> along the <i>reach</i> .
1 65	velocity of approach; approach velocity	The mean <i>velocity</i> at a cross section at a specified distance upstream of a measuring device.
1 66	velocity head	The head due to <i>velocity</i> , equal to the vertical height through which a fall under the influence of gravity alone would give the liquid a <i>velocity</i> equal to its actual <i>velocity</i> , expressed as the square of the <i>velocity</i> divided by twice the acceleration due to gravity. NOTE The velocity head is the kinetic energy of the flow.
1 67	gauged head	The level of the water surface, or stage, related to the invert of the <i>flume</i> or <i>weir</i> crest level as datum.
1 68	piezometric head	The elevation of the free surface plus pressure head. At any cross section it is the <i>total head</i> above datum minus the <i>velocity head</i> at that cross section.
1 69	total head; energy head (<i>H</i>)	The sum of the elevation of the free surface above the horizontal datum of a section, and the <i>velocity head</i> based on the mean <i>velocity</i> at that section. NOTE 1 The total head (<i>H</i>) is given by the following expression:

$$H = h + a \frac{\bar{V}^2}{2g_n}$$

where

- h* is the head of liquid level;
- V* is the mean velocity of the liquid;
- a* is the coriolis energy coefficient;
- g_n* the acceleration due to gravity.

NOTE 2 The coriolis energy coefficient, ≥ 1 , takes account of the non-uniform *velocity* distribution. In many cases *a* is assumed to equal unity.

NOTE 3 See Figure 6 and also *specific energy*.

No.	Term	Definition
1 70	total head line; energy head line	A plot of the <i>total head</i> in the direction of flow. NOTE See Figure 6.
1 71	total head level	The sum of the elevation of the free surface and the <i>velocity head</i> based on the mean <i>velocity</i> at the section.
1 72	energy gradient	The difference in <i>total head</i> per unit horizontal distance along an <i>open channel</i> measured in the direction of flow.
1 73	energy loss; head loss	1) The difference in <i>total head</i> between two cross sections. 2) The decrease in <i>total head</i> , expressed in units of height, due to energy dissipation.
1 74	specific energy	The sum of the elevation of the free surface above the bed and the <i>velocity head</i> based on the mean <i>velocity</i> at that section. NOTE See also <i>total head</i> .
1 75	stage; gauge height; liquid level	The elevation of the free surface of a <i>stream</i> , lake, or <i>reservoir</i> relative to a specified datum. NOTE See also <i>gauge datum</i> .
1 76	gauge height of zero flow	The highest point on the <i>thalweg</i> downstream from the <i>gauge</i> in a natural or artificial <i>channel</i> .
1 77	gauge height of zero flow line	The line on a <i>shift diagram</i> where the sum of the <i>stage</i> and the shift adjustment is equal to the <i>gauge height of zero flow</i> for the <i>rating</i> .
1 78	stage-discharge relation	A curve, equation or table that expresses the relation between the <i>stage</i> and the <i>discharge</i> in an <i>open channel</i> at a given cross section, for a given condition of steady, rising or falling <i>stage</i> . NOTE See Figure 1.

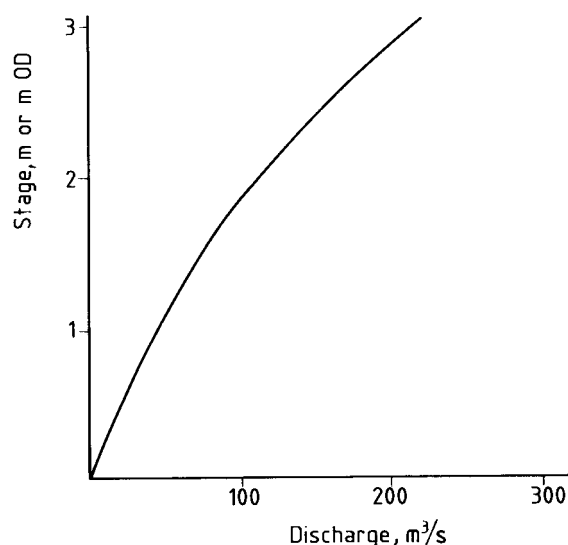


Figure 1 — Stage-discharge relation

No.	Term	Definition
1 79	stage hydrograph	A graphical representation of changes in <i>stage</i> with respect to time.
1 80	discharge hydrograph	A graphical representation of changes in <i>discharge</i> with respect to time.
1 81	shift adjustment	A correction made to the recorded <i>stage</i> to compensate for vertical movement of the bed or for shifting of the <i>control</i> .
1 82	cumulative volume curve; mass discharge curve	A curve in which the cumulative <i>volume</i> of flow or flow mass is plotted against time.
1 83	gauging station	A site selected on a <i>stream</i> , <i>river</i> or <i>open channel</i> at which systematic measurements of water level or <i>discharge</i> , or both, are made.
1 84	single-gauge station	A <i>gauging station</i> at which <i>stage</i> records from a <i>single gauge</i> are adequate to establish a <i>stage-discharge relation</i> .
1 85	twin-gauge station	A <i>gauging station</i> at which two water-level <i>gauges</i> define a <i>reach</i> for measurement of water-surface slopes as an essential parameter for establishing a <i>stage-discharge relation</i> .
1 86	control	The physical properties of a cross section or a <i>reach</i> of a natural or artificial <i>open channel</i> , that govern the relation between <i>stage</i> and <i>discharge</i> at a location in the <i>channel</i> .
1 87	rating	The relationship between <i>discharge</i> and other variables, or the taking of observations and making of calculations needed to establish the relationship.
1 88	calibration of a station; rating of a station	The establishment of a <i>discharge</i> relation with the measured variable(s).
1 89	unit-fall rating	The relation between <i>stage</i> and <i>discharge</i> when the <i>fall</i> is equal to 1 m.
1 90	discontinuous rating	A <i>rating</i> that has a change in diagrammatic shape resulting from a change from lower to upper <i>flow regime</i> in all or part of the <i>control reach</i> . NOTE The change in shape is usually abrupt.
1 91	shift diagram	A curve or set of curves expressing the relation between <i>stage</i> and <i>shift adjustment</i> for a given <i>rating</i> .
1 92	afflux	The rise in liquid level immediately upstream of and due to an obstruction.
1 93	backwater	The <i>afflux</i> upstream from a given location on an <i>open channel</i> resulting from the impedances offered to flow. NOTE Backwater is caused by <i>channel storage</i> for which the reservoir properties vary with the <i>depth</i> of flow at the given location.
1 94	backwater curve	The profile of water surface, concave upwards, along an <i>open channel</i> , from the raised surface at an obstruction or confluence to the point upstream at which the flow is at <i>normal depth</i> . NOTE The term is also used to denote all liquid surface profiles that are non-uniform with respect to distance upstream or downstream. However, this usage is deprecated.
1 95	drawdown curve	The profile of the liquid surface when its <i>surface slope</i> exceeds the <i>bed slope</i> . NOTE From the point at which the <i>bed slope</i> increases, or drops abruptly, to the point where <i>normal depth</i> occurs, the profile along an <i>open channel</i> is convex upwards in an upstream direction and concave upwards in a downstream direction.

No.	Term	Definition
1 96	depth (<i>D</i>)	The linear dimension measured in the <i>vertical</i> direction from the water surface to the bed.
1 97	normal depth	The <i>depth</i> from the water surface to the bottom grade line of a <i>channel</i> , in conditions of <i>uniform flow</i> . NOTE Normal depth is a function of the geometry, slope and roughness of the <i>channel</i> , and of the rate of <i>discharge</i> .
1 98	mean depth	The <i>depth</i> obtained by dividing the wetted cross-sectional area by the <i>width</i> of the free surface.
1 99	length (<i>L</i>)	The linear dimension measured in the direction of the <i>stream</i> .
1 100	width; breadth (<i>B</i>)	The linear dimension measured across the direction of the <i>stream</i> .
1 101	frazil ice	Fine spicules, plates or discoids of ice, suspended in water, that are generally formed by the supercooling of turbulent water. NOTE Frazil ice may float or accumulate under ice cover or adhere to the <i>stream</i> bed as <i>anchor ice</i> .
1 102	anchor ice	Submerged ice found attached to the bed, irrespective of the nature of its formation.
1 103	rime ice	A white mass of tiny ice crystals or granular ice tufts formed on exposed objects, due to atmospheric moisture.
1 104	surface ice	An ice sheet formed on the surface of a lake or <i>river</i> . NOTE Surface ice is known as ice cover or ice sheet.
1 105	slush ice	A mass of loosely-packed <i>anchor ice</i> that has released from the bottom, or <i>frazil ice</i> that floats or accumulates under <i>surface ice</i> .
1 106	peak stage	The maximum instantaneous <i>stage</i> during a given period. NOTE See also <i>flood mark</i> and <i>crest stage gauge</i> .
1 107	friction; drag	The boundary shear resistance that opposes the flow of a liquid.
1 108	conveyance (<i>K</i>); conveyance factor, deprecated	The carrying capacity of a <i>channel</i> expressed in terms of the <i>discharge</i> and the <i>bed slope</i> . NOTE The conveyance (<i>K</i>) is given by the following expression: $K = QS^{1/2}$ where <i>Q</i> is the total <i>discharge</i> ; <i>S</i> is the <i>bed slope</i> .
1 109	hydraulic jump	The sudden <i>transition</i> from <i>super-critical flow</i> to <i>sub-critical flow</i> . NOTE Immediately upstream of the hydraulic jump, the <i>velocity</i> and the <i>depth</i> are, respectively, greater and less than the <i>critical depth</i> ; beyond the jump the <i>velocity</i> and the <i>depth</i> are respectively less and greater than the <i>critical depth</i> .
1 110	hydraulic mean depth	The area of the cross section of water flowing in an <i>open channel</i> divided by the <i>width</i> of the <i>open channel</i> at the water surface.
1 111	hydraulic radius (<i>r_h</i>)	The cross-sectional area of water flowing in an <i>open channel</i> divided by the length of the <i>wetted perimeter</i> at that cross section.
1 112	stage gauge	A device installed for measuring the level of the surface of the liquid relative to a <i>gauge datum</i> .

No.	Term	Definition
1 113	gauge datum	The elevation of the zero of the <i>gauge</i> to which the level of the liquid surface is referred. NOTE The gauge datum is related to a <i>bench mark</i> .
1 114	bench mark	A permanent mark, the elevation of which should be related, where practicable, to a national datum.
1 115	gauge well; stilling well	A chamber open to the atmosphere and connected with the <i>stream</i> in such a way as to permit the measurement of the <i>stage</i> in relatively still water.
1 116	stilling tube	A tube connected with the <i>stream</i> in such a way as to permit the measurement of the <i>stage</i> in relatively still liquid.
1 117	float well	A <i>stilling well</i> in which a <i>float</i> device is used.
1 118	rugosity coefficient; roughness coefficient	A coefficient that characterizes the roughness of the <i>wetted perimeter</i> and which is taken into account when computing the resistance to flow.
1 119	friction coefficient	A coefficient used to calculate the <i>energy</i> gradient caused by friction.
1 120	Froude number (F_r)	A dimensionless parameter that represents the ratio between the inertia and gravity forces in a liquid. NOTE For <i>open channels</i> , the Froude number (F_r) is given by the following expression: $F_r = \frac{\bar{v}}{\sqrt{g\bar{D}}}$ where $\bar{v}$ is the mean <i>velocity</i> of the liquid; $\bar{D}$ is the <i>mean depth</i> of the cross section; g is the acceleration due to gravity.
1 121	Reynolds number (R_e)	A dimensionless parameter that represents the ratio of the inertia forces to viscous forces. NOTE For <i>open channels</i> , the Reynolds number (R_e) is given by the following expression: $R_e = \frac{\bar{v}\bar{D}}{\nu}$ where $\bar{v}$ is the mean <i>velocity</i> of the liquid; $\bar{D}$ is the <i>mean depth</i> of the cross section; ν is the kinematic viscosity of the liquid.
1 122	Weber number (W_e)	A dimensionless parameter that represents the ratio of the inertia forces to surface tension forces. NOTE For <i>open channels</i> , the Weber number (W_e) is given by the following expression: $W_e = \frac{\rho \bar{v}^2 \bar{D}}{\sigma}$ where ρ is the <i>density</i> of the liquid; $\bar{v}^2$ is the squared value of the mean <i>velocity</i> of the liquid; $\bar{D}$ is the <i>mean depth</i> of the cross section; σ is the surface tension of the liquid.
1 123	telemetry	A data or information acquisition system in which the measurement facility is sufficiently remote from the location of data presentation that a system of data transmission is necessary.

No.	Term	Definition
1 124	remote sensing	The acquisition of data or information on some property of an object or phenomenon by a sensor which is significantly remote from the object or phenomenon. NOTE 1 In hydrometry, the common usage of this term usually implies that the sensor is mounted in an aircraft or in a space vehicle. NOTE 2 In hydrometry, it is recommended that the term should not be applied when the sensor is merely not in contact with the object or phenomenon.
1 125	remote telemetry station	All the facilities necessary to accept or to acquire measured data and to transmit the data from an hydrometric station without a human presence at the station.
1 126	remote telemetry unit	A set of equipment which accepts the input of signals from measurements and status indicators, and performs all the processes required to present a data message to a communication link.
1 127	redundancy	The employment of extra facilities, each capable of performing the same function, in order to improve the reliability of a particular function.
1 128	encoding	The process of converting data to a specific code.
1 129	parity check	The addition of an extra bit so that the total number of bits in a sample is either always even or always odd.
1 130	code	A set of rules which specifies the format in which data may be represented.
1 131	system	A set of elements organized to perform a set of designated functions in order to achieve desired results.
1 132	data; raw data	The output resulting directly from the measurement of variables.
1 133	information	The result of analyzing or interpreting data.
1 134	energy	A quantity characterizing the ability of a system to do <i>work</i> (see also <i>power</i>).
1 135	power (<i>P</i>)	The time-rate of transferring <i>energy</i> or of transforming <i>energy</i> , or of doing <i>work</i> .
1 136	work	The transfer of <i>energy</i> expressed as the product of a force and the distance through which its point of application moves in the direction of the force.
1 137	hardware	The tangible equipment associated with a system.
1 138	software	The intangible element of a system, which when applied to the <i>hardware</i> , enables the system to perform in the designed manner.
1 139	firmware	An element of <i>hardware</i> in which its associated <i>software</i> is embedded as a stage in its manufacture.
		NOTE In operation the <i>hardware</i> and the <i>software</i> act as a fixed entity.
1 140	realtime	A characteristic which defines the requirement to complete all the necessary procedures in time to influence a process whilst it is in progress.
1 141	free surface flow (in closed conduits)	Flow within a closed conduit under gravitational flow and normally having a free surface. NOTE Where a flow exceeds the free surface capacity of the conduit, the flow will become surcharged with the consequent disappearance of the free surface. Instances of surcharging of short duration normally do not affect the overall concept of free surface flow in closed conduits.

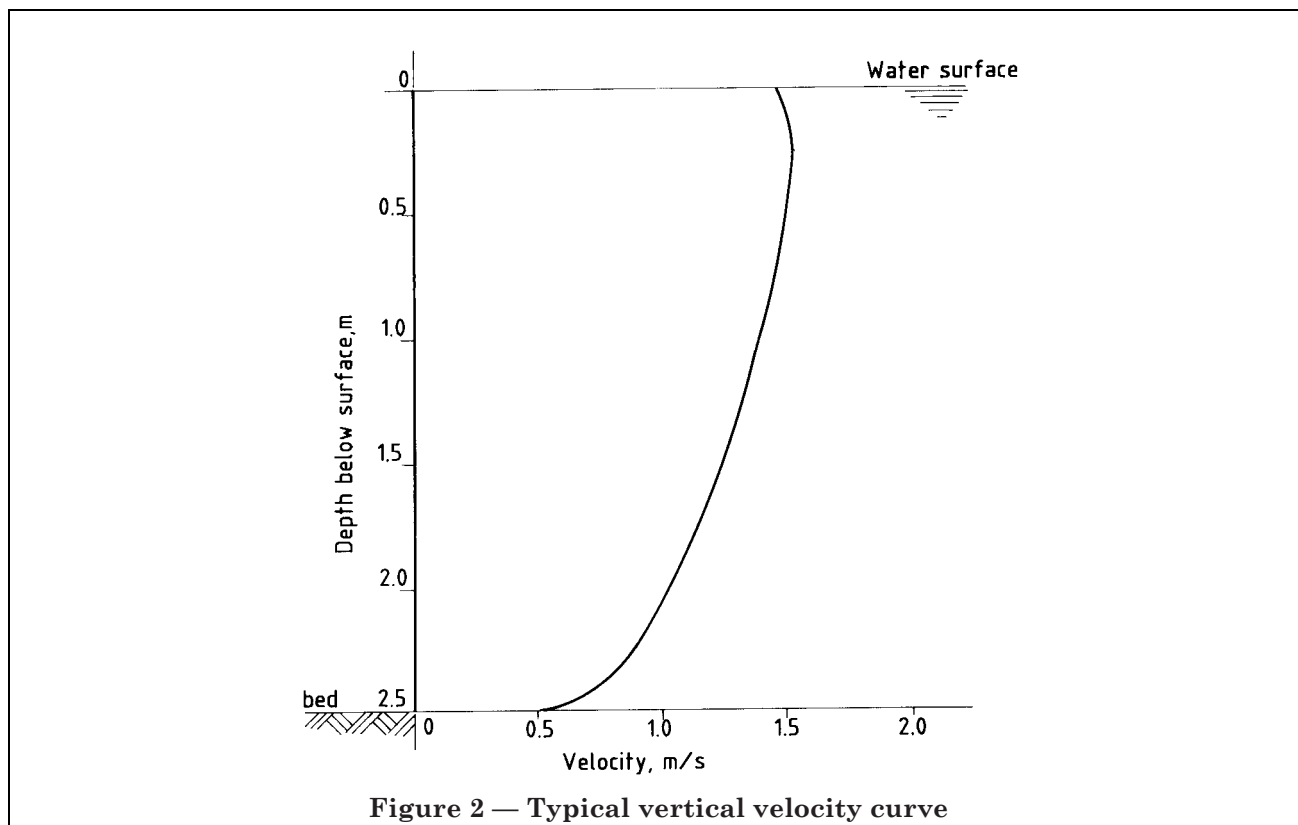
No.	Term	Definition
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Section 2. Velocity-area methods

2 01	velocity-area method	A method of <i>discharge</i> determination deduced from the area of the cross section, bounded by the <i>wetted perimeter</i> and the free surface, and the integration of the component <i>velocities</i> in the cross section.
2 02	slope-area method	An indirect method of <i>discharge</i> determination in a <i>reach</i> which is based on the <i>surface slope</i> , the <i>reach</i> roughness, the <i>wetted perimeters</i> and the flow areas of the various cross sections in the <i>reach</i> .
2 03	mean direction of flow	The direction in which the summation of the component <i>velocity</i> elements in a cross section is a maximum when the components are taken along that direction.
2 04	vertical	The vertical line in which <i>velocity</i> measurements or <i>depth</i> measurements are made.
2 05	drift	1) The distance that a measuring boat travels during the time taken to make a <i>velocity</i> observation. 2) The distance that a current-meter assembly is carried downstream when used with a flexible suspension. NOTE See Figure 3.
2 06	drift velocity	The <i>velocity</i> due to <i>drift</i> .
2 07	period of pulsation	The average period of a cycle of pulsation during which the <i>velocity</i> in the cross section fluctuates between limiting high and low values.

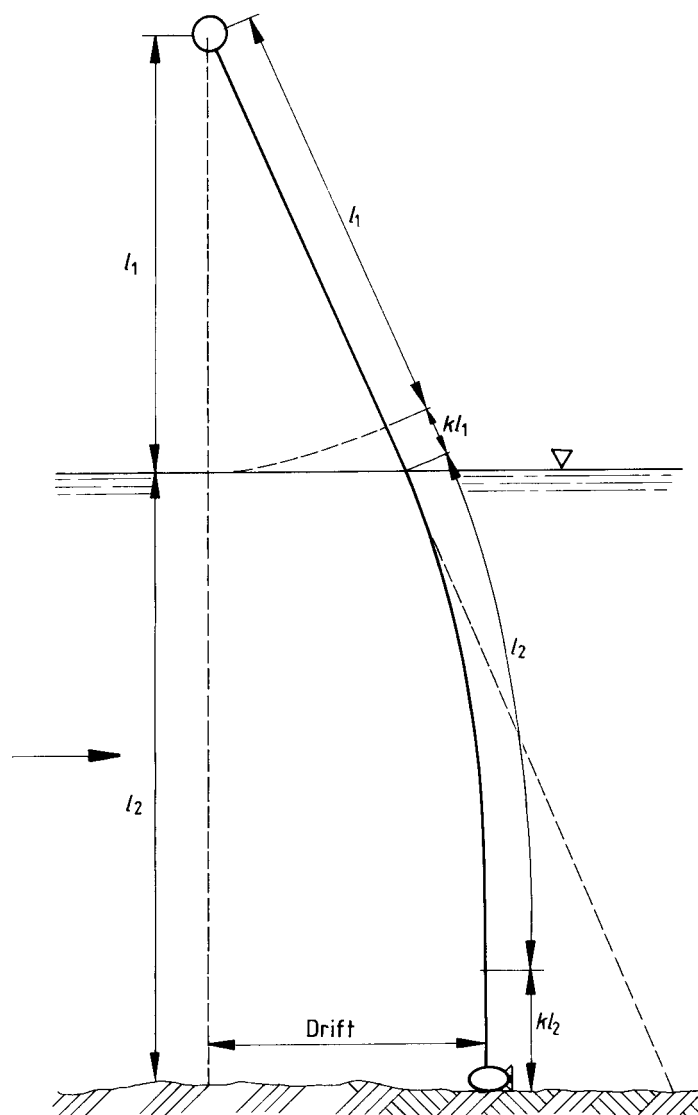
No.	Term	Definition
2 08	vertical velocity curve	A curve showing the relation between <i>depth</i> and <i>velocity</i> along a <i>vertical</i> line in a specified section of a <i>stream</i> .

NOTE See Figure 2.



2 09	velocity vertical gradient	The change in <i>velocity</i> per unit distance along the <i>vertical velocity curve</i> .
2 10	vertical velocity coefficient	The coefficient applied to a single, or an equivalent single, <i>velocity</i> determination at any <i>depth</i> on a <i>vertical</i> to infer the mean <i>velocity</i> on that <i>vertical</i> .
2 11	sounding	The operation of measuring the <i>depth</i> from the free surface to the bed.

No.	Term	Definition
2 12	air line correction	The correction to the <i>sounding line</i> measurement applied to that part of the <i>sounding line</i> above the liquid surface.
		NOTE See Figure 3.

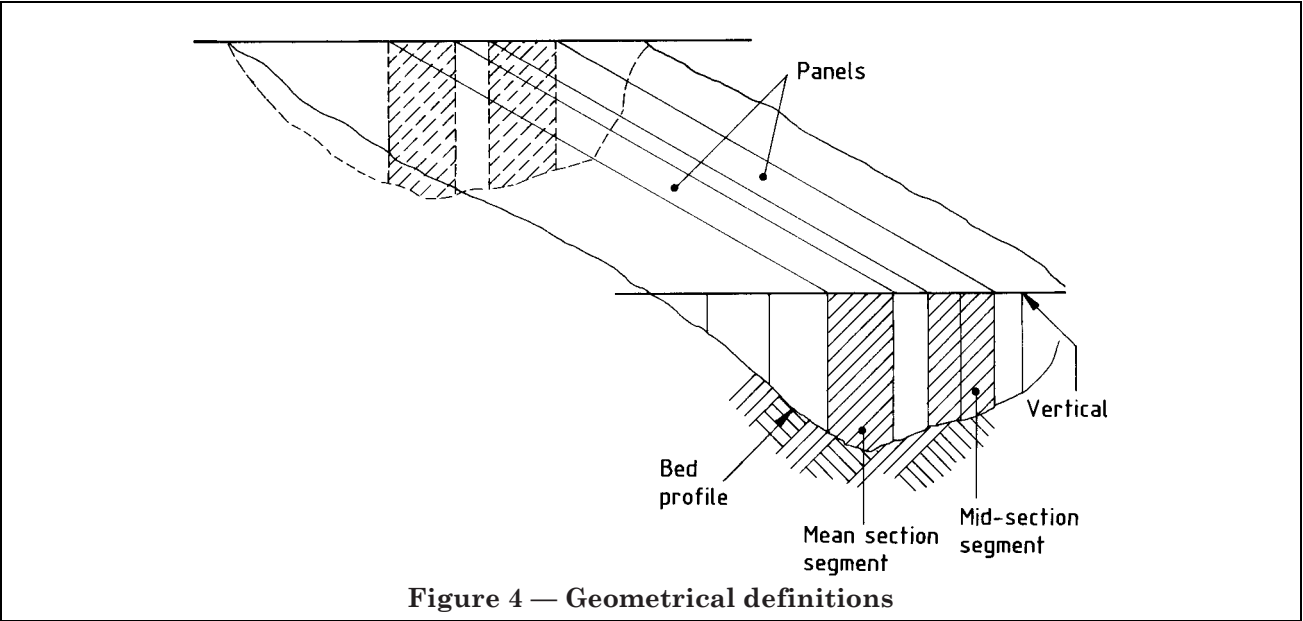
**Key**

- kl_1 is the *air line correction*;
- kl_2 is the *wet line correction*;
- $\rightarrow$ is the direction of the flow;
- ∇ is the level of the water.

Figure 3 — Sounding line corrections

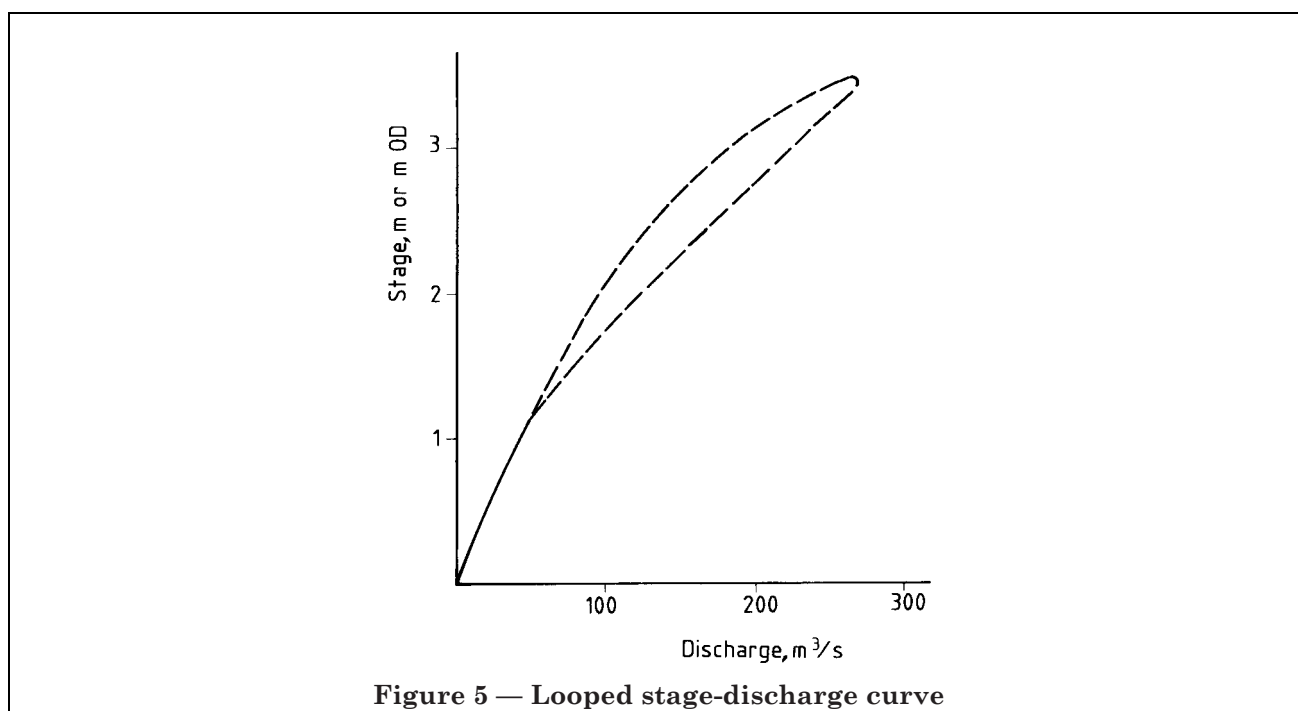
No.	Term	Definition
2 13	wet line correction	The correction to the <i>sounding line</i> measurement applied to that part of the <i>sounding line</i> below the liquid surface. NOTE See Figure 3.
2 14	reference gauge	A <i>stage gauge</i> normally linked to a specified datum.
2 15	reference current-meter	A <i>current-meter</i> that is immersed at a fixed position in the cross section during the carrying out of a <i>discharge</i> measurement. NOTE 1 See <i>current-meter</i> . NOTE 2 For slight changes in <i>discharge</i> during the gauging operation, it is assumed that the change in <i>velocity</i> indicated by the reference current-meter is proportional to the change of <i>discharge</i> .
2 16	standard current-meter	A calibrated <i>current-meter</i> used as a basis of comparison for other <i>current-meters</i> .
2 17	integration method (velocity area measurement)	A method of measuring the <i>velocity</i> in a <i>vertical</i> , involving the raising and lowering of a <i>current-meter</i> at a constant rate through the entire <i>depth</i> of the <i>vertical</i> .
2 18	point method	A method of measuring the <i>velocity</i> in a <i>vertical</i> by exposing a <i>current-meter</i> at a number of designated points on the <i>vertical</i> . NOTE The <i>velocity</i> is usually measured at one, two, three, five or six points on the <i>vertical</i> .
2 19	float gauging	Measurement of <i>velocity</i> of a <i>stream</i> by means of a <i>float</i> or <i>velocity rod</i> .
2 20	moving boat method	A method of measuring <i>discharge</i> from a boat by traversing the <i>stream</i> along the measuring section whilst continuously measuring <i>velocity</i> , <i>depth</i> and distance travelled.
2 21	channel storage	Generally, the volume of liquid flow contained in an <i>open channel</i> at a given instant. Specifically, the volume contained in a defined <i>reach</i> at a given instant and represented by the <i>mean depth</i> of flow in the <i>reach</i> .

No.	Term	Definition
2 22	mean section segment	The area bounded by two consecutive <i>verticals</i> in a cross section, the bed of the <i>open channel</i> and the water surface. NOTE See Figure 4.



2 23	mid-section segment	The area at a <i>vertical</i> defined by the <i>depth</i> at that <i>vertical</i> multiplied by one-half of the distance between the preceding and succeeding <i>verticals</i> . NOTE See Figure 4.
2 24	panel	That part of the surface of the <i>stream</i> enclosed between the corresponding traces of segments in adjacent cross sections. NOTE See Figure 4.
2 25	storage curve	A curve depicting the volume of stored water against <i>stage</i> or time.
2 26	cubature	A numerical technique of computing <i>discharges</i> in a <i>tidal channel</i> at a cross section from the rates of change in volume of water up to the tidal limit, with algebraic allowance for the fresh water <i>discharges</i> entering the <i>channel</i> . NOTE The maximum volume is usually that occurring at <i>high water</i> of <i>spring tide</i> .

No.	Term	Definition
2 27	looped stage-discharge curve; hysteresis of the stage-discharge relation	The effect on the <i>stage-discharge relation</i> at a <i>gauging station</i> where, for the same <i>gauge height</i> , the <i>discharge</i> on the rising <i>stage</i> is different from that on the falling <i>stage</i> .



2 28	sensitivity of the stage-discharge relation	A measure of the change in <i>stage</i> of a <i>gauging station</i> due to a change in <i>discharge</i> . NOTE When a small increase in <i>discharge</i> produces a relatively large increase in <i>stage</i> , the <i>stage/discharge relation</i> is said to be sensitive. When a large increase in <i>discharge</i> produces a relatively small increase in <i>stage</i> , the <i>stage/discharge relation</i> is said to be non-sensitive.
2 29	stilling well lag	The difference at a specific time between the <i>channel stage</i> the <i>stilling well stage</i> , during conditions of rising <i>stage</i> and falling <i>stage</i> in a <i>channel</i> .
2 30	normal fall stage-discharge relation; normal fall method	The relationship between <i>stage</i> and <i>discharge</i> established graphically from a number of distinct sets of measurements of <i>stage</i> , <i>discharge</i> and <i>fall</i> , at a <i>gauging station</i> subject to variable <i>slope</i> , so as to define the condition of minimum <i>backwater</i> in terms of the upstream <i>gauge</i> .
2 31	constant fall stage-discharge relation; constant fall method	The relationship established by graphical interpolation between a number of distinct sets of measurements of <i>stage</i> , <i>discharge</i> and <i>fall</i> , recorded at a <i>gauging station</i> subject to variable <i>slope</i> , so as to define those pairs of <i>stage</i> and <i>discharge</i> measurements for which the measured <i>fall</i> has the same value.
2 32	fall stage-discharge relation; slope stage-discharge relation	A family of curves that expresses the relationship between the water <i>surface slope</i> , <i>stage</i> and <i>discharge</i> in an <i>open channel</i> in a given <i>reach</i> subject to variable <i>backwater</i> .

No.	Term	Definition
2 33	tide	The periodic rise and <i>fall</i> of water due principally to the gravitational attraction of the sun and the moon.
2 34	ebb tide	The occurrence of falling water surface of a <i>tide</i> .
2 35	ebb current	The seaward movement of water along a <i>tidal channel</i> .
2 36	flood tide	The occurrence of rising water surface of a <i>tide</i> .
2 37	flood current	The landward movement of water along a <i>tidal channel</i> .
2 38	spring tide	<i>Tide</i> of large amplitude occurring twice during the lunar month when the resultant tractive force of the sun and the moon acting upon the earth is at a maximum.
2 39	neap tide	<i>Tide</i> of small amplitude occurring twice during a lunar month, near the time of quadrature of the moon with the sun, i.e. when the resultant tractive force acting upon the earth is at a minimum.
2 40	high water	The state of <i>tide</i> when water is highest for any given <i>tidal cycle</i> .
2 41	low water	The state of the <i>tide</i> when water is lowest for any given <i>tidal cycle</i> .
2 42	ebb volume	The total <i>discharge</i> of an <i>ebb tide</i> .
2 43	flood volume	The total <i>discharge</i> of a <i>flood tide</i> .
2 44	tidal amplitude	One half of the difference in height between consecutive <i>high water</i> and <i>low water</i> , hence half the <i>tidal range</i> .
2 45	tidal cycle	A period that includes a complete set of <i>tide</i> conditions or characteristics, such as a <i>tidal day</i> .
2 46	tidal day	The interval between two upper transits of the moon over a local meridian, approximately 24.84 h.
2 47	duration of tide	The time taken for the completion of one <i>tidal cycle</i> ; usually 12.42 h for a semi-diurnal <i>tide</i> or 24.84 h for a diurnal <i>tide</i> .
2 48	tidal prism	The volume of water that flows into a <i>tidal channel</i> and out again during a complete <i>tide</i> , with the movement of the <i>tide</i> , excluding any upland <i>discharges</i> .
2 49	tidal range	The difference in level between <i>high water</i> and <i>low water</i> of a <i>tide</i> . The range is specific to a particular <i>tide</i> if consecutive <i>high water</i> and <i>low water</i> are used; otherwise, the range can refer to extremes of <i>high water</i> and <i>low water</i> over any specified period of time.
2 50	diurnal inequality	1) The difference in heights and durations of the two successive <i>high waters</i> or two successive <i>low waters</i> of each day. 2) The difference in speed and direction of the two <i>flood currents</i> or the two <i>ebb currents</i> of each day.
2 51	seiche	An oscillation of the surface of a liquid caused mainly by winds and variations of atmospheric pressure.
2 52	density current	The phenomenon of gravity flow of a liquid relative to another liquid, or of relative flow within a liquid medium due to difference in density. NOTE See also <i>salt-water wedge</i> .
2 53	salt-water wedge	The wedge-like intrusion of a large mass of salt water flowing in from the sea under the fresh water in a <i>tidal waterway</i> .
2 54	current-meter	Instrument for measuring water <i>velocity</i> .